

The Economist

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March of the machines

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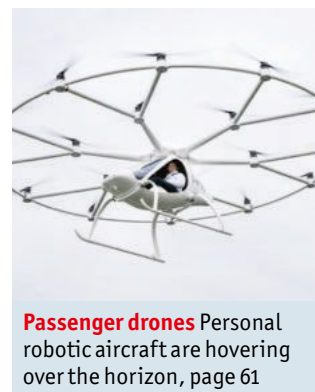
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Politics



Once again, **America's** Senate shot down gun-control proposals. Four measures introduced in response to the massacre at a gay nightclub in Orlando were thrown out. Democratic members of the House of Representatives protested by staging a sit-in on the floor of their debating chamber. Republicans tried to stop it.

The presidential campaigns of **Hillary Clinton** and **Donald Trump**, the presumptive nominees for the Democrats and the Republicans, continued. A British man attempted to shoot Mr Trump at a campaign rally by grabbing a gun from a Secret Service agent. He was swiftly arrested.

Time for peace

Colombia's government and the FARC guerrilla group announced that they had reached an agreement on a bilateral ceasefire. The accord is a big step toward ending a war that has dragged on for more than 50 years. It is expected to bring a formal end to the fighting, with a final peace deal to be signed later this summer.

Six people were killed and over 100 injured in clashes between teachers and police in Oaxaca, a state in southern **Mexico**. The protests began when two officials of the radical CNTE teachers' union were arrested on charges of corruption.

The **Brazilian** state of Rio de Janeiro said it is suffering from a "public calamity" in its finances that could prevent it from fulfilling its commitment to support the Olympic games

to be held in August in the state's capital city. Rio's interim governor, Francisco Dornelles, blamed the shortage of money on a decline in tax revenues caused by Brazil's recession and low oil prices. The declaration permits the state to tap the federal government for extra money.

Canada enacted a law that allows people with terminal illnesses to end their lives with the assistance of a doctor or nurse. The country's Liberal government rejected proposals that would have extended the right to people with non-fatal "grievous and irremediable" diseases.

A grave situation

Prosecutors in **Poland** said that they would exhume the bodies of all the uncremated victims of the plane crash in 2010 in Russia that killed Lech Kaczynski, the then president, and 95 others. Previous investigations blamed pilot error but have failed to dispel conspiracy theories. The current government, led by Law and Justice, a nationalist party, believes criminal negligence at a minimum was involved.

The **French** government reversed a decision to ban a trade-union march in Paris against its unpopular labour reforms. It feared a repeat of the vandalism and rioting that marred previous protests, but was accused of infringing the right to demonstrate.

Italy's highest court made it easier for gay people to adopt their partners' children. The move followed on from the recognition of same-sex civil unions (but not marriage) in May. Campaigners cheered the

move, but want it to go further, with both partners in a same-sex union being recognised as a child's parents at birth.

Fall out

Iraq's president said his forces have recaptured Fallujah from Islamic State, which seized the city, just 60km from Baghdad in January 2014. Fighting is still continuing in parts of it; it may be many months before civilians can return.

Boeing, a planemaker, said that it has reached an agreement to sell 100 planes to **Iran Air**, a state-owned airline, in a deal worth up to \$25 billion. Iran complains that sanctions still hamper investment almost a year after it reached a deal over its nuclear programme.

An **Egyptian** court overturned a decision by the government to hand two islands in the Red Sea to Saudi Arabia. The government is likely to appeal.

Jean-Pierre Bemba, a former vice-president of the **Democratic Republic of Congo**, was sentenced to 18 years in prison by the International Criminal Court in The Hague. He had earlier been found guilty of heading a campaign of rape and murder in the neighbouring Central African Republic.

Moise Katumbi, widely expected to run against President Joseph Kabila of **Congo**, was sentenced in absentia to 36 months in prison over a property deal. He protests his innocence.

A mushrooming problem

North Korea carried out two mid-range missile tests on Tuesday, one of which succeeded, according to American

and South Korean military officials. Japan's defence minister called the missiles "a serious threat".

Shinzo Abe, **Japan's** prime minister, kicked off an upper-house election campaign by touting his plans to boost the country's economy.

Since Rodrigo Duterte was elected president of the **Philippines** on May 9th, the country's police have killed at least 40 suspected criminals, more than in the preceding four months combined. The tough-talking former mayor has spoken approvingly of extrajudicial killings in the past.

Thousands of residents of the village of Wukan in southern **China** staged demonstrations against the arrest of their village chief, Lin Zulian, on corruption charges. Wukan became a cause célèbre in 2011 when Mr Lin led prolonged protests against the alleged seizure of land by local officials. In a remarkable concession, the government later allowed him to stand for election as village chief; he won by a landslide. Villagers believe his recent arrest is linked with his plans to renew a campaign for the return of the land.

Wu Jianmin, a retired **Chinese** diplomat who had served as ambassador to France and the United Nations, died in a car crash while travelling to Wuhan. Mr Wu had recently aroused controversy in China because of his public criticism of the country's nationalists, which was rare from someone of his rank.

Hot dog, anyone?

The southern **Chinese** city of Yulin went ahead with its annual dog-meat festival, despite widespread criticism by animal lovers in China and abroad. Dog ownership has increased rapidly in China in recent years, fuelling opposition to the tradition of eating them. The state news agency, Xinhua, said a poll showed that 64% of people aged 16 to 50 believed the festival should not be held.

Business

Foreign direct investment

India, net inflows, \$bn
Three-month moving average



Raghuram Rajan, the respected governor of **India's central bank**, announced that he would be stepping down in September rather than staying on for a customary second term. Mr Rajan's efforts to clean up the country's banks may have turned some of India's tycoons against him; his star power may also have annoyed government figures. Any sign that India will wobble on cleaning up the ailing banking sector or inflation-targeting will hurt its ability to attract foreign investment. The country is to relax some rules on foreign ownership in an effort to reassure investors.

Germany's highest court decided that a **European Central Bank** scheme to buy troubled countries' bonds on secondary markets is constitutional. In 2014 the Constitutional Court in Karlsruhe deferred a ruling on whether such "Outright Monetary Transactions"—which have not yet been invoked—are tantamount to state financing, and thus outside the ECB's mandate. Meanwhile, 30-year German bond yields fell to 0.65%, the lowest level on record.

Abu Dhabi said it planned to merge the **National Bank of Abu Dhabi** and **First Gulf Bank**. A tie-up would create the Gulf's largest lender. Further consolidation among the region's banks could be on the cards because the low oil price has taken its toll on deposits.

Oi, a Brazilian telecoms firm, applied for "judicial recuperation", Brazil's equivalent of Chapter 11 bankruptcy. The company has debts of 65.4

billion reais (\$19.3 billion) and had failed to agree on a restructuring deal with its creditors. With the Brazilian economy in recession, and many large firms heavily in debt, Oi's troubles might be a grim portent of things to come.

Slow motion

American regulators approved an application by **IEX** to operate as a public stock exchange. IEX has been designed to mitigate the impact of high-frequency trading by delaying trades by 350 microseconds. Several of America's bourses had lobbied against certification, arguing that such a "speed bump" to slow down trades would give the exchange an unfair advantage.

Tencent, a Chinese technology firm, launched a bid to buy an 84% stake in **Supercell**, the Finnish maker of computer games responsible for "Clash of Clans", in a deal worth \$8.6 billion. The move is the latest in a line of investments in gaming firms by Tencent, which owns the WeChat messaging app. The firm is buying its stake from SoftBank, a Japanese telecoms firm.

Meanwhile, Nikesh Arora, the president of **SoftBank**, resigned. Mr Arora cited the

decision of the firm's founder and chief executive, Masayoshi Son, to extend his tenure for perhaps as long as another ten years. Mr Arora had been considered the likely candidate to succeed him.

German prosecutors launched an investigation into whether Martin Winterkorn, the former boss of **Volkswagen**, was complicit in manipulating the market in relation to the diesel-emissions scandal at the firm. He is suspected of waiting too long to disclose that VW faced an inquiry into its use of devices designed to cheat on emissions tests. Mr Winterkorn has denied personal wrongdoing. Another unnamed executive at the firm is also under investigation.

Mitsubishi is another carmaker currently ruing cheating on vehicle tests. The Japanese firm said it expected to post a loss of ¥145 billion (\$1.4 billion) this year, after it admitted it had been falsifying fuel-efficiency data for 25 years. Mitsubishi said it would pay affected customers \$1,000 in compensation, at a total cost of perhaps \$600m.

Walmart said it would partner with **JD.com**, a Chinese e-commerce firm. The American

retailer hopes the tie-up will help it to revive the fortunes of Yihaodian, its struggling Chinese online marketplace.

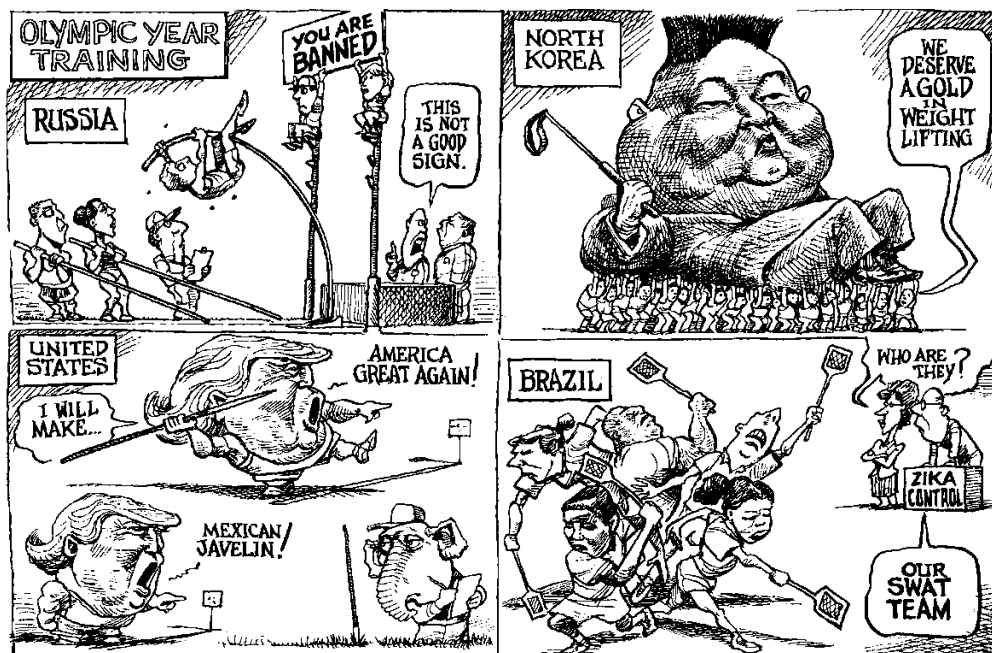
Are friends electric?

Tesla Motors, an electric-car maker, made a \$2.8 billion bid to buy **SolarCity**, a solar-power firm. Elon Musk is the largest shareholder in both firms, chief executive of the former and chairman of the latter. Mr Musk is keen to consolidate his businesses, though some questioned why, given their overlapping interests, Tesla was paying a premium to buy the firm. Mr Musk is to recuse himself from voting on the deal.

China topped a new ranking of the world's **supercomputers**. The country is now home to 167 of the world's 500 most powerful machines, overtaking America for the first time. The top-ranked computer is the Sunway TaihuLight, which uses its 93 petaflops for weather forecasting among other things.

Instagram hit 500m users. Some 95m photos and videos are posted on the Facebook-owned app every day.

Other economic data and news can be found on pages 72-73



March of the machines

What history tells us about the future of artificial intelligence—and how society should respond



EXPERTS warn that “the substitution of machinery for human labour” may “render the population redundant”. They worry that “the discovery of this mighty power” has come “before we knew how to employ it rightly”. Such fears are expressed today by those who worry that advances in artificial intelligence (AI) could destroy millions of jobs and pose a “Terminator”-style threat to humanity. But these are in fact the words of commentators discussing mechanisation and steam power two centuries ago. Back then the controversy over the dangers posed by machines was known as the “machinery question”. Now a very similar debate is under way.

After many false dawns, AI has made extraordinary progress in the past few years, thanks to a versatile technique called “deep learning”. Given enough data, large (or “deep”) neural networks, modelled on the brain’s architecture, can be trained to do all kinds of things. They power Google’s search engine, Facebook’s automatic photo tagging, Apple’s voice assistant, Amazon’s shopping recommendations and Tesla’s self-driving cars. But this rapid progress has also led to concerns about safety and job losses. Stephen Hawking, Elon Musk and others wonder whether AI could get out of control, precipitating a sci-fi conflict between people and machines. Others worry that AI will cause widespread unemployment, by automating cognitive tasks that could previously be done only by people. After 200 years, the machinery question is back. It needs to be answered.

Machinery questions and answers

The most alarming scenario is of rogue AI turning evil, as seen in countless sci-fi films. It is the modern expression of an old fear, going back to “Frankenstein” (1818) and beyond. But although AI systems are impressive, they can perform only very specific tasks: a general AI capable of outwitting its human creators remains a distant and uncertain prospect. Worrying about it is like worrying about overpopulation on Mars before colonists have even set foot there, says Andrew Ng, an AI researcher. The more pressing aspect of the machinery question is what impact AI might have on people’s jobs and way of life.

This fear also has a long history. Panics about “technological unemployment” struck in the 1960s (when firms first installed computers and robots) and the 1980s (when PCs landed on desks). Each time, it seemed that widespread automation of skilled workers’ jobs was just around the corner.

Each time, in fact, technology ultimately created more jobs than it destroyed, as the automation of one chore increased demand for people to do the related tasks that were still beyond machines. Replacing some bank tellers with ATMs, for example, made it cheaper to open new branches, creating many more new jobs in sales and customer service. Similarly, e-commerce has increased overall employment in retailing. As with the introduction of computing into offices, AI will not so much replace workers directly as require them to gain new skills to

complement it (see our special report in this issue). Although a much-cited paper suggests that up to 47% of American jobs face potential automation in the next decade or two, other studies estimate that less than 10% will actually go.

Even if job losses in the short term are likely to be more than offset by the creation of new jobs in the long term, the experience of the 19th century shows that the transition can be traumatic. Economic growth took off after centuries of stagnant living standards, but decades passed before this was fully reflected in higher wages. The rapid shift of growing populations from farms to urban factories contributed to unrest across Europe. Governments took a century to respond with new education and welfare systems.

This time the transition is likely to be faster, as technologies diffuse more quickly than they did 200 years ago. Income inequality is already growing, because high-skill workers benefit disproportionately when technology complements their jobs. This poses two challenges for employers and policymakers: how to help existing workers acquire new skills; and how to prepare future generations for a workplace stuffed full of AI.

An intelligent response

As technology changes the skills needed for each profession, workers will have to adjust. That will mean making education and training flexible enough to teach new skills quickly and efficiently. It will require a greater emphasis on lifelong learning and on-the-job training, and wider use of online learning and video-game-style simulation. AI may itself help, by personalising computer-based learning and by identifying workers’ skills gaps and opportunities for retraining.

Social and character skills will matter more, too. When jobs are perishable, technologies come and go and people’s working lives are longer, social skills are a foundation. They can give humans an edge, helping them do work that calls for empathy and human interaction—traits that are beyond machines.

And welfare systems will have to be updated, to smooth the transitions between jobs and to support workers while they pick up new skills. One scheme widely touted as a panacea is a “basic income”, paid to everybody regardless of their situation. But that would not make sense without strong evidence that this technological revolution, unlike previous ones, is eroding the demand for labour. Instead countries should learn from Denmark’s “flexicurity” system, which lets firms hire and fire easily, while supporting unemployed workers as they retrain and look for new jobs. Benefits, pensions and health care should follow individual workers, rather than being tied (as often today) to employers.

Despite the march of technology, there is little sign that industrial-era education and welfare systems are yet being modernised and made flexible. Policymakers need to get going now because, the longer they delay, the greater the burden on the welfare state. John Stuart Mill wrote in the 1840s that “there cannot be a more legitimate object of the legislator’s care” than looking after those whose livelihoods are disrupted by technology. That was true in the era of the steam engine, and it remains true in the era of artificial intelligence. ■

Guns in America

Control, alt, delete

The impasse on gun control will not last for ever



FIRST comes grief, then outrage and then failed gun-control bills in Congress: the ritual that follows a mass shooting in America is wearily familiar. After 49 people were murdered in Orlando, the cycle hit warp speed. Less than ten days after

the bodies arrived in the morgue, the Senate voted against introducing universal background checks on gun purchases, a measure that has the support of close to 90% of Americans. In a sign of their frustration, House Democrats staged a sit-in in Congress, as part of an attempt to get a vote on gun control (which they would almost certainly lose). Will America ever follow other rich countries and introduce far-reaching restrictions on gun ownership?

There are powerful reasons for pessimism. The vetoes wielded in Congress by those who take an expansive view of gun rights is one. The prevailing interpretation of the Second Amendment is another. Add that half of gun owners now say they own firearms for self-protection, up from a quarter at the beginning of the century, stir in lobbying by the National Rifle Association (NRA), and change looks impossible. Indeed, mass shootings tend to be followed by a spike in gun sales and a renewed desire in many states to loosen gun laws.

But pessimism can sink too deep. The near absolutist position on gun rights, which leads lawmakers to pass bills like the one in Florida that makes it difficult for doctors to ask patients whether they have a gun at home, is the product of a particular moment in the history of gun ownership. Though it might not seem so after the Orlando shooting, forces are pushing against the notion that more guns are always better and that people who decline to carry a weapon are failing in their duty as citizens. Look far enough into the future and it is possible to see

how America might one day confront its gun problem.

Some states have made a start. On the day that the Senate rejected four gun-control measures, the Supreme Court decided not to query the bans on some semi-automatic weapons adopted in New York and Connecticut. Banned guns can be smuggled across state lines, but such laws do make it slightly harder to kill lots of people in a confined space quickly. All told, 18 states have laws mandating background checks. National policy changes often bubble up from the states. In time, gun laws may follow the same trajectory.

The Glock block

The place of guns in American life is not fixed—which is why the NRA fights every proposed curb. Since the shootings at Fort Hood, San Bernardino and now Orlando, the availability of guns has been discussed in the same sentence as terrorism. Perhaps not coincidentally, support for universal background checks has risen.

Until the 1990s, many who owned rifles and shotguns for hunting thought handguns disreputable. As crime went up, the idea of gun ownership as self-protection took hold. Now that crime rates are lower, gun owners' views might revert.

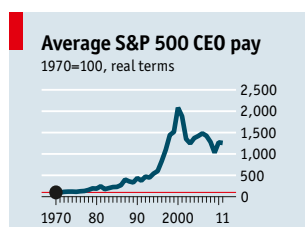
The most enthusiastic owners, who take a libertarian position, tend to be white. African-Americans and Hispanics are more likely to think that guns are wielded by gangs. As the country becomes less white, support for the absolutist view of the Second Amendment may weaken. A new Supreme Court, with justices appointed by a Democrat, could embody that.

It is a mistake to view gun violence as a natural phenomenon like the twisters that tear across the plains states or the hurricanes sent north and west from the Caribbean. Gun violence is the product of a set of American choices that, compared with other rich countries, are harmful and extreme. Although after Orlando it may not seem so, such choices can be unchosen. ■

Executive pay

Cheques need balances

The right ways to fix a flawed system



VOLKSWAGEN has had a pig of a year. The revelation that it was systematically cheating on emissions tests landed the carmaker with its largest-ever annual loss. The scandal cost Martin Winterkorn, the man in charge at the time, his job; this

week it emerged that prosecutors are investigating him for possible market manipulation. But his bonuses survived: he received €5.9m (\$6.5m) in performance-related pay for 2015.

Bouts of public anger about fat cats are nothing new. But in an era of populist campaigns, idiocies such as vw's pay poli-

cies strike a powerful chord. Both of America's presumptive presidential candidates have lashed out at levels of CEO compensation. Investors in Europe have rebelled this year against pay packages that hand managers huge rewards even though the share price has dived.

The fury is understandable. But the debate about how to fix the system for setting executive pay is marred by muddled thinking and divergent objectives. Politicians, newly sensitive to concerns about gaping income inequality, care about curbing the vast sums that accrue to bosses. Shareholders, who want executives' incentives to be in sync with theirs, fret more about the structure of the boss's pay than its scale.

Contrary to popular perception, executive pay is set more ►►

► by market forces than by a cigar-chomping boardroom cartel. In recent decades, the rewards at the top have gone up in numerous professions, from film stars to financiers, as the most talented apply their skills on a bigger, globalised stage. Rising levels of disclosure mean that executives and boards respond to an observable price for talent. Bosses' pay has rocketed even as shareholders have won more control over boards. And compensation is more tightly linked to performance. In 2000 only a fifth of large, listed American firms offered performance-based awards; now four-fifths do.

Even so, there is plenty to worry about. One characteristic of a well-functioning market is liquidity, but senior executives do not leave their jobs very often: between 2001 and 2014 the average tenure of a CEO at an S&P 500 firm was close to nine years. Markets work best when buyers and sellers know the precise qualities of what is being traded, but boards cannot measure how much value a great CEO adds. Competitive markets have homogeneous products; the evidence that managers can transfer their talents to lots of different firms is slim.

The frictions do not stop there. Executive pay has an upward bias. Boards are incentivised to pay their executives at or above the average rate in order to signal they have above-average ambitions—or to assure investors that their new boss is of above-average calibre. That produces a ratchet effect, as a pay jump in one firm sends remuneration higher in companies that benchmark themselves against it.

One check on the upward bias is for shareholders to have more power over the companies they invest in. The pantomime of holding advisory votes on pay should end, for example; if investors strike down pay policies, firms should be bound to respond. Shareholders should use their clout to demand greater simplicity—it is no good firms producing de-

tailed remuneration policies if no one understands them. They should press for longer vesting periods for stock awards, so that executives do not engineer short-term bumps in share prices at the cost of lasting success. And CEOs should be judged on their plans for an internal succession that will spare firms the unnecessary risk of hiring an outsider.

State of pay

Changes such as these would reduce the chance of executives making hay while shareholders suffer. But they would not do much to bring down the level of pay. For shareholders eager to squeeze even a slightly better performance out of a company, a high salary is only a rounding error: CEO pay in 2014 was around 0.5% of net income at S&P 500 firms. It suits investors to tie pay to performance, but that means executives demand higher absolute amounts for success to compensate for the risk that they will receive no payout.

If the scale of pay is deemed to be a problem, it will thus fall to the state to act. Direct intervention in setting compensation is no answer, not only because the bar to interfering in a private contract between firm and employee ought to be high, but also because government meddling in this area tends to have unfortunate unintended consequences. Bill Clinton's attempt to clamp down on pay in the 1990s left a loophole for the use of stock options that firms marched through. Bonus caps imposed on European banks after the financial crisis encouraged higher salaries. More important, even if it were possible to meddle benignly, the case for focusing a pay policy only on the corner office is weak. Plenty of the highest earners in society are not corporate executives. Politicians who want to shift the market's distribution of income have a better tool already at hand: a higher marginal rate of income tax. ■

America and Iran

Sanctions busting

Iran says that the West is not honouring its side of the nuclear deal. Poppycock



THE Supreme Leader, Ayatollah Ali Khamenei, is not happy. "Anyone who has ever trusted the Americans was eventually slapped by them," he declared earlier this month. "The experience of nuclear talks proved that even if we compromise, the United States will not stop its destructive role."

This was the latest in a stream of attacks by Iranian hardliners on the deal reached a year ago. Some of this is politics: they never wanted the deal and have tried to sabotage it in order to damage their rival, Iran's reformist president, Hassan Rohani. But the charge that the West has failed to honour its side of the bargain—lifting most sanctions in return for strong curbs on Iran's nuclear programme—is growing. It is also wrong.

Even the most hawkish critics of Iran agree that it has done its bit. Within months of the deal being signed last July, Iran began to dismantle almost all of its centrifuges, which could be used to enrich uranium to weapons-grade purity, and to move its stockpile of low-enriched uranium out of the country. That work has been speedily completed. Iran's apparent compli-

ance with the intrusive inspection regime under the deal has also been a milestone for non-proliferation.

The West, too, has kept to the letter of the deal. The sanctions imposed on Iran as its nuclear programme intensified in the 2000s have been lifted. Iran is increasing its production of oil and foreign investment is rising.

The problem lies outside the accord. Iran has tested nuclear-capable ballistic missiles and is waging wars, directly and by proxy, around the Middle East. America maintains its unilateral sanctions, which were imposed long before the nuclear crisis. They concern Iran's dire human-rights record; its support for terrorist organisations, including Hamas in Gaza and Hizbullah in Lebanon and Syria; and its development of long-range missiles. These sanctions were excluded from the nuclear negotiations. For Iran to suggest otherwise is untrue.

America's non-nuclear sanctions are hurting Iran in two ways. The "primary" ones ban American companies and individuals from dealing with the regime, subject only to a tightly controlled list of exceptions which include food, medicine and commercial airliners (Boeing has just signed a big order with Iran). Any transaction that passes through an American bank or insurance company, even tangentially, or uses the dollar, or ►►

involves an American citizen working for a foreign company, is theoretically subject to sanctions. This is creating a chilling effect on the financing of even non-American trade and investment: all remember the \$9 billion fine slapped on BNP-Paribas in 2014 for sanctions evasion.

Under “secondary” provisions, America reserves the right to punish foreign firms if they do business with anyone on a list of designated people and institutions, among them Iran’s Islamic Revolutionary Guards Corps. This Praetorian guard has a murky hand in practically every aspect of Iran’s state-dominated economy. The risk of getting caught up unwittingly in an American sanctions prosecution is all too real.

Fix it quickly

Perhaps the Supreme Leader did not understand the nuclear deal, or perhaps Mr Rohani oversold it. More likely, Iran is trying to extract extra concessions that it has not negotiated. Some had hoped that the nuclear accord, though limited, would help open the Iranian economy, normalise the revolutionary re-

gime and ease fraught relations with America and the Sunni Arab world. That will not happen for a long time, if only because Iranian hardliners draw strength from their enmity with the Great Satan.

Even so, the unravelling of the nuclear deal would hurt reformists and fuel the fires of the Middle East. The Obama administration can help preserve its only real diplomatic success in the region by issuing clearer guidance on exactly how foreign banks must act to comply with sanctions. It could also allow Americans working for foreign firms to advise on such issues, and permit some kinds of dollar transactions.

But the burden falls mostly on Iran. It must clean up its opaque corporate culture. It should bring its accounting and banking rules up to date, so that investors know whom they are dealing with. If that pushes the Guards out of business, so much the better. For Iran to find jobs for millions of educated, underemployed young Iranians, it will have to give up the hardliners’ cherished idea of a “resistance economy”. Ironically, sanctions could yet prove a route to prosperity. ■

The Niger Delta Avengers

Danegeld in the Delta

Nigeria’s turbulent oilfields cannot be pacified by bribing rebels



A THOUSAND years ago an English king called Aethelred (“the Unready”) used to pay marauding Vikings sacks full of precious coins not to attack his kingdom. The trouble was, the Vikings got a taste for Danegeld, as it was later known, and kept

coming back for more. King Aethelred learned a harsh lesson: when you reward bad behaviour, you get more of it.

Nigeria’s rulers have yet to learn from history. In recent weeks a group of heavily armed and masked men calling themselves the Niger Delta Avengers has caused havoc in the region where Nigeria’s oil is pumped. With speedboats and submachine guns rather than longboats and battle-axes, they are every bit as fearsome as the Danes of old, and nearly as disruptive. They claim to fight for justice (and a bigger share of oil revenues) for the people of the Niger Delta. By blowing up pipelines they have helped crash oil production from 2.2m barrels per day to 1.5m. This has hobbled the Nigerian economy and gutted the budget—petrodollars account for nearly all of the country’s exports and the vast bulk of government revenues. It has also set off global ripples. The squeeze on Nigerian oil output is one reason why the price of crude has rallied in recent weeks.

Intriguingly, for such an influential group, no one knows who the Niger Delta Avengers are or where they got their seed money. There is less mystery about why they are holding the state to ransom: because it has worked in the past.

The Nigerian army never defeated the previous group that mounted a serious insurgency in the Delta, the Movement for the Emancipation of the Niger Delta. Instead, in 2009, the government negotiated an amnesty with the rebels, who laid down their weapons in return for a monthly stipend of several hundred dollars each—in a region where most people make

less than a dollar a day. This is far more than the UN offers other African rebels to disarm. And Nigeria’s plan to provide job training for ex-rebels, which has succeeded in other countries, was a shambles. The deal gave the region’s many jobless young men an incentive to take up arms, in the hope of being paid to lay them down again.

These Avengers are not superheroes

It is unclear how Nigeria’s president, Muhammadu Buhari, will tackle the Avengers, or even whether the government is talking to them. However he proceeds, Mr Buhari should not try to buy them off. Rather, he should arrest those who have committed acts of violence or extortion. And he should work to improve the appalling governance in the Delta region, so that locals have less cause to hate the government.

Alas, the Nigerian security services are not good at hunting down rebels. As a recent study by the International Crisis Group, a think-tank, points out, the army is overstretched, has a woeful human-rights record and is hollowed out by corruption. Officers sometimes even sell their own side’s weapons to insurgents. Urgent reforms are needed to military recruitment, training and procurement.

The people of the Niger Delta have genuine grievances. In theory the region gets a generous share of the nation’s oil revenues. In practice much of the money is stolen, by federal or local bigwigs, before it reaches schools or clinics. The national budget crisis has made matters worse as many local officials have not been paid for months. Cleaning up this mess will be staggeringly hard, not least because Mr Buhari, a northern Muslim who replaced a president from the Delta, is not popular there. The task will be close to impossible unless it is part of a nationwide push to fight graft. Mr Buhari’s anti-corruption zeal seems genuine and he has shown he can make tough decisions. This week, for example, he allowed the Nigerian currency to float. He should be resolute in the Delta, too. ■

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How free is free speech?



Authoritarian regimes will always try to muzzle free speech (“Under attack”, June 4th). But as a resident of the United States, where freedom of speech, however offensive, is constitutionally protected from government sanction or censorship, I find it particularly astonishing that in England, the land of the Magna Carta and Bill of Rights, the government is allowed to prosecute people under the 2003 Communications Act for “grossly offensive” postings on the internet.

A sick joke about a child murder victim on Facebook is offensive, but allowing the Crown Prosecution Service to convict and jail the drunken teenager responsible for writing mere words sets a frightening precedent for arbitrary and selective prosecutions. Giving the police the power to prosecute a Muslim for saying British soldiers “should die and go to hell” or a man who set up a Facebook fan page for the killer of two police officers in Manchester can lead to the suppression of anti-government rhetoric. The danger should be self-evident.

MARK HARDIMAN
Partner
Nelson Hardiman
Los Angeles

Your article on the state of free speech was spot-on (“The muzzle grows tighter”, June 4th). But Rita Maestre, the spokesperson for Madrid’s city council, was convicted not so much because she insulted the religious feelings of Catholics, but because she staged a protest at a place of worship, thus disrupting the right of others to practise their religion. Spanish

law is not alone in banning this kind of behaviour.

Every religion should be subject to public debate, even scorn, but it is as important to ensure the religious freedom of those who seek to exercise it within the law.

GONZALO URDIALES
Madrid

I agree wholeheartedly that freedom of speech needs to be protected. But one needs to differentiate between speech for the purpose of debate, or the discussion of uncomfortable ideas, and speech which is intended to insult or inflame passions. For example, Western societies permit caricatures of Prophet Muhammad under the guise of free speech, even though they insult a person revered by Muslims. There was even a special contest organised in the United States for such cartoons with a prize for “the most insulting”. I fail to see where the free debate that is supposed to separate the good ideas from the bad ones comes in. This is hate speech and needs to be curbed.

TARIQ-UR-RAHMAN
Islamabad, Pakistan

Perhaps Clark Kerr, president of the University of California from 1958 to 1967, said it best when defending free speech on campus:

The university is not engaged in making ideas safe for students. It is engaged in making students safe for ideas. Thus it permits the freest expression of views before students, trusting to their good sense in passing judgment on these views. Only in this way can it best serve American democracy.

DAVID HALLIGAN
Berkeley, California

Don’t shoot the messenger

You provided an excellent summary (Free exchange, June 11th) of the evolution of central banks’ transparency, but your analysis of the problems they face in communicating with the public was too simple. Central banks’ messages sometimes are obscured by noise, and that is largely because

policy is set by a committee. The chairman can explain why a policy decision was made, but can say little about future decisions that the committee has not yet discussed. There is therefore no substitute for hearing the views of individual members, although they sometimes conflict.

The resulting ambiguity reduces the power and precision of policy. That is not because central banks are poor communicators, but because the world is a complex place.
STEFAN GERLACH
Former deputy-governor
Central Bank of Ireland, 2011-15
Zurich

Putting it in perspective

Your review of Ben Ehrenreich’s book on Palestine states that “a rubber-coated bullet can break a jawbone” and “penetrate the flesh” (“The view on the ground”, June 11th). As much damage has also been done by the rocks Palestinians have slung at Israelis and by the boulders dropped on their heads. According to the review, Mr Ehrenreich ignored lethal attacks against Israelis by offering the excuse that he did not seek to write an “objective book” nor did he think that was possible.

Objectivity is not a binary choice, but a matter of degree. I cannot paint a perfect picture, but I should aspire to do my best. Above all, I would not want to deliberately distort a picture, which is exactly what Mr Ehrenreich has done.

H.V. SAVITCH
Alexandria, Virginia

Core subjects

“Teaching the teachers” (June 11th) listed general “what works” strategies to reform education. At a recent mathematics education study group in Kingston, Canada, a video was shown of a lesson in which all the statistically effective “what works” strategies you listed were in evidence. Nevertheless the lesson was ineffective because it lacked any mathematical coherence, meaning and clarity. In our experience this is all

too common.

Training, observation and inspection regimes focus on teacher behaviour without paying attention to subject content. This vital aspect was overlooked in your briefing, possibly because it is easier for generalists to focus on teacher behaviour in order to measure performance than it is to take the specifics of subject disciplines into account. To teach any subject well requires a particular depth of knowledge that has to be internalised, during training, alongside general classroom techniques.
ANNE WATSON
JOHN MASON
Emeritus professors of
mathematics education
University of Oxford

Road rage

Technology is certainly the solution to mending potholes (“The hole story”, June 11th). But another big part of the problem is local councils. There exists already in the commercial sphere a wealth of innovative technological solutions for road repair that are greener and cheaper than the conventional method of man and shovel. Sadly it has always been my experience that councils view potholes through a Keynesian lens: holes to be filled equals work for the boys. Embracing new technology would put them all out of a job.

ANDREW JORDAN
Former road-repair technician
London

The daily rind

How could you publish an article about halloumi/hellim and reunification in Cyprus without using the phrase “blessed are the cheese-makers” (“Cheese in our time”, May 21st)?
KERRY NOBLE
London ■

Letters are welcome and should be addressed to the Editor at The Economist, 25 St James’s Street, London SW1A 1HG
E-mail: letters@economist.com
More letters are available at:
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DIRECTOR (Grade AD1-4)

Directorate-General for Informatics, Brussels
COM/2016/10368

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Neither rigged nor fair

Bosses' pay in the rich world is not a fix. But it is flawed

IN SEPTEMBER 2012 Marissa Mayer, newly installed as the CEO of Yahoo, an internet firm, and positively glowing with star power, met members of the company's compensation committee. She told the committee that she was in discussions with a potential candidate to be her right-hand man, and wanted to get guidance on "compensation parameters".

Ms Mayer described the candidate's expected compensation package as "\$15m per year (with \$40 million as part of that up front in a four-year grant) and a \$16m or more make-whole payment." Ms Mayer was authorised to continue negotiations in that meeting, and in one that followed. Just one tiny detail was missing: no one apart from Ms Mayer actually knew who the candidate was.

When his identity emerged, at the same time as the committee approved a draft offer letter, it was revealed to be Henrique de Castro, a former colleague of Ms Mayer's at Google. Further negotiations followed, during which Ms Mayer made changes to the offer that the committee did not sign off and that increased payouts due to Mr de Castro if he were sacked without cause.

Those payouts turned out to be more than just theoretical. In his first year at Yahoo, during which advertising revenues declined in every quarter, Mr de Castro made \$39.2m, putting him behind only

eight CEOs of listed American firms in the income charts. By his 14th month, Ms Mayer had decided to fire him without cause, triggering a severance payment worth almost \$60m. Mr de Castro may not have impressed as a chief operating officer, but you must admire his negotiating skills.

Seeing what goes on inside firms when they make pay decisions is unusual. These details have come out only thanks to a court opinion issued in February in a case brought by investors in Yahoo who were miffed by the saga. And the scale of Mr de Castro's earnings was extraordinary. For those who think the system of executive pay in the rich world is working as it should, such egregious stories are just that—anomalies. "In a sample of lots of firms, some things will always look bad, and some unreported things will be great," says Steven Kaplan of the University of Chicago Booth School of Business.

For critics, however, the exceptions are informative. "The market view of pay says that deviations are at the margin; that they are second-order, limited and transient," says Lucian Bebchuk, an academic at Harvard Business School. "I think they are first order, and that the self-correcting mechanisms of the market cannot be relied on."

Many would agree. In his doorstopper, "Capital in the Twenty-First Century", Thomas Piketty, an economist, pins much

of the blame for wider income inequality on pay rises for executives, managers and financial professionals. This month the French parliament handed shareholders a binding vote on CEO pay, following a row over compensation for the head of Renault, a carmaker. Shareholders elsewhere seem to be getting antsy too. British investors have delivered stinging protest votes against a string of firms. Shareholders have berated Volkswagen, a German carmaker, for paying bonuses to bosses who presided over its largest-ever annual loss.

This wave of dissent should not, however, obscure the fact that the concerns which animate shareholders and policymakers are very different. Public anger is fuelled by the size of bosses' pay cheques. Shareholders tend to care less about how much money managers take home, and more about whether pay and performance are genuinely in sync.

America is a case in point. Both of America's presidential candidates are gunning for bosses: Hillary Clinton has run ads lamenting excessive pay; Donald Trump has described CEO pay as a "complete joke". But investors in America are notably less ruffled. As of June 16th, 1,623 firms in the Russell 3000 group of firms had held "say-on-pay" votes, according to Semler Brossy, a pay consultancy; just 1.5% had been rebuffed by shareholders.

Forget about the price tag

These different perspectives reflect divergent views on the way that executive pay is set. Critics claim that executive compensation is essentially a rigged game, in which boards packed with insiders parcel out rewards to their friends. Defenders argue that the market is setting pay, as firms ►►

▶ strive to keep hold of talented executives in a competitive world. The truth lies somewhere in between. Compensation is not the work of a cartel, but it is light years from being an ideal market.

The notion that the market is efficient at setting executive pay rests on three arguments. The first is that competitive pressures are at work. Inside the firm, the “tournament theory” of pay holds that big awards high up a company are worthwhile because they motivate ambitious middle managers to take risks and put in the hours in order to climb the greasy pole to the top. And outside the firm, there are observable prices for the labour of senior executives, thanks largely to disclosures by listed firms. For example, the median pay level of an S&P 500 chief executive in 2015 was \$10.4m, according to Equilar, a research firm, a rise of 1% over the 2014 figure. (In practice, executives do not benchmark themselves against pan-industry figures but against their peers.)

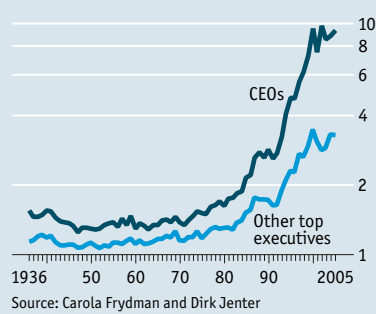
These sorts of pay packages seem outrageous to many, especially when compared with wages elsewhere in the economy. Peter Drucker, the doyen of management theorists, reckoned that exceeding a 20:1 multiple of pay within a firm between executives and the average worker was bad for morale. Mr Drucker was worrying about the gap back in the 1980s, when the economy-wide difference between CEOs of big American firms and average workers was in the 40:1 range. How quaint that seems: depending on how you count things, the multiple now is somewhere between 140:1 and 335:1.

Even those who defend the market view of pay often say that these multiples may be too high from a social or ethical perspective. But their argument is that, from an economic perspective, they make sense. Pay is not set in isolation. Just like other parts of the labour market, what others pay sets an external market price. “You can argue that CEOs of public firms are in some senses underpaid,” says Mr Kaplan, who points out that a senior partner at a blue-chip law firm or consultancy could earn several million dollars a year with none of the scrutiny, more job security and far fewer people to manage. Overpaid or underpaid, executives certainly know what the going rate is.

That transparency explains why it is hard for compensation committees to swing the axe on pay unilaterally, for fear that managers will go elsewhere. If executives do leave, firms are jolted into action. A paper published in 2015 by Huasheng Gao of Nanyang Business School and colleagues looked at 510 job-hops in S&P 1500 firms between 1993 and 2011, in which an executive leaves one firm and joins another the following year. Total compensation for the executives left behind jumps by 46% on average.

Baby, you're a rich man

Median US executive compensation at top 50 firms
\$m, constant 2000 dollars, log scale



What this does not explain is why pay suddenly took off in the mid-1970s and kept on rising (see chart 1). Until then, executives in America were used only to modest bumps in pay; after then, massive salary increases became the norm. Here adherents to the market view of pay make their second argument: that returns to talent rose as firms globalised, became more complex and crucially, got bigger.

As companies grow, the impact of a top team which is a bit more talented is correspondingly more valuable. Driving up the value of Apple by 1% has a much bigger dollar effect than increasing the value of a much smaller firm by the same proportion. Firms should be willing to pay more for superstars as a result. According to research by Xavier Gabaix, Augustin Landier and Julien Sauvagnat, a trio of French academics, between 1980 and 2011 the average value of American firms rose by 425%; during the same period, the average rise in CEO pay in America's largest firms was 405%.

The third argument made on behalf of the market view concerns governance. The conventional critique of pay at listed firms is that shareholders are not able to run the firms directly; that enables managers, whose interests are different, to cream off more pay than they should. But the explosion of pay in the 1990s coincided with moves towards better governance, and shareholders have continued to accumulate power since. In Britain investors have had an advisory vote on pay since 2003; a law passed in 2013 gave them a binding vote on firms' remuneration policies once every three years. In America a rule change in 2006 prompted fuller disclosure of items such as the use of pay consultants; the Dodd-Frank act of 2010 handed advisory say-on-pay votes to shareholders in public companies. From Australia to Switzerland, the Netherlands to Sweden, the trend is strongly towards a louder shareholder voice.

Pay packages have changed as a result. Compensation for the suits comes in three flavours. First, a share of fixed pay, the salary that most employees take home; second, an annual bonus, paid on the basis of

short-term performance targets; and third, stock-based long-term incentives (LTIs), which pay out over periods of multiple years. Over time, more and more of an executive's pay has come from these last two variable elements of compensation. And LTIs increasingly include specific performance triggers, often based on performing better than a group of competitors, rather than just requiring executives to stay with a firm for a certain period. In 2000 about 20% of large listed firms in America included performance-based awards in their pay packages; by 2015, that share had gone up to 80%, according to Equilar. As a result, unlike most workers, CEOs can see their pay move up and down year to year.

This, then, is the nub of the case that executive pay is no fix. There is competition for talent, and firms are willing to pay up for it. Talented executives can have an outsize impact on shareholder returns. And managers enjoyed huge gains even as shareholders won more control over the boards who set pay.

Welcome to Lake Wobegon

The system of executive pay also suffers from flaws that push corner-office compensation higher than it would go in a truly efficient market. Well-functioning markets generally assume lots of transactions. But for executives, certainly right at the top of firms, it is a “thin market”, with relatively few transactions, buyers and sellers. Analysis by the Conference Board, a research group, finds the average tenure of a CEO at an S&P 500 company close to nine years between 2001 and 2014. Over the past five years, the average number of CEO departures in this group has been 48.

That matters for a couple of reasons. One is that the risk of the most senior executives leaving for other competitors may not be as great as assumed. Almost half the departures last year were for retirements, for instance. Once people reach the very top of the tree, they tend not to move to ▶▶



▶ other CEO roles. Yet these are also the roles that pay most—indeed, the pay gap with other senior executives inside firms has gone up over time.

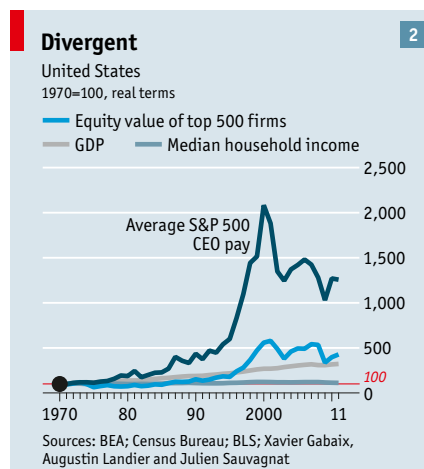
The other implication of this lumpy market is that pay is not the expression of constant bargaining between a deep pool of buyers and sellers of executive talent, but of the outcomes of sporadic negotiations between boards and managers. Powerful CEOs, like Ms Mayer at Yahoo, can often command acquiescence. Research from ISS, a shareholder-advisory firm, shows that board structure has a statistically significant effect on compensation. Large American firms led by a chairman who is also the CEO or another current executive paid their bosses \$3.7m more on average over the three prior fiscal years than did firms led by an independent chairman.

Another flaw in the system is imperfect information. Most parts of the labour market suffer from this problem, but it is particularly hard to measure how an executive's decisions affect a firm's performance. The best-available proxy is the share price, which explains why stock and options made up 62% of the average pay for S&P 500 bosses last year, according to Equilar. That should bring the interests of shareholders and managers into line, but there are other effects, too. Share prices move around for all sorts of reasons: executives may benefit from market movements that they have little to do with. Because share prices have grown faster than GDP, consumer prices and wages, their use as a proxy has caused bosses' pay to pull away from that of average workers (see chart 2).

Although share-price increases are precisely what shareholders want from their chief executive, the effects can sometimes be perverse for investors. Stock options, which have value only if they go above a certain price, seem to be especially liable to manipulation that boosts share prices in the short run, but harms them in the longer term. Academics at the Mendoza College of Business at the University of Notre Dame found that option-heavy pay plans were correlated with a higher likelihood of product recalls. Executives, the researchers speculated, were being tempted to push out products to juice up the share price, content in the knowledge that they had nothing to lose.

Another classical trait of well-functioning markets is homogeneity of products. When you buy a certain type of fridge, it doesn't matter if it is one that came out of the factory on Tuesday or Friday. They are, to all intents and purposes, identical. Clearly, no one thinks that is true of people generally, nor of individual executives. But the very idea of a market price does rest on the idea that the very top bosses are, to some extent, interchangeable.

Yet the evidence behind this assumption is flimsy. The bulk of firms still appoint



their executives from inside the ranks (see chart 3). And when boards do look outside, the rewards are not great. A research paper by academics from the University of Texas system looked at 192 S&P 1500 CEOs who had been hired from outside between 1993 and 2005. Their analysis showed that boards at these firms tended to go for hires whose prior employers had performed strongly, and that they paid a premium to entice these executives away. But there was no strong relationship between the performance of past and subsequent employers.

A very particular set of skills

Adding to these frictions is another specific trait of executive pay. In other parts of the labour market, you might assume that firms are generally aiming to pay as little as possible, and individuals are trying to drive up the price. But when it comes to the corner office, the incentives to bear down on pay are less clear. The amounts involved matter enormously to the individual concerned, much less to the compensation committee (which does not want to be responsible for encouraging executives to look elsewhere) or to the shareholders (for whom a payment of a few million dollars is well worth it if an executive can bring about a small extra uptick in market value).

A number of issues exacerbate this unusual coincidence of interests. Perhaps the



biggest, ironically, is the shift to performance-related pay. However valid the arguments for this kind of compensation structure, it introduces more risk for the executive. Managers behave just like everyone else: when a payoff is uncertain and a long way into the future, it counts for less in their mind. As a result, they are incentivised to demand a higher absolute amount to compensate. Research by Sandy Pepper of the London School of Economics shows that the typical discount rate that managers apply to deferred bonuses is 30%, far in excess of the risk-free interest rate used in accounting valuations of LTIs. To get executives like Mr de Castro to move jobs, you have to pay them more.

Now think about the interests of the compensation committee and the wider board of directors. The signal sent by a firm's hiring decisions matters. No firm wants to unveil a dud as their new leader; any firm that aspires to grow faster than the market average will be prepared to pay at or above the market rate. Executives are more like luxury goods than they are standard ones: paying more to land a big name can add prestige.

Any upward movement in one firm tends to ripple among its peers. Pay packages for executives often centre on a limited number of competitor firms. When compensation committees review their policies each year, they survey their peers' as well. Some firms are willing to underpay, but this is rare. "The prevalent practice is to be at or above the median, which means pay goes higher," says one compensation consultant, who defends this upward momentum nonetheless. "Some call it the ratchet effect, I call it a market effect. It's competitive and talent can move."

As for shareholders, the incentives to kick up a real fuss about executive pay are blunted by a few factors. First, dispersed ownership means that it is often hard for one investor to have a big impact: even a very large shareholder like a Fidelity or a BlackRock will often own only 3-4% of the firm. Second, passive investors are condemned to own the shares of some of the biggest firms, which means they value maintaining decent relationships with these firms. Third, many shareholders would much prefer managers not to be distracted by a row over pay. As a result, it takes a lot for institutional investors (public pension funds are much readier to dissent) to come out in open opposition to a firm. "Not voting 'no' does not mean we agree with the board," is the contorted phrasing of one large investor.

What all this suggests is that executive pay is a hybrid of different factors. Market forces play their part. But so do governance frictions, the mechanical relationship between firms in peer groups, and the signalling effects of lavish compensation. That will keep pay high, and the debate toxic. ■



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Australia's election

Shortening the odds

SYDNEY

Once the prohibitive favourite, Malcolm Turnbull faces a tight race in his bid for a second term

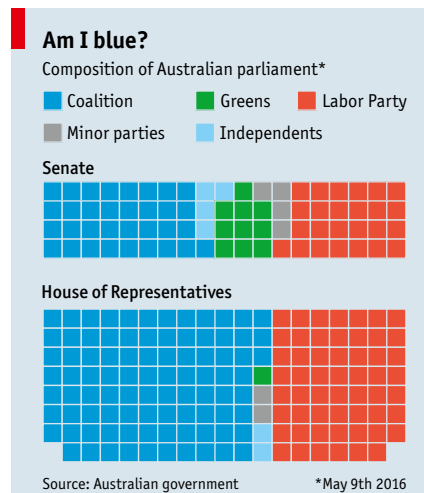
IN THEIR last debate before Australia's general election on July 2nd, Malcolm Turnbull, the Liberal prime minister and head of the conservative coalition government, and Bill Shorten, the Labor opposition leader, faced not just an audience of swing voters, but the entire world: Facebook live-streamed the event. An online viewer named Melissa asked the first question: given the "lies and backflipping" from major-party politicians, and the number of prime ministers Australia has churned through (five in the past decade), why should she vote for either of them? Why not vote for an independent? Many voters are asking themselves the same thing. More than any Australian election in decades, this one could be decided by independents and small parties.

That is partly owing to surprisingly tight polls. The government's approval rating soared after Mr Turnbull unseated the snarling Tony Abbott as the Liberal Party's leader last September. With his sunnier manner and more liberal views, many expected Mr Turnbull to coast to an easy victory as he sought a strong mandate of his own. But Mr Shorten, the first Labor leader in 15 years to survive a full parliamentary term, has proved an unexpectedly deft campaigner: government and opposition are now tied.

But it also shows how outmoded Australia's two-party system has grown. The class divisions that produced the Labor-Liberal divide have faded. Australia has

grown more diverse and some of its concerns—climate change, immigration, China's rise—more complex. Many voters have turned, in hope or protest, to outsider candidates, who now garner 28% support, according to the most recent polls. Among these the Australian Greens, an environmental party, and the Nick Xenophon Team, a new centrist party headed by Mr Xenophon, an independent senator from South Australia, are forecast to win seats in both houses of parliament.

Tony Windsor, also an independent, is challenging Barnaby Joyce, the deputy prime minister and leader of the rural National Party, for the New South Wales seat



of New England. Their race shows Australia's shifting electoral dynamics. Some rural conservatives never forgave Mr Windsor for helping Julia Gillard, a former Labor leader, form a minority government six years ago. But an unlikely alliance of farmers and environmentalists support him. Mr Windsor contends that Mr Turnbull's government has harmed rural Australians by changing Labor's plans for a national cable-broadband network. And he accuses both major parties of ignoring the environmental risks posed by a Chinese company's plan to build a massive coal mine in New England.

Mr Turnbull's pitch is simpler: trust the Liberals to manage the economy. When the rest of the world sank into recession during the financial crisis eight years ago, Chinese hunger for Australian minerals and meat kept the country afloat. Australia has weathered the commodity boom's passing better than many expected: growth is a healthy 3.1%. Interest rates are low and the currency is weak, helping investment and exports. A poll by the Lowy Institute, a think-tank, shows that 70% of Australians are optimistic about the economy. Mr Turnbull, a former banker and entrepreneur, argues that his main election pledge—to cut the corporate-tax rate from 30% to 25% over the next decade—will spur investment and create jobs.

Mr Shorten once supported similar cuts, but now wants them limited to small businesses—to which he will also offer incentives for hiring old people and parents returning to the workforce. Labor vows to match the conservatives' target of balancing the budget in four years, but admits it will run bigger deficits until then, partly because it will spend more on health and education. Mr Shorten says the campaign is a "referendum" on Medicare, the public health-insurance scheme that he claims the government wants to privatise. (Mr ►►

▶ Turnbull calls that the “biggest lie in the whole campaign”.)

Otherwise, Mr Shorten, a lawyer and former union leader, has tried to turn voters’ attention from economic to social issues—particularly gay marriage. Mr Abbott, Mr Turnbull’s predecessor, opposed gay marriage, but was grudgingly planning a plebiscite on it; polls showed a large majority would vote yes. Mr Turnbull, a gay-marriage supporter, said then that instead of going to the expense of holding a national plebiscite, parliament should vote. But dealmaking with his coalition’s conservatives required him to reverse his stand and agree to put gay marriage to a national vote; he “expects” it will happen this year

if he wins. Mr Shorten says that would be a “taxpayer-funded platform for homophobia”, and promises to legalise gay marriage within 100 days if Labor wins.

Mr Shorten has led Labor back into contention just three years after the chaotic rivalry of Ms Gillard and Kevin Rudd, its latest two prime ministers. He has unified his party. But to form a government Labor will have to snatch 19 extra seats in the 150-seat lower house. That will not be easy. Though the parties are tied, in polls that ask voters whom they would prefer as prime minister, Mr Turnbull maintains a comfortable lead. Yet even if he prevails on July 2nd, he may see his majority reduced, and his mandate weaker. ■

Law enforcement in Indonesia

Time for Tito

JAKARTA

Jokowi displays his new confidence with a bold choice for police chief

TWO factors drove Indonesians to elect Joko Widodo, universally known as Jokowi, president in 2014. The first was his reputation for clean governance, earned as mayor of the mid-sized Javanese city of Solo and then as governor of Jakarta, Indonesia’s capital. The second was his personal background: a former furniture-seller, he is Indonesia’s first president to come from outside the political and military elite, which has long dominated Indonesia’s narrow politics. Voters wanted him to change the system.

Many of his supporters were therefore angered when, in January 2015, he nominated Budi Gunawan to head the national police force. The appointment was widely seen as a sop to Megawati Sukarnoputri, a former president who heads Jokowi’s party, the PDI-P. Just days after the appointment was announced, Indonesia’s anti-corruption commission declared that Mr Budi was suspected of corruption. After weeks of protests Jokowi dropped Mr Budi and appointed the uncontroversial Badrodin Haiti in his place.

Mr Haiti will reach the mandatory retirement age of 58 in July. To replace him Jokowi surprised everyone by choosing Tito Karnavian, a respected officer who runs the country’s counter-terrorism agency. Often candidates are appointed based on seniority, but at just 51 Mr Karnavian will be younger than many of his subordinates. Few have better credentials. As a former commander of Densus 88, Indonesia’s American-trained anti-terrorism force, Mr Karnavian battled Jemaah Islamiyah, an Indonesian jihadist outfit, and killed or captured some of South-East Asia’s most wanted militants. He is articulate and intelligent, and seems committed to cleaning up the police force, one of Indonesia’s most notoriously corrupt institutions.

As important as what Mr Karnavian may do in the top job is what his appointment says about Jokowi. Presumably the PDI-P wanted Jokowi to renominate Mr Budi, who remains close to Ms Megawati. But Jokowi stood firm, and the party’s parliamentarians appear likely, perhaps with some grumbling and reluctance, to support the politically independent Mr Karnavian. Although nobody gets promoted through the police ranks without patrons, Evan Laksmana of the Centre for Strategic and International Studies, a think-tank in Jakarta, says that Mr Karnavian has not aligned himself with any one political

Pakistani cinema

Lights, camera, action men

ISLAMABAD

Pakistan’s army gets into the film business

SOMETIMES the old army dictum “Don’t volunteer for anything” must be broken. As when, for instance, a soldier in Pakistan’s army is given the choice between fighting rebels in the badlands of Waziristan, or volunteering to appear in a film in which he portrays a soldier fighting the same rebels. Whatever thespians may say about the sweat, tears and pain that go into acting, compared with actually fighting in north-western Pakistan, it is at least safer.

Pakistan’s film industry lacks the size and razzmatazz of Bollywood. This year Pakistan looks likely to screen 48 local films. That is a record, but between April 2014 and March 2015, India released more than 38 times as many. The army, envious of its great rival’s soft power, is trying to rectify that imbalance. Hassan Waqas Rana, a prominent Pakistani director, says that the army “looks at the script, and if they think it is good enough they give you whatever you need.”

The army does not finance films. Instead it makes low-budget productions look like higher-budget ones, mainly by offering logistical help and access to military land and hardware: guns, explosives, helicopters and the occasional company of soldiers to appear in the background for extra authenticity. “When we were done shooting a battle sequence,” says Mr Rana, “our extras went straight back to an operation.”

Some credit the army with helping to revive an industry nearly killed off by decades of high taxes. But liberal critics charge it with promoting crude jingoism. Unsurprisingly, the army likes scripts that portray it in a good light. Army-backed films also tend to reflect the institution’s dim views of India and of politicians,



Better than the badlands

whom the generals regard as irredeemably corrupt. Mr Rana’s first film featured a sultry female Indian spy who cooks up terrorist attacks with the Pakistani Taliban—a favourite lunatic trope of Pakistan’s security establishment, which loves to blame India for fomenting jihadism in Pakistan.

Can help that comes with such strings attached make a creative industry flourish? Some think not: Nadeem Mandviwalla, a cinema-chain owner and film financier, says that Pakistani audiences “won’t accept” relentless India-bashing. Despite official bans, Bollywood films are popular: the government turns a blind eye to distributors who buy the films through third countries. Mr Rana agrees. He resisted calls last year to make a film retaliating against “Phantom”, a Bollywood drama about Indian spies thwarting Pakistani terrorists. “Pakistan needs to get out of this whole anti-Indian thing,” he says.

▶ group or party.

Jokowi's independence appealed to voters, but it hobbled him in a party-reliant political system. At times he seemed overawed in office; he deferred too much to Ms Megawati, and struggled to keep his fractious cabinet from squabbling and setting out often divergent policies. Lately, though, Jokowi's leadership has been more assured. His ministers have been less inclined to snipe at each other.

Partly this is because he has silenced or removed some of the more disruptive ministers. But it also reflects external political shifts that have made Jokowi less reliant on Ms Megawati and the PDI-P. Golkar, parliament's second-largest party, quit the opposition coalition and threw its support behind Jokowi after settling a long-running leadership dispute in May. Perhaps Golkar wants the president to switch parties before 2019; perhaps it just wants cabinet seats. Whatever the reason, Ms Megawati now matters less—she has long treated her protégé less as the president than as a recalcitrant backbencher—and Jokowi now has more room to govern on his own terms. ■

Addiction in India

Pushing poppies in Punjab

AMRITSAR

A state's drugs problem, in life and film

IT WAS the lying that proved hardest for Pradeep, a 30-year-old man who has spent the past two years getting off heroin. Whenever he had to leave his family's house to score, or to nod off somewhere, he had to invent a story. Money was another problem: spending 5,000 rupees (\$75) for his daily fix led him to rock bottom due to, as he says in delicate English, "financial disturbance". He was a shop clerk for 15 years, but after just four months on the needle his savings were gone.

Today Pradeep looks healthy, with a clear gaze and only faint scars on the backs of his hands. Similarly, Maqboolpura, an area of the city of Amritsar shamed in the national press as a den of addicts and widows, appears tranquil: its brick-lined lanes are tidy, with a few cows lowing and no junkies staggering through the dark. But Punjab is suffering from a hidden epidemic of drug abuse. A recent study found that nearly 20% of the state's young men use opioids—and not just the traditional poppy husks. P.D. Garg, a psychiatrist who has been treating Punjab's drug addicts for years, says that injectable heroin appeared five years ago, and quickly became the drug of choice.



The lands are dry and the kids are high

Why Punjab more than other states? Theories abound. Many point to the border with Pakistan, over whose territory Afghan heroin flows. But Punjab's demand has outpaced that supply. Heroin now also arrives from Rajasthan to the south, while synthetic opioid painkillers creep in from the east. The state bears economic and psychological scars from its agriculture crisis. In the 1960s the green revolution made Punjab rich. It invested in education and infrastructure. But as the state's water table fell and farming grew more mechanised, jobs in the cities failed to materialise. Today Punjab's per-capita GDP is middling by Indian standards. Gursharan Singh Kainth, an economist, reckons the state needs an "agro-industrial revolution" to provide better jobs for young men.

The local head of the Bharatiya Janata Party (BJP), which rules Punjab together with the Shiromani Akali Dal (SAD), says nonsensically that drug use will cease "if honour increases". The SAD contradicts itself brazenly: it has denied the scale of the state's drugs problem, while at the same time boasting of how many treatment clinics it has opened. Punjabi voters have had enough: the upstart reformists of the Aam Aadmi Party won their first parliamentary seats in Punjab two years ago. Expect the squabbling to grow fiercer as the 2017 elections draw nearer.

A new film, "Udta Punjab", dramatises the state's struggles with drugs in a brutal, electrifying 148 minutes. One subplot draws a parallel with the real-life case of a convicted drug lord who named the SAD deputy chief's brother-in-law as his accomplice (the brother-in-law, a state minister, says the accusations are baseless and politically motivated). In the film, a subtle old Sikh villain dismisses his state's future with a Punjabi couplet—"The lands are dry and the kids are high"—and a shrug. Punjabis say the film feels true to life.

The film nearly missed its release date

of June 17th: India's film board demanded 89 cuts, including every reference to Punjab. But at the last minute, the Bombay High Court intervened, ruling that just a single shot of a pop star urinating from the stage had to go. The overruled censor was appointed by the BJP, whose coalition partner in Punjab, the SAD, had much to lose from bad publicity.

Pradeep says he would like to see the film. But he says that these days he is far too busy, working 13 hours a day, making up for lost time. ■

Endangered species

No rosewood of such virtue

LAK XAO

Illegal logging threatens the survival of a beautiful tree

MR DENG'S ramshackle lumber yard on the edge of town offers a wide array of wood for sale. One species, however, is conspicuously absent. Asked whether he has any Siamese rosewood, he sends a lad off to retrieve one single foot-long chunk. Five years ago, says Mr Deng, rosewood was plentiful in the forests outside Lak Xao (a Lao town so small that its biggest restaurant is called, almost accurately, the Only One Restaurant). But then Chinese and Vietnamese businessmen started buying up trees by the lorryload. Today? "Finished," he says.

On May 13th, hoping to save his country's dwindling forests, Thongloun Sisoulith, the new prime minister of Laos, banned all timber exports. A government representative says environmental protection is among its top priorities. But a report to be published on June 24th by the Environmental Investigation Agency (EIA), an ▶▶

▶ NGO, suggests the clampdown will not be implemented by local officials—and even if it is, may come too late to save Siamese rosewood from being eradicated in Laos and Cambodia.

Much like the trade in rhino horn and tiger skins, trade in rosewood is driven by demand from China's burgeoning middle classes for goods once reserved for the rich: in this case, *hongmu*, or “redwood”, furniture made in the ornate Qing-dynasty style. Siamese rosewood is among the most highly prized of the 33 types of tree used to make *hongmu*.

Five years ago Thailand had roughly 90,000 Siamese rosewood trees—more than anywhere else in the world. But the EIA says “significant volumes, if not most” of those trees were illegally chopped down before trade in Siamese rosewood became regulated under the Convention on International Trade in Endangered Species (CITES), a treaty.

That grim history seems to be repeating itself in Laos and Cambodia. Between June 2013 and December 2014 Vietnam and China (including Hong Kong) imported more than 76,000 cubic metres of Siamese rosewood—more than the total amount growing in Thailand in 2011. Jago Wadley of the EIA says that Vietnam is a conduit through which the wood enters China. Of the total amount imported, 83% came from Laos and 16% from Cambodia.

Documentation accompanying the imported wood showed that 85% was harvested in the wild. Corrupt local officials have failed to enforce the restrictions imposed by the central Lao and Cambodian governments. Middlemen pay villagers to cut down the trees; they then sell the timber to Chinese or Vietnamese businessmen. Rosewood exports require a permit from the local CITES management office, which should only issue one if the export is not deemed detrimental to the survival of the species. Cambodia maintains that almost half of its exports during the period covered by the EIA report took place before the ban took effect. A Cambodian government spokesman says that the “competent authorities have never issued any permit which is contrary to the law.”

In Laos, the situation is clearer: the government has no credible data on how much Siamese rosewood remains, so the EIA cannot determine that exports are not detrimental. It says its investigators met a trader in Shenzhen who had permits issued by Laos's CITES office, which he said could be bought for “any rosewood logs, regardless of their provenance”.

In Bolikhamxay province, where Lak Xao sits, Siamese rosewoods have been nearly eradicated. At the corner of Mr Deng's property stands a rosewood tree, still young and slender. He knows of no others in the region. He says he will never cut it down. ■

Japanese-American relations

Rina's legacy

TOKYO

A murder by an American sparks protests in Okinawa

FLOWERS and tributes left by angry Okinawans surround a makeshift shrine on the country road where Rina Shimabukuro's body was dumped. The only suspect in her rape and murder, Kenneth Franklin Gadson, a former American marine, led police to this remote spot after he was arrested in April.

Ms Shimabukuro, who was just 20 when she was killed, has become the latest symbol in a conflict over American military bases that has raged for decades. On June 19th an estimated 65,000 people mourned her at a stadium in Naha, Okinawa's prefectural capital. A letter from her father urged Okinawans to unite and demand that American soldiers leave. It was among the biggest such protests in years, and one of the most passionate.

America has 85 military facilities throughout Japan, but three-quarters of the area they occupy is in Okinawa. Futenma, a marine airbase, occupies nearly two square miles in the crowded centre of Ginowan, a small city. In 1996, after three American servicemen were convicted of raping a 12-year-old Japanese girl, America and Japan agreed to close the ageing facility and build a replacement near the quiet fishing village of Henoko.

Many locals dislike that plan, because it still leaves Okinawa hosting far more American troops than any other part of the country. A recent survey found that 84% of Okinawans oppose the planned Henoko base—the highest share since the government of Shinzo Abe, the current prime

minister, took power in 2012. Anti-base politicians led by Takeshi Onaga, Okinawa's governor, won control of the prefectural assembly in local elections on June 5th.

A nuclear North Korea and an increasingly assertive China have boosted Okinawa's military importance. Backed by America, Japan is moving away from the pacifism that took root after the second world war. Henoko is central to Mr Abe's plans to boost military defences across Okinawa's 160-island Ryukyu chain. Gavan McCormack, a historian, says Henoko will host “the largest concentration of land, sea and air military power in East Asia”.

But construction has been stalled since March, when Mr Abe agreed to accept a court proposal that he not force building over local objections. Hideki Yoshikawa, an anti-base activist, says that the winds are blowing in his side's favour now, but after next month's election he expects the government to restart construction.

Mike Mochizuki, a political scientist at George Washington University in Washington, DC, argues that would be a mistake. Passions over Ms Shimabukuro's death are running so high that if Mr Abe pushes too hard on Henoko he risks losing support for other bases. But it would be difficult for Mr Abe to give up—both for his own political standing and for the effect on Japan's alliance with America. He may instead opt for the status quo, leaving Futenma open and putting the dispute back where it was in 1995.

Peter Lee, Futenma's commanding officer, blames hostile media coverage for obscuring the strengths of the Japan-US military alliance. American soldiers commit fewer crimes per head than locals do. But perception trumps reality. In late May, military officials imposed a one-month curfew and alcohol ban on all service members. A few weeks later an off-duty sailor driving at six times the legal alcohol limit crashed into two cars. ■



Outraged in Okinawa



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Propaganda

Who draws the party line?

BEIJING

Xi Jinping sends his spin doctors spinning

THE nondescript glazed-brick building at 5 West Chang'an Avenue, near Tiananmen Square, gives no hint of what happens inside. No brass plaque proclaims its purpose. In an office around the corner, a dog-eared card says the reception of the Propaganda Department of the Central Committee of the Communist Party will be open on Tuesdays, Thursdays and Fridays between 8am and 12pm. The staff deals only with party officials; armed guards politely shoo other visitors away.

In English, the Propaganda Department calls itself the Publicity Department (it adopted this translation in the 1990s, realising how bad the literal one sounded). It is both secretive and vast. It is now at the centre of attempts by Xi Jinping, China's president, to increase his control over the party, media and universities. It is also at the heart of factional infighting involving Mr Xi, his anti-corruption chief and allies of his two predecessors as president.

The Publicity Department sounds like the home of spin doctors, spokesmen and censors, and the scope of such activity is indeed vast. With the help of various government agencies, the department supervises 3,300-odd television stations, almost 2,000 newspapers and nearly 10,000 periodicals. The chief editors of these outfits meet regularly at the Publicity Department to receive their instructions. It spends around \$10 billion a year trying to get the Chinese government's opinions into for-

eign media outlets. According to researchers at Harvard University, propagandists help churn out 488m pro-government tweets a year.

But this public role is only the half of it. Another crucial function is to steer the government machinery. The country is too large to be governed through a bureaucratic chain of command alone. So the department also sends out signals from on high: Mr Xi's speeches, and directives given by leaders during their visits to provinces or factories. Such messages tell lower-level officials what the high command is thinking and what is required of them.

The Publicity Department is the chief signals office. It decides which speeches to print and how much to push a new campaign. To this end it has authority over various government bodies (such as the Ministry of Culture and the Chinese Academy of Social Sciences), runs party-only newspapers (not for public consumption) and influences thousands of training schools for party officials. Every province, county and state-owned enterprise also has its own propagandists. The department has been at the centre of battles between hardliners and reformers since the 1980s, when the then propaganda chief, Deng Liqun, was at loggerheads with Deng Xiaoping. It is not so much a group of spin doctors as a spin National Health Service.

The department is at the centre of things again because Mr Xi puts so much

emphasis on the work it does. He has launched a string of ideological campaigns aimed at making party members better Marxists and more honest officials. He has insisted that universities pay more attention to teaching Marxism and less to other wicked foreign influences. In February he made a widely publicised visit to China's three main media organisations, *People's Daily* (a newspaper), Xinhua (a news agency) and China Central Television, in which he stressed that all media must "love the party, protect the party and serve the party". This was interpreted as a swipe at the propaganda department's bosses since it implied that the media should be paying more attention to Mr Xi, who regards himself as the party's "core".

Minitrue's blues

So even as they emphasise its work, Mr Xi and his allies have been criticising the department. On June 8th, after a two-month investigation, the Central Commission for Discipline Inspection (CCDI), the party body responsible for fighting graft and enforcing loyalty, launched a stinging attack.

In a posting on the CCDI's website, the leader of the investigation said the department "lacked depth in its research into developing contemporary Chinese Marxism". He said "news propaganda" (a revealing phrase) was "not targeted and effective enough"; he claimed the department was "not forceful enough in co-ordinating ideological and political work at universities" and had failed online "to implement the principle of the party managing the media". It is unusual for such an attack to be made public. It is unheard of for a party body to attack the reputation of the Publicity Department, the party's own reputation-maker and breaker.

The CCDI's charge sheet strengthened earlier hints that Mr Xi is unhappy with ▶▶

▶ the department's promotion of his policies. Less clear is which of its shortcomings he is upset about. It could be its failure to beat the drum for economic reform (Mr Xi made a big speech on the subject in January; it did not appear in *People's Daily* for four months). Possibly it gave too much encouragement to a mini personality-cult of "Uncle Xi", violating long-standing party orders against such fawning.

Or possibly the Publicity Department has been caught up in factional infighting. The two propaganda chiefs are Liu Qibao, the head of the Publicity Department, and his (unrelated) supervisor, Liu Yunshan, a member of the Politburo Standing Committee, the Politburo's inner circle, who was Liu Qibao's predecessor. Both are former high-fliers in the Communist Youth League, which has long been a stepping stone to membership of the party elite.

"Princelings" such as Mr Xi, who have been helped to power by their blood ties to party veterans and their service in the provinces, often resent the cliquish influence of those who emerged through the league's bureaucracy. They include Mr Xi's predecessor as president, Hu Jintao, and many of those who rose through the ranks with him and remain in positions of influence. Liu Yunshan has the added disadvantage of being part of "Jiang's gang", the group of senior officials close to Jiang Zemin, Mr Hu's predecessor, which is seen as another rival faction to Mr Xi.

Leaguers are falling foul of the anti-graft campaign to an extent that can hardly be coincidental. In late May and early June, the CCDI and the country's chief prosecutors placed under investigation or indicted three allies of Vice-President Li Yuanhao, who was once one of the league's most senior figures. Just before that, a court in the northern port city of Tianjin charged Ling Jihua with bribery, after a year-long investigation by the CCDI. Mr Ling had been a senior member of the league, and had served as chief aide to Mr Hu when he was president.

The Publicity Department is fighting its corner. Earlier this year it targeted Ren Zhiqiang, an outspoken property magnate and ally of the CCDI's boss, Wang Qishan (who was his tutor in high school). Mr Ren had criticised efforts to tighten control of the media. By denouncing him, the Publicity Department could claim to be carrying out Mr Xi's policies while simultaneously attacking a friend of Mr Wang, whose commission's report was so damning.

Like media organisations everywhere, the Publicity Department is struggling to keep pace with changing consumer demands. Unlike most such organisations, it is also having to keep pace with the changing political requirements of its boss, Mr Xi. As an institution, these have made it more important than it was. But its current leaders might prefer a quieter life. ■

Grassroots democracy

Unwanted model

WUKAN

A village famed for its struggle for democracy is once again in turmoil

MARCHING by the thousands this week in stifling heat through their small coastal village, residents of Wukan carried Chinese flags and shouted out slogans in support of the Communist Party. That was just to protect themselves from retribution by the riot police, who watched them closely but did not intervene. Their real message was in other chants: "Give us back our land!" and "Free Secretary Lin!"

The secretary in question was their village chief, Lin Zulian, whom they elected in 2012 in what was widely hailed at the time as a breakthrough for grassroots democracy. Mr Lin had led Wukan in a months-long rebellion against local authorities. Villagers kicked out party officials and police from their offices in protest against the alleged seizure of some of Wukan's land by corrupt officials who had lined their pockets with the proceeds of selling it. Police responded by blockading the village, turning it into a cause célèbre—including in some of the feistier of China's heavily censored media. In the end the government backed down: it allowed Wukan to hold unusually free elections and it promised to sort out the land dispute. The "Wukan model" became Chinese reformists' shorthand for what they hoped would be a new way of defusing unrest.

They have been disappointed. Villagers did not get their land back, or the money

some wanted in lieu of it. Mr Lin, who won another landslide victory in elections two years ago, announced plans on June 18th to launch a new campaign for the return of the land. That was clearly too much for the local government: Mr Lin was promptly arrested on charges of corruption. Angry residents took to the streets again.

Villagers in China often stage protests over land rights; local authorities usually deal with them either with force, or by promising concessions and then rounding up the ringleaders. Restoring calm to Wukan will be tougher. Because of its fame, journalists have poured in, especially from nearby Hong Kong. Local officials may be reluctant to resort to the usual thuggish tactics in front of such an audience.

In an effort to undermine support for Mr Lin, the government has tried blackening his name. On June 21st officials released a video showing him confessing to bribetaking. But that merely stoked the villagers' anger. His wife, Yang Zhen, says she is certain the confession was coerced. His halting delivery in substandard Mandarin, she believes, was his way of letting villagers know this. "They are trying to deceive everyone, but no one believes it," she says. Dozens of furious villagers went to a local school where nervous officials had barricaded themselves behind metal doors and barred windows; they kicked the doors and shouted abuse. As *The Economist* went to press, Wukan was preparing to embark on its sixth consecutive day of protest.

Many residents say they have lost all faith in the local government, and that only the central authorities in Beijing will be able to find a fair solution. "They took our land. My father and grandfather farmed it, and now I have nothing. No work and no other path forward," says a 39-year-old villager. "We have a black government, all corrupt. They cannot trick us again with more talk of the 'Wukan model'. We need our land back," he fumes.

But the central government will be reluctant to cave in to the protesters' demands. "Handling the Wukan problem well means much to the rest of China," said *Global Times*, a pro-party paper in Beijing. But it warned that if the "drastic actions" of Wukan's villagers were copied by others, China would "see mess and disturbance" at the grassroots. In a country where many seethe with grievances similar to Wukan's, officials do not want the village to become a model for revolt. ■



In Wukan, yes we can

Banyan | In Beijing's bad books

China's clumsy, baffling handling of Hong Kong alienates its people



OF THE explanations offered for the mysterious disappearance of five Hong Kong booksellers late last year it was both the most lurid and the most plausible. As Lam Wing-kee told it on his return to Hong Kong this month, he was kidnapped last October as he made what was meant to be a short visit to his girlfriend in mainland China. He was blindfolded and bundled onto a train to the port of Ningbo, near Shanghai. There he was detained for months, interrogated and forced to record a televised confession of his crime: selling banned books on the mainland. He had now decided to tell the world his story to show that “Hong Kongers will not bow down before brute force.” Some in Hong Kong show similar defiance; others see bowing down as a better option.

Mr Lam said he could speak out because he has few ties with people across the border. The girlfriend has denounced him, as have three of his colleagues who have also resurfaced in Hong Kong (one is believed to remain in custody). They denied Mr Lam’s claim that their televised confessions were scripted. One of them, Lee Bo, also maintained that he had crossed the border of his own accord, and had not, as Mr Lam had suggested and many believe, been snatched from Hong Kong. This is the most sensitive allegation. Detaining Hong Kong citizens without trial is bad enough. But they must have known the risks of peddling scurrilous books about Chinese politics on the mainland. Kidnapping a suspect in Hong Kong, however, would be a clear breach of the agreement with Britain under which China resumed sovereignty over Hong Kong in 1997 but promised it 50 years of autonomy under the rubric “one country, two systems”.

The booksellers’ travails feed into the climate of tetchy disgruntlement that has prevailed in Hong Kong since the failure of the big street protests of the “Umbrella” movement in 2014 to prompt China to allow democratic reform there. Unusually, Hong Kong’s chief executive, Leung Chun-ying, responded to Mr Lam’s story. He said he would write to Beijing and look at procedures for liaising with the mainland’s police. It amounted to a candid admission of the constraints his government faces.

China’s denial of Hong Kong’s demand for more open politics is having perverse consequences. Street protest is now commonplace. Mr Lam himself led a march on June 18th to the Chinese government’s liaison office in Hong Kong. The next day, Denise

Ho, a pop singer facing commercial sanctions for her outspoken criticism of Chinese policies, gave a free street-concert to hundreds of fans. Meanwhile political discourse is becoming shriller. The next election for Hong Kong’s Legislative Council is due to be held on September 4th. The council’s powers are very limited, and its composition is distorted by complex voting arrangements designed to thwart a majority for the “pan-Democrat” parties critical of China’s ruling Communist Party. But the campaign will provide a platform for the many parties that backed the aims of the Umbrella protests: to see a more democratic Hong Kong with a chief executive freely elected by Hong Kong’s people (rather than, as now, first vetted by a committee dominated by the Communists’ placemen).

This year’s campaign, however, will also be joined by other fringe groups questioning the “one country, two systems” set-up itself. Various describing themselves as localist, nativist or pro-self-determination, these parties champion Hong Kong’s distinctive identity. Some argue explicitly for its independence. It seems odd that such forces are still so marginal. In Taiwan, the campaign for democracy was always inseparable from that for formal independence from China. In Hong Kong it embodied the hope that China too might see democratic reform.

In the 1980s, as Britain and China negotiated the future of Hong Kong’s people over their heads, some did call for self-determination. But in the words of one of them, Emily Lau, now chairman of the biggest of the mainstream pan-Democrat parties, they found “no echo”. Some point out that, unlike Taiwan, where only a minority have strong connections with the mainland through immigration in the past century, Hong Kong is a refugee-majority society that naturally sees the mother-country as home. So it was never given the chance of self-determination enjoyed by other British colonies. Britain said its hands were tied by the expiry in 1997 of the lease China had granted on Hong Kong’s mainland adjunct, the “New Territories”. Hong Kong Island and Kowloon, adjoined in perpetuity, would be unviable without this hinterland. (Don’t tell Singapore.) China never formally recognised either the lease or the cession, but played along.

Young passion

Two decades after the handover, however, the gap in outlook and level of freedom between Hong Kong and China seems to be widening even as the wealth gap narrows. A new generation of activists is agitating not for freedom in China but freedom from China. A rare debate this week held at the Island School, an international high school, on whether Hong Kong needs self-determination, pitted young representatives of two of the nativist groups—Civic Passion and Youngspiration—against speakers from one of the established parties. The establishment probably won the argument, if only on the ground of feasibility: barring unimaginable changes, China is never going to let Hong Kong secede.

Yet China should be worried that many of Hong Kong’s brightest young people, having seen the futility of trying to improve the current political system, want to replace it altogether. And not just the young: the sexagenarian Mr Lam unsurprisingly now sympathises with the call for independence. How the booksellers were treated will strengthen anti-mainland sentiment and undermine confidence in the rule of law in Hong Kong. For that reason, optimists hope it was an aberration—a security-service blunder. The alternative, that China either doesn’t care or deliberately wants to scare its critics, is even more disturbing. ■



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Minimum wages

Maximin

EMERYVILLE, CALIFORNIA

Some cities have raised minimum wages dramatically. They may regret it

EMERYVILLE, a tiny city of 12,000 lying on the eastern shore of the San Francisco bay, is rather cruelly known by residents of its bigger neighbours primarily as a place to buy furniture. A huge IKEA, a Swedish homeware shop, greets visitors to the city, which has no fewer than four shopping centres. But Emeryville has a better claim to fame; its many shoppers are served by some of the best-paid retail staff in the country. Since July 2015 the city's minimum wage, for all but the smallest firms, has been \$14.44 an hour, nearly double the federal minimum of \$7.25 and almost 50% higher than the state minimum of \$10. Emeryville is one of dozens of cities across America to have boosted its minimum wage in recent years, but it has gone further than almost any other towards the \$15 campaigners seek.

That goal emerged in New York in 2012, when 200 fast-food workers went on strike demanding higher pay and a union. Those strikes were repeated, grew, and then spread nationwide (the last national strike was in April). At the same time, local politicians began to take action. After more than a decade with barely any changes to local minimum wages, they rose significantly in a handful of places in 2013. The next year 12 localities raised them, including Bay-area cities Berkeley, Oakland and San Francisco. In 2015, sixteen more, including Emeryville, followed suit.

Most areas have not gone as far as Emeryville, but many promise to do so eventually. On June 21st, the city council in Wash-

ington, DC, the latest city to follow the trend, voted unanimously to raise the minimum wage to \$15 by 2020. Only California and New York have taken comparable action at the state level. But, thanks mainly to local laws, almost 17m workers have benefited from higher minimum wages since the "fight for \$15" began, according to the National Employment Law Project. At least 10m of those will eventually receive \$15 an hour.

Campaigners claim that higher local minimum wages are necessary to alleviate

poverty, particularly as minimum wages are often not adjusted for years at the state and federal levels. Prices are already 10% higher than in 2009, the last time lawmakers upped the federal rate. This argument carries particularly weight in Emeryville, where a one-bedroom flat commands rent greater than \$2,000 per month, owing to an influx of rich techies into the area. Dianne Martinez, the city's mayor, says \$14.44 was picked based on an estimate of what it now costs to live in her city.

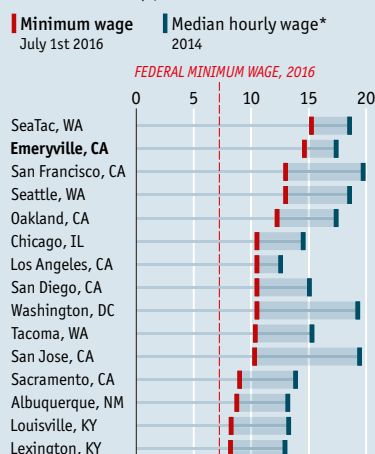
These justified concerns about poverty are often mixed up with anger about stagnant median incomes or inequality. Here, the thinking is sloppier. Minimum wages exert little pressure on middle-America's earnings; neither do they restrain the pay of bankers or CEOs. Until recently it looked like low minimum wages did cause middle-earners to pull further away from very low-earners during the 1980s. But a recent study by economists David Autor, Alan Manning and Christopher Smith suggests that minimum wages explain only 30-40% of this trend.

Minimum-wages, then, are best viewed as one route to helping the lowest earners. Since nobody thinks that low pay is desirable, the argument against minimum-wages is that they destroy jobs. Campaigners deny this, with some justification. A canonical study in 1993 found that employment in New Jersey restaurants increased, rather than fell, in response to a minimum wage rise. More recent research, from 2010, examined all county-pairs that straddle a state border and found that, for the period from 1990 to 2006, differences in minimum wages had no effect on employment in low-wage sectors.

Other economists dispute these findings. But some jobs clearly can survive higher minimum wages. In 2015 more than half of workers earning at or below the federal minimum wage worked in restaurants, bars and the like. Such service jobs ▶▶

Sweet fifteen

Selected US cities, \$



Sources: National Employment Law Project; Census Bureau; The Economist

*Based on personal income of surrounding county

cannot be moved overseas, and many, such as cleaning the floor of a McDonalds, are hard to automate. These jobs will survive if firms can tolerate lower profits or raise their prices sufficiently. Soaring demand for services in fast-growing, high-income areas like New York and San Francisco typically enables them to do so. Seattle began raising its minimum wage in April 2015, initially from the state minimum, \$9.32, to \$11 for large firms. Yet the proportion of jobs in the Seattle area in the food service and preparation industry has grown from 7.2% in April 2015 to 7.4% today.

But in other industries, raising prices is harder. Match Analysis, an Emeryville business with around 35 local staff, collects data on soccer matches, which it sells globally alongside analytical software. The firm's competitors hire exclusively in countries with lower wages, such as India and Russia, says Mark Brunkhart, who founded the business in 2000. That means it cannot raise prices; instead, the higher minimum wage has forced the firm to shed 13 data-collection jobs. This has mainly been achieved with a hiring freeze, but this month Mr Brunkhart had to lay-off six staff. These were the first redundancies in the firm's history.

Some retail workers, who make up 13% of workers whose pay is at or below the federal minimum wage, are also under threat because of automation. Big shops are unlikely to speak out against minimum-wage changes because of the bad press it generates. But they are not immune to incentives. Target, one of the retail behemoths in Emeryville, has in the past month installed self-service checkouts, perhaps because of higher labour costs.

Caution is warranted because economists' experience with minimum wages is limited to where they have been set modestly, relative to incomes. The average minimum-wage to median-income ratio in the OECD, a club of mostly-rich countries, is 50%. The highest, 68%, is in Turkey. Median hourly wages vary hugely by state, from less than \$14 in Mississippi to over \$22 in Alaska. That means even Hillary Clinton's proposed \$12 federal minimum-wage exceeds 75% of the median hourly wage in fully 16 states—well beyond the rates that have been well-studied.

Decentralised minimum-wage setting might therefore be desirable. But 19 states ban cities from raising minimum wages on their own; in February this stopped Birmingham, Alabama, from raising its rate to \$10.10. In Emeryville, the minimum-wage to median-income ratio is around 85%, according to our calculations (see chart). Ms Martinez promises an economic impact study, but says "there are times where you have to take a leap of faith".

A further claim campaigners make is that minimum wages will reduce welfare payments. These currently subsidise firms

like McDonalds, the argument goes, because the only reason such firms can only pay so-called "poverty wages" is because the government picks up the rest of the tab for housing, feeding and clothing their employees. Research suggests that about a third of the Earned Income Tax Credit (EITC) bill does indeed flow to firms' coffers, by lowering pre-tax wages. The minimum wage stops the leakage. Yet this is not necessarily good: subsidising firms to hire unskilled workers might be desirable if

their jobs are under threat from automation and outsourcing.

The Fight for \$15 campaign is often guilty of a bait-and-switch, justifying much higher minimum wages with reference only to food-service giants like McDonalds, but then endorsing them across the whole economy. Unlike the campaigners, those unskilled workers who lose out, through redundancies or slower hiring, do not have loud voices. Politicians, at all levels of government, must remember that. ■

The Trump campaign

Poor Donald

WASHINGTON, DC

The Republican nominee's campaign is impoverished

THROUGHOUT the presidential primary contest, Donald Trump's claim to be self-funding his campaign always drew loud cheers. Part boast—"I'm like, really rich" he would smirk—and part a badge of incorruptibility, the claim allowed the property developer to paint all his Republican rivals as puppets of special interests. Voters at campaign rallies would reliably cite his supposedly vast wealth, and the independence it brought, as one of their biggest reasons for trusting the businessman.

Loyal Trump supporters forgave their champion when he secured the nomination and abruptly changed his tune, boasting in early May that he would create a "world-class finance organisation" to solicit donors and fill war chests for himself and

for the Republican Party. The same Trump loyalists will doubtless shrug off headlines that greeted the release of campaign-finance reports for the month of May, showing that he raised just \$3.1m from donors and has just \$1.3m cash on hand—sums dwarfed by Mrs Clinton's campaign, which raised over \$26m in May and started June with \$42.5m in cash on hand. Mr Trump himself sounded defiant, asserting that he could spend "unlimited" sums of his own money if needs be.

The donor drought could still break—a small army of deep-pocketed Americans would commit millions if they were sure that their money would keep Mrs Clinton out of the White House. The real danger for Mr Trump is that his money goes point to a larger fear among conservatives: that his presidential campaign represents a bad investment. Mrs Clinton needs to fund a formidable political machine that employs almost 700 people at her Brooklyn headquarters and in field offices across the country. The Trump campaign employs a tenth of that number. The Clinton campaign and allied groups are estimated to have reserved \$117m in television advertising, according to Kantar Media/CMAG, an ad-tracking firm, as the Democrats prepare for a summer airwar intended to define Mr Trump in voters' minds. As of June 20th, the Trump campaign was not thought to have reserved any TV airtime, reflecting its candidate's confidence, to date, in his ability to earn free publicity.

Mr Trump boasts that he is keeping his campaign "lean", delving into conspiracy theories to suggest that Mrs Clinton will spend money from "the Middle East" and "from people you don't want her to have money from."

But the fine print of Federal Election Commission filings show considerable largesse directed to Mr Trump's own busi- ▶▶



Let's expense it

nesses and the travel expenses of his family members. His largest expenditures in May included \$350,000 for the use of his private aircraft and \$423,000 for the use of Mar-a-Lago, his Florida resort (the campaign spent just \$48,000 on data management). While he is obliged to reimburse his companies to avoid making illegal in-kind donations to his campaign, the extent to which Mr Trump's brand and political ambitions overlap is unusual. Donors are reported to be anxious for Mr Trump to write off almost \$46m that he has lent to his campaign, rather than find their dollars being used to repay his loans.

Team Trump's resemblance to a fractious family business only increased with the abrupt firing on June 20th of its campaign manager, Corey Lewandowski, a short-tempered, grudge-bearing schemer who had lost the trust of the candidate's adult children. Mr Lewandowski was more henchman than strategist, jealously guarding access to the candidate and espousing the principle: "Let Trump be Trump". That has been Mr Trump's guiding principle, too. Mr Lewandowski's sacking will matter if the tycoon has understood that the primary election is over, and he must act like a disciplined nominee for national office. He does not have much time. ■

After Orlando

Of docs and Glockes

ATLANTA

Beyond the farrago in Congress there are reasons for hope on gun control

SEXUAL proclivities, diet, booze: doctors soften talk to patients about squirm-inducing subjects. In Florida they inquire about the safety of swimming pools. But, according to a state law considered this week by the Eleventh Circuit court of appeals in Atlanta, they may lose their licences if they ask or "harass" their patients about guns. That is, unless they believe "in good faith" that the questions are medically relevant: a vague proviso which, in a case known as *Docs v Glockes* that pits a coalition of doctors against Florida, its lawyers struggled to explain.

The law, signed in 2011, is symptomatic of the perfervid politics of guns in the years since self-defence began ousting hunting as the main rationale for owning them; an era in which gun rights—not just defending them from any restraint, but advancing them in increasingly eccentric ways—have become a preoccupation and litmus test for many Republicans. Like previous horrors, the shooting to death of 49 people at a gay nightclub in Orlando seems not to have changed the mood. Not in Con-



Don't tell the doctor

gress, anyway, where four proposals to expand background checks for gun-buyers, or stop terrorist suspects arming themselves, failed. The Senate is yet to vote on a narrow plan affecting people banned from flying; Democrats staged a long sit-in on the floor of the House of Representatives to protest the inaction.

So, while some politicians want to recommence waterboarding, several would apparently rather let suspected terrorists buy guns than support measures sponsored by their opponents. For gun-control advocates, the popular response to Orlando is almost as depressing. Shares in gun companies have risen again, as Americans again seem to infer that a clampdown on ownership is imminent, or that guns will keep them safe—despite the evidence that they are far likelier to be fired in accidents, rows or suicides than against an assailant, let alone a terrorist. Not only swivel-eyed survivalists are reaching this conclusion: Gwen Patton of Pink Pistols, a pro-gun gay group, says several new chapters have been founded, while Facebook membership has quadrupled.

All this makes despair about gun-control understandable. Yet there are two reasons for optimism: less conspicuous than the antics in Congress, but important.

A gloomy mantra has it that, after the slaughter of children in Newtown in 2012, nothing changed. In fact, as Laura Cutilletta of the Law Centre to Prevent Gun Violence enumerates, a lot has—but in statehouses, not Washington, DC. Twenty states have since changed their laws to keep guns away from domestic abusers; nine have extended background checks, while at least 20 have mandated that mental-health records be submitted for them. Five have reined in the use of the so-called assault rifles implicated in Newtown, Orlando and other atrocities, or of large-capacity magazines. California enacted restraining orders whereby families or police can ask a court to suspend a dangerous per-

son's gun rights. Washington state may vote on a similar measure in November.

As Ms Cutilletta says, the deadlock in Congress "has overshadowed the fact that states have done so much." Nor is progress confined to Democratic states: domestic-violence gun laws have been passed, for example, in Louisiana and South Carolina. True, gun-rights enthusiasts in Florida and elsewhere are still pushing further liberalisations, such as "constitutional carry" (carrying concealed weapons without a permit), "campus carry" (guns in college) and "open carry" (macho posturing). But such gambits are mostly failing. In part that reflects the growing clout of the gun-control movement, which is consolidating around Everytown for Gun Safety, an umbrella outfit kickstarted by Michael Bloomberg that boasts 3m members—still lagging the National Rifle Association's 5m.

The other source of hope is the courts. In the case of the Supreme Court, the influence has been passive, though that may change when its empty seat is filled. This week it refused to hear a challenge to bans on assault weapons in Connecticut and New York; it has also declined to hear challenges to concealed-carry rules in New York and Maryland, among others. Many such complaints have failed in lower courts, too. On June 9th, for instance, federal judges upheld limits on concealed carry in California. Meanwhile the families of Newtown's victims have made progress in their claim against the makers and distributors of the rifle used in the massacre, despite a law of 2005 that conferred broad immunity on the industry. This week the defendants tried again to nix the suit.

In *Docs v Glockes*, the judges seemed sceptical that Florida's rules could serve any purpose without restricting doctors' first-amendment right to free speech. One suggested the statute was "illusory." They have yet to rule; but, just possibly, the hysterical era that produced such outlandish legislation may be waning. ■

Oakland's police

Too many chiefs

A sex scandal prompts a purge at Oakland's police department

THINGS seemed to be looking up for Oakland's police department. Between January and the middle of March seven people were murdered in the notoriously violent northern Californian city—11 fewer than over the same period in 2015. Rapes, assaults and burglaries were down too. The department was closer to complying with the 51 reforms it was ordered by a court to implement in 2003, following a police misconduct settlement. The leader of the White House's task-force on policing had even praised Oakland's force, which was once a byword for abuse of power.

Then, in May, several Oakland police officers were accused of sleeping with a prostitute, who was possibly underage at the time. Separately, an investigation was launched into other Oakland officers for sending racist text messages. On June 9th, Sean Whent, Oakland's police chief, resigned. In the nine days that followed, a replacement chief was appointed and sacked, and the replacement's replacement, who became chief automatically, stepped down. For now, Oakland's police department is being led by a civilian.

The turmoil has its roots in a suicide note found beside the body of Brendan O'Brien, a police officer who shot himself in September. The note, which has not been released, prompted an internal investigation. The probe mostly went unnoticed until May, when reports surfaced that three officers had slept with a woman named Celeste Guap. Ms Guap later said she had sex with more than 20 officers from four different police departments in the area, none of whom she says paid her (though several gave advanced warning of undercover prostitution stings).

This is not the Oakland police department's first brush with ignominy. In the early 2000s, four officers who called themselves "the Riders" were accused of assaulting, robbing and planting evidence on suspects while they worked the night shift in West Oakland, a neighbourhood plagued by high crime. Since then, the department has been under federal supervision. The mayor, Libby Schaaf, who won office in part with promises to continue with reforms, issued a terse statement about the shenanigans: "As the Mayor of Oakland I am here to run a police department not a frat house."

Eugene O'Donnell, a former New York city cop and professor at John Jay College of Criminal Justice, reckons that the Oak-



Bump City

land mayor's office needs to directly increase scrutiny of its police, rather than rely on the federal monitor. Recruiting better officers would also help, though he expects they will be hard to find. Distrust of police in the post-Ferguson era mean fewer young Americans want to work in law enforcement; the dubious reputation of Oakland's police probably makes it even harder to attract motivated rookies.

Ray Long, the general manager of Bay Bridge Auto Body, a car repair shop in East Oakland, is similarly pessimistic. The neighbourhood where he tends to cars is so violent he has become desensitised to it. "Someone got shot in front of the shop recently in broad daylight and I don't think I even put down my lunch," he sighs. He says it took the police two hours to arrive and that when they did, they were laughing and joking around. "You can cut off the head, but that doesn't fix the problem." ■

The Fourth Amendment

Amended

NEW YORK

The Supreme Court weakens the law against unreasonable searches

FANS of television shows such as "Law and Order" are familiar with the so-called "exclusionary rule": when police obtain evidence of a crime through illegal means, the evidence is usually inadmissible in court. This rule, an outgrowth of the Fourth Amendment bar on "unreasonable searches and seizures", deters police from violating citizens' constitutional rights when undertaking criminal investigations. But the rule just became something closer to a suggestion: on June 20th the Supreme Court divided along gender lines in a 5-3 decision that introduces a loophole in rules for obtaining evidence that were de-

veloped more than 50 years ago.

The case, *Utah v Strieff*, involves a dodgy drug bust. Responding to an anonymous tip that drugs were being sold from a house in South Salt Lake City, Utah, detective Doug Fackrell started keeping an eye on the property. He didn't see much from his unmarked car, but he did notice—in the several hours he spent watching over the course of a week—people visiting the home and then quickly leaving.

Without keeping track of how long one such visitor spent at the house, Mr Fackrell decided to stop the man, Edward Strieff, for questioning. The detective discovered, after a colleague ran his name through a database, that Mr Strieff had an open warrant for a traffic violation. Mr Strieff was arrested on the traffic warrant and searched. Mr Fackrell discovered a baggie of methamphetamine and drug paraphernalia in his pockets. He was then charged with drug possession. Mr Strieff challenged the charges by denying that the evidence against him was obtained lawfully.

The five men on the Supreme Court ruled against Mr Strieff. In an opinion written by Justice Clarence Thomas, the court quoted its own ruling in a case in 2006 that, "suppression of evidence...has always been our last resort, not our first impulse." One circumstance in which the exclusionary rule does not apply is when "the connection between unconstitutional police conduct and the evidence...has been interrupted by some intervening circumstance." Since it was the traffic fine (not the illegal questioning) that gave rise to the arrest, and since Mr Fackrell was "at most negligent" in questioning the suspect, his "errors in judgment hardly rise to a purposeful or flagrant violation of Mr Strieff's Fourth Amendment rights," the court held. The drugs can be used as evidence. Two biting dissents from Justices Elena Kagan and Sonia Sotomayor took sharp issue with this holding. "Do not be soothed by the opinion's technical language", Justice Sotomayor warned. "This case allows the police to stop you on the street, demand your identification, and check it for outstanding traffic warrants."

The exclusionary rule has long been contested. Introduced in 1914 for federal prosecutions, it was not applied to all courts until the Supreme Court ruled on *Mapp v Ohio* 1961. Justice Tom Clark wrote in that case that police would have no incentive to stick to the Fourth Amendment when searching suspects if all the evidence they collect is admissible no matter how they come by it. Benjamin Cardozo, a Supreme Court justice in the 1930s, opposed it, asking why "the criminal is to go free because the constable has blundered"? Now begins the wait to see whether police forces change their behaviour to take advantage of the new powers the Court has just handed them. ■

Catholic hospitals

Gloria in expansion

Catholic hospitals are gaining market share, and influence over gynaecology

CATHOLIC hospitals have been a force in American medicine since the Industrial Revolution, when nuns arrived from Europe to tend to immigrant communities. They are still flourishing. The total number of Catholic acute-care hospitals, where patients receive short-term treatment for urgent health conditions, increased by 8% from 2001 to 2016. In the same period, the number of beds in such hospitals grew by 18%. One in six acute-care beds lies within a Catholic hospital.

Over the past two decades, economic pressures have driven health-care providers to consolidate. To achieve scale and increase their bargaining power with insurance companies, independent hospitals have merged to form larger systems. Catholic hospitals look to each other for potential partnerships first, says Lois Uttley, the director of MergerWatch, an advocacy group. Of the ten largest non-profit health systems in America, six are Catholic. To ensure their survival, Catholic hospitals have also overhauled their leadership. While in 1968 there were 770 religious officials—often nuns—running hospitals, today there are only four; the rest are laypeople.

Catholic hospitals generally follow the health-care directives laid out by the Conference of Catholic Bishops, which ban “contraceptive intervention” of any sort. Abortions are rarely administered in any sort of hospital, but secular hospitals usually provide emergency abortions in cases where pregnancies go awry. When future pregnancies are undesired, or would carry health risks, women also rely on hospitals to tie their Fallopian tubes, a process called “tubal ligation”. Catholic hospitals seldom provide either of these services. In Arizona in 2010, a nurse at a Catholic hospital was

demoted after she approved an emergency abortion for a woman suffering from perilously high blood pressure.

Some hospitals have found creative ways to reconcile religious interests and reproductive emergencies. In Austin, Texas, the fifth floor of Brackenridge Hospital, which is affiliated with the Catholic Ascension Health system, operates as a women’s hospital, which is separately incorporated and managed. It provides maternity services, sterilisations, emergency contraception for rape victims and family planning services. A Catholic hospital in Troy, New York, has carved out a similar facility.

But most Catholic hospitals have not made such accommodations. The American Civil Liberties Union (ACLU) tells the stories of several women with pregnancy complications who were denied emergen-

cy abortions at Catholic hospitals. One, Mindy Swank of Illinois, recalls how she was refused an abortion when her waters broke prematurely at 20 weeks and testing showed her fetus had a very low probability of survival. It was only when she began rapidly losing blood seven weeks later that the hospital induced labour. Her baby died shortly after. The Catholic Health Association called the report’s claims “unsubstantiated and irresponsible”.

In some rural areas patients have little choice over hospitals. According to MergerWatch, almost 50 Catholic facilities are at least 35 miles or 45 minutes away from a competitor. This worries Douglas Laycock of the University of Virginia. “One has a presumptive right to live by one’s own moral commitments,” he says. “One does not have a right to use a monopoly position to block others from exercising the same liberty.” Kevin Fitzgerald of the Centre for Clinical Bioethics at Georgetown University retorts that Catholic hospitals are prominent in many rural areas because nuns were once the only carers intrepid enough to hunker down there. “To those who complain ‘Well, it shouldn’t be that way’, I say: no one is keeping you from starting a hospital there.” ■

Suing the Church

Bully pulpit

PHILADELPHIA

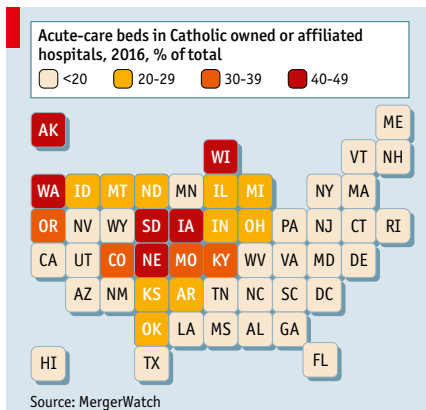
The Catholic Church is lobbying to prevent changes to statutes of limitations

ABOVE the announcement for confessions on Tuesday at 7pm, the weekly bulletin for St Rose of Lima’s church near Philadelphia had an unusual notice for parishioners with the heading, “JUST SO YOU ARE AWARE”. It stated that Nick Miccarelli voted in favour of House Bill 1947. The legislation would abolish the criminal statute of limitations for future child sexual abuse cases, including rape, incest and statutory sexual assault. In addition to sitting in the statehouse, Mr Miccarelli is a member of the parish.

Many states are revising their statutes of limitations for assault. Delaware has done so—a wave of lawsuits followed—as has California. New York’s statehouse considered a bill this month that would have extended its statute of limitations by five years. Pennsylvania’s bill would allow civil cases for child sexual abuse to be filed against public and private institutions, and extend the statute of limitations for civil cases from 30 to 50 years (the average male victim does not come forward until he is in his late 30s, women come forward even later on average). The state senate’s judiciary committee is considering whether to send the bill to the floor for a vote.

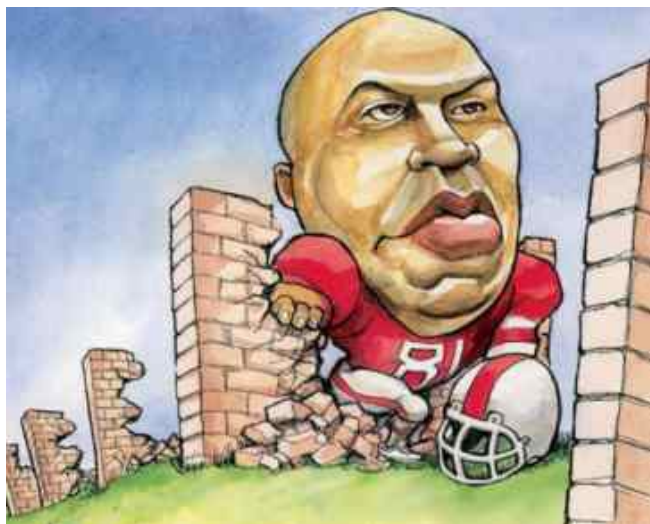
Mr Miccarelli, the lawmaker and parishioner, was not the only representative singled out by the church for supporting the bill. Martina White, who represents a district in Philadelphia, has been disinvited from several church events. Another was told by a priest that he had betrayed his faith. Earlier this month a letter written by Charles Chaput, the Archbishop of Philadelphia, was distributed at Sunday services saying the bill was a “clear attack” on the church and “poses serious dangers” for parishes, charities and schools. Archbishop Chaput helped defeat a similar bill in Colorado when he was Denver’s Archbishop.

Pennsylvania’s bill is timely. In March the state’s attorney general released a 147-page grand jury report exposing a decades long cover-up of child sex abuse in Altoona-Johnstown diocese, in central Pennsylvania. The abuse stretches back to the 1940s and involved at least 50 priests, according to the report. Many parishioners think the administrators who covered it up deserve to be punished too. Mr Miccarelli is unrepentant. “Frankly, I would rather be chastised from the altar than to be damned for not allowing justice to be done.”



Lexington | Cory Booker

The senator from New Jersey thinks Americans must love one another or die



NOT knowing his place has led Cory Booker to success all his life. Breaking barriers of race, class, ideology and age helps explain why, as a first-term senator from New Jersey, he is more famous than colleagues 20 years his senior, and appears on lists of possible vice-presidential running mates for Hillary Clinton.

Early in his career the habit almost got Mr Booker shot, he recalls in a new book, “United: Thoughts on Finding Common Ground and Advancing the Common Good”. A young graduate of Stanford, Oxford, and Yale Law School, eager to offer legal help to a troubled neighbourhood, he moved into a crime-blighted housing complex in Newark, New Jersey. Especially after he was elected to the city council, his presence was deemed bad for business by local drug dealers. They debated scaring him away with violence, an ex-gang boss told Mr Booker later—adding soothingly: “They were just going to shoot you in the leg.”

Other moments of boundary-crossing were happier. Just before he was born in 1969 civil-rights lawyers helped his parents, both pioneering black executives with IBM, overcome invisible (and by then illegal) racial barriers to buy a home in the overwhelmingly white New Jersey town of Harrington Park—though not before an incensed real-estate agent tried to defend those barriers by setting his Doberman on them.

When Mr Booker began his rise in Democratic politics, his suburban childhood saw him denounced as too privileged to understand riot-scarred, post-industrial Newark. The incumbent mayor, a old-school black Democrat later jailed for corruption, called Mr Booker “a Republican who took money from the κκκ.” By the time Mr Booker was elected mayor in 2006 his struggles against machine politics had been filmed for an Oscar-nominated documentary. He represents a distinctive strand of Democratic politics: a sort of social-justice centrism. His see-what-works pragmatism, and his use of data to drive reforms of city government, including policing, earned praise from such peers as New York’s then-mayor, Michael Bloomberg, a Republican-turned-independent. He raised hefty sums from philanthropists: Mark Zuckerberg of Facebook gave \$100m to shake up failing schools.

During the 2012 presidential election Mr Booker drew fire from the left for his response to campaign adverts attacking the Republican candidate, Mitt Romney, for a career in private equity.

Noting that private-equity firms helped businesses grow in New Jersey, Mr Booker called the Democratic attacks “nauseating”. Ease with Wall Street bosses aligns him with Mrs Clinton and other centrist Democrats. Like them, he has sharply criticised tough-on-crime bills passed during Bill Clinton’s presidency, though he carefully calls this a bipartisan mistake.

A vegan, shaven-headed former college football player, he earned headlines as mayor for chasing a robber in the street and for rescuing a neighbour from a fire. When Mr Booker was elected to the Senate in 2013, critics questioned his legacy in Newark, pointing to the backlash against his education reforms, and his failure to make a lasting difference to crime rates, notably after a second-term budget crunch saw scores of police officers laid off.

Mr Booker now comes close to disavowing his action-man image. Rushing past police to chase a robber as mayor was “stupid”, he says: the act of a “chest-pounding politician”. He regrets that when first elected to the nine-member council, he was obnoxious and self-righteous, losing many votes by 8-1 margins.

Those confessions behind him, he sets out to make readers care about Newark. Like many on the left, Mr Booker argues that America is damaged by yawning gaps between the rich and poor, whites and non-whites, or safe and unsafe neighbourhoods. Appealing to conservatives, he talks about the staggering costs of both crime—a single gunshot wound can easily cost taxpayers \$100,000 in uncollectable medical fees, an emergency-room doctor tells him—and of a criminal-justice system that jails too many non-violent offenders. He insists that both parties have good reason to back criminal-justice reform. His central argument, though, has as much to do with psychology as politics. He is sure that injustices persist because many social and economic barriers prevent Americans from seeing one another, and from understanding what fellow citizens endure.

No one exists alone

Speaking in Newark on June 20th, after a rally to call for new laws to stop terrorists buying guns, Mr Booker expresses faith that greater empathy can unjam even the intractable gun debate. He is not making a warm and fuzzy point. “It may be a lot more bloodshed that is finally going to move this country,” he says, noting how it took a “horrific” massacre to change Australian gun laws.

In a concession to gun owners, he recalls his surprise when shown data that almost all Newark’s gun murders were the work of known criminals. Once a “get guns off our streets kind of guy”, he is now focused on making background checks universal before gun sales: his interest is keeping weapons out of the wrong hands. After that appeal to shared logic, Mr Booker addresses conservative emotions. How can patriotic Americans not support Democratic amendments to push for those on terrorist watch lists to be barred from buying guns, he asks? “In World War Two, you wouldn’t give the Germans and the Japanese access to your weapons,” he says. “I think that this might be the way of going about this issue.” His pitch, though ingenious, seems likely to founder on conservative distrust of government and its works, terrorist watch lists included.

Might empathy fix Washington? Most vice-presidential speculation weighs something more short-term: Mr Booker’s ability to inspire young and black Democrats to turn out, an ability that pundits set against his relative inexperience. But the senator has spotted a real crisis: partisans seem unable to imagine how others see the world. Those barriers are worth tearing down. ■



North American summitry

Three amigos and two spectres

MEXICO CITY, OTTAWA AND SACRAMENTO

NAFTA's glory days may be over

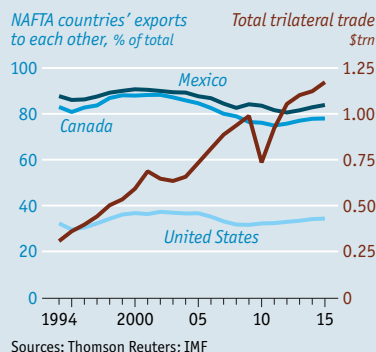
WHEN Ronald Reagan, running for president in 1979, proposed doing away with trade barriers between the United States, Canada and Mexico, he did so with his usual hyperbole. It would show that Americans were still capable of “dreaming up fantastic deeds and bringing them off to the surprise of an unbelieving world”, he declared. The North American Free-Trade Agreement (NAFTA) signed by his successor, George H.W. Bush, and by his Canadian and Mexican counterparts in 1992 could not live up to such hype. But the benefits were still substantial, especially in the early years. Trade among NAFTA countries nearly quadrupled in nominal terms after the treaty took effect in 1994 (see chart). Northern Mexico industrialised. Productivity jumped in Canada, which had signed a free-trade deal with the United States six years earlier.

But when the “three amigos”, as the leaders of the NAFTA countries call themselves, gather for one of their annual summits in Ottawa on June 29th, the mood will be uneasy rather than celebratory. The biggest reason for that is Donald Trump. Today's amigos—Barack Obama, Justin Trudeau, Canada's recently elected Liberal prime minister, and Enrique Peña Nieto, Mexico's president, are like-minded leaders who can unblushingly call one another friends. No one imagines that Mr Trump, if he is elected the United States' next president in November, will fit into that club. He

has called NAFTA a “disaster”. Just as he wants a wall to bar Mexicans from the United States, he wants high tariffs to keep out the goods they manufacture.

Although Mr Trump will be the most troubling spectre at the triangular talks, he is not the only one. The proposed Trans-Pacific Partnership (TPP), which would include the three NAFTA partners plus nine other (mostly Asian and Latin American) countries, would largely supersede the North American deal. Mr Obama views it as an improvement because it includes environmental and labour protections that NAFTA lacks. It would also help remove non-tariff barriers that still thwart North American trade. But it would transform NAFTA's ménage à trois into a clamorous

Golden triangle



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throng of a dozen; the three amigos would become the 12 acquaintances.

The TPP may founder if the United States does not ratify it; that, too, would be unsettling. If Mr Obama fails to win congressional approval by the end of his presidency in January, Mr Trump would be unlikely to try. His rival, Hillary Clinton, initially a supporter of the TPP, has turned cool. Unnerved by the protectionist mood in the United States, Mr Trudeau and Mr Peña, who will pay a state visit to Canada before the summit, are drawing closer.

NAFTA needs new impetus. The agreement “was a framework for bigger and better things that was never realised”, says Jennifer Jeffs of the Canadian International Council, a think-tank. Security measures imposed by the United States at its borders after the September 11th terrorist attacks in 2001 continue to impede trade. Progress has been slow on harmonising regulations and product standards. New forms of business, such as e-commerce, have not been incorporated into the agreement (but are part of the TPP). Excess paperwork and ponderous regulation deter small and medium-sized businesses from exporting within North America, says Laura Dawson of the Wilson Centre, a think-tank in Washington, D.C.

They persist in part because NAFTA matters much more to its smaller members, which trade mainly within the group, than it does to the United States. Mr Obama's pivot to Asia, part of the motivation behind the TPP, was also a pivot away from Canada and Mexico. Mr Trudeau's Conservative predecessor, Stephen Harper, had testy relations with both of his NAFTA partners. In 2009 he imposed a visa requirement on Mexicans to stem an increase in bogus claims for refugee status. The summit planned for 2015 in Canada was cancelled, partly because of the ill feel- ▶▶

ing that measure provoked.

This month's meeting, with the affable Mr Trudeau presiding, will see a return to bonhomie. Mr Obama will become the first American president to address Canada's Parliament since Bill Clinton did so in 1995. The new Canadian prime minister has tried harder than his predecessor to allay the United States' security worries. This month Canada's government introduced legislation to allow its officials to record travellers' departures from Canada, a security measure long sought by the United States. Earlier this year Canada agreed to an expansion in the number of airports

and train stations where American border guards could pre-clear travellers to the United States.

Mr Trudeau would be delighted if Mr Obama reciprocated by pushing American lumber producers, who complain that Canada subsidises exports of softwood, to settle their dispute. But the president is unlikely to provoke American voters, who are in a protectionist mood. The three leaders are expected to promise to co-operate more on climate change and to integrate further their energy markets (even though Mr Obama has rejected the proposed Keystone XL pipeline to deliver oil from Alber-

ta's tar sands).

But the main progress may be in relations between NAFTA's two smaller members, which are one another's third-biggest trading partners. Mr Trudeau has already indicated that he will end the visa requirement for Mexicans. Mexico's government hopes he will announce that at the summit, though he may wait until the end of the year, when Canada is expected to expand its "electronic travel-authorisation system", an entry requirement for visitors who do not need visas. Canadian companies are eager to take advantage of Mr Peña's liberalisation of Mexico's energy ▶▶

Bello | Peace, at last, in Colombia

The government declares an end to its war against the FARC

IT HAS been a long time coming. After 52 years of fighting, almost four years of peace negotiations and three months after a final deadline, the Colombian state and the Marxist guerrillas of the so-called Revolutionary Armed Forces of Colombia (FARC) have agreed to a bilateral and "definitive" ceasefire. That is cause for celebration, for Colombia and for the region. But the peace deal is controversial. Putting it into practice will be tricky and it may be made harder by the unpopularity of the government of Juan Manuel Santos, Colombia's president.

On June 23rd Mr Santos was due to fly to Havana, the site of the talks, for a ceremony with the FARC's leader, Rodrigo Londoño (aka "Timochenko"), in the presence of Ban Ki-moon, the UN secretary-general, and five Latin American presidents. In practice, the two sides all but stopped firing a year ago, when the FARC declared a unilateral ceasefire and the government halted offensive actions. But the government's formal declaration of a ceasefire is historic.

It is possible because the two sides have agreed on the details of the FARC's demobilisation. This involves the group's 6,800 troops and 8,500 militia assembling at 22 fixed points around the country. Only once Colombians have approved the peace deal in a plebiscite, perhaps in October, will the FARC start putting their weapons "beyond use", watched by international monitors.

The negotiators have now reached agreement on all five of the points on their original agenda. There are still details to be resolved. Mr Santos hopes the final accord can be signed in July. But both sides are now saying, in effect, that there is no going back.

For Colombians, the agreement involves "swallowing toads", in a local met-



aphor. The FARC claim to have fought a just war against unequal land ownership. In that cause the country suffered bombings, firefights, murders, kidnapping and extortion. Many people find it hard to accept that FARC leaders accused of crimes against humanity will not go to jail provided they confess. But they will face a special tribunal and restrictions on their liberty for up to eight years. Many other points in the agreement involve the government saying it will do things it should do anyway, such as fostering rural development and adopting better ways to fight drug-trafficking and criminal gangs.

Álvaro Uribe, Mr Santos's predecessor as president, has launched a campaign of "civil resistance" against the agreement, which he portrays as handing Colombia over to the FARC and "Castro-chavismo". That is a travesty. But there are legitimate grounds for worry. Nobody knows how much money the FARC has invested from its criminal businesses. Many distrust the sincerity of the FARC's conversion to democracy. And partly because the peace negotiations have taken so long and missed so many deadlines, Colombians have no

love for Mr Santos. In a recent poll his approval rating was just 20%, lower than that of Nicolás Maduro in Venezuela.

In the eyes of Colombians, the credibility of the agreement will turn on the integrity of the special tribunal and effective verification of disarmament. Polls suggest that in the plebiscite the agreement will probably be ratified by a margin of around two to one. Just as important will be the government's ability to flood the areas of FARC influence with quick-starting development projects to employ the guerrilla rank and file, and to impose security, justice and effective administration. There are two further complications. A smaller guerrilla group, the ELN, shows no serious interest in peace; it may recruit FARC renegades and will have to be fought. And criminal gangs whose leaders emerged from right-wing paramilitary groups which demobilised a decade ago are growing in strength.

Unfortunately, the peace agreement comes when Colombia is facing a sharp economic adjustment. The IMF expects the economy to grow by only 2.5% this year, compared with 4.4% in 2014. To fill a hole in government revenues caused by the oil slump, Mr Santos is preparing to raise taxes later this year. His opponents bridle at the notion of paying taxes to help the FARC.

But as Mr Santos says, war is more expensive than peace. If the agreement is less than perfect it is because Mr Uribe's military build-up—which for three years was directed by Mr Santos as defence minister—weakened the FARC but did not defeat them. That Colombia's conflict has long been an anachronism does not make it any easier to end. Peace with the FARC will improve the lives of Colombians, especially those in remote rural areas. However late in the day, it is a big prize.

▶ market. Calgary-based TransCanada and the Mexican subsidiary of Sempra Energy, an American firm, recently won a \$2.1 billion contract to build and operate an 800km (500-mile) gas pipeline in Mexico.

Mexicans admit that the terrifying prospect of a Trump presidency is one reason to make better friends with Canada. "If negative sentiment towards Mexico in the US prevails, we'll be looking for closer ties to other countries that are friends of Mexico," said the country's finance minister, Luis Videgaray, to the *Globe and Mail*, a Canadian newspaper. Vicente Fox, a former Mexican president, was blunter. Mr Trump will "declare a trade war on Canada", he predicted.

Even if Mr Trump loses, NAFTA's glory days may be over. A successful TPP would eventually supplant it; the TPP's failure would signal less openness to trade. Mexico has signed deals with more than 40 countries, most of them since NAFTA took effect, and Canada is actively seeking new partners. The three amigos will proclaim undying friendship, predicts Carlo Dade of the Canada West Foundation, a think-tank. But, he fears, this month's reunion may be the last. ■

Canada

Last rights

OTTAWA

The new assisted-dying law is restrictive. It may not be the last word

"I DO not want to die slowly, piece by piece," said Gloria Taylor, pleading in 2011 to be allowed a medically assisted death. Diagnosed two years before with amyotrophic lateral sclerosis (ALS), which takes away the ability to walk, speak and eventually breathe, Ms Taylor feared ending her days in a hospital, wracked with pain. Her court challenge to Canada's ban on assisted dying changed the legal landscape, although she did not live to see the outcome (she died of an infection in 2012). Last year the Supreme Court declared the ban unconstitutional and invited Parliament to write new legislation. On June 17th Canada joined a handful of countries in legalising medically assisted suicide.

Canadians older than 18 who suffer from a "grievous and irremediable condition" and whose death is "reasonably foreseeable" may now ask a doctor or nurse to help end their lives. Those who administer life-ending drugs will not be prosecuted; they can refuse for reasons of conscience or religion. The families of members of the armed forces and veterans who die this way will not be deprived of their pensions.

Some legislators opposed the law on the ground that life should never be taken

deliberately. But the fiercest opposition came from those who think the law does not go far enough. It allows medically assisted suicide only for the terminally ill, stopping short of extending that right to other people suffering intolerable pain or mental suffering. The government is making a "cruel mistake", said André Pratte, a senator. A lawmaker from the governing Liberal Party is urging provinces to mount a constitutional challenge to the new law.

This is not the first time Canada has grappled with assisted dying. Between 1991 and 2010 Parliament failed to pass six proposals to legalise it. In 1993 the Supreme Court turned down the petition of a woman also suffering from ALS. What has changed, said the justices in their decision last year, is that other countries, including the Netherlands, Belgium, Luxembourg, Colombia and Switzerland, plus four American states, have shown that assisted dying can be well regulated.

In writing its own law, Canada did not copy any foreign model. Unlike Oregon and Washington, where patients have to administer lethal drugs themselves, Canada allows doctors and nurses to perform that function. Switzerland permits non-residents to come to the country to die, whereas Canada restricts assisted death to residents eligible for coverage by a government health plan. In Belgium children and people who are mentally ill can request euthanasia, but in Canada that is still illegal.

Perhaps not for long. Jody Raybould-Wilson, the justice minister, says the legislation "is not the last step in this journey". She has promised to study whether to extend the right to die to "mature minors", people with mental illnesses and those who want to leave instructions in advance in case they fall hopelessly ill. The law calls for a parliamentary review in five years. A constitutional challenge could expand its scope sooner than that. Gloria Taylor's fight is not yet finished. ■



Her cause is marching on

Brazil's Olympics

Calamity Janeiro

RIO DE JANEIRO

A state financial crisis is another threat to the games

RIO DE JANEIRO does not look like a disaster zone. Beaches are emptier than normal, but that's because temperatures have dropped to a frigid 23°C. The streets are bustling. Yet on June 17th the acting governor of Rio de Janeiro state, Francisco Dornelles, decreed a "public calamity". It will, he warned, affect the state's ability to support the Olympic games, which are to take place in its capital city in August.

The calamity is financial, not natural. Brazil's recession has caused tax receipts to plummet. Falling oil prices have pulled down royalties, which provided more than a tenth of Rio's revenues. The budget deficit this year is expected to exceed 19 billion reais (\$5.6 billion), a third of revenue.

Luckily for sports fans, the games are mainly the responsibility of the city, which is in better fiscal health. The arenas are nearly ready. But the state is in charge of policing and of the metro line linking the Olympic village to the city centre, which is unfinished. Tourists worried about the mosquito-borne Zika virus, which causes birth defects, have another reason to fret.

The state compounded its woes by raising salaries and pensions during the oil boom and giving big tax breaks to businesses. Lately it has been paying policemen, teachers and doctors in arrears—or not at all. The Rio city morgue, run by the state police, did not accept corpses earlier this month because it could not pay for cleaning (it sent them to other cities).

Rio is not the only state in trouble. Since 2010 regional debts, owed mainly to the federal government, have ballooned by a third in real terms, reaching 11% of GDP. Michel Temer, who is serving as Brazil's interim president while Dilma Rousseff undergoes an impeachment trial, thinks something good can come of the crisis. On June 20th he reached a deal to restructure states' debts. In return, they agreed to apply a proposed constitutional spending cap to their own budgets. This will reduce Rio's shortfall this year by 5 billion reais.

The declaration of a calamity allows Mr Temer to give the state a further 2.9 billion reais for security, which will release money to complete the metro line. That may spare Rio Olympic embarrassment, but it still leaves a huge hole in the budget. "What happens after the Olympics?" wonders a cleaner at the morgue, who returned to work in mid-June, when payments to her firm resumed. Mr Dornelles is no doubt asking himself the same question. ■



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The nuclear deal with Iran

Teething pains or trouble ahead?

The agreement to curb Iran's nuclear activities is working, but it may be more fragile than it seems

ON THE face of it, last July's nuclear deal between Iran and six world powers (known as the Joint Comprehensive Programme of Action) looks to be in good shape. Last weekend Iran announced that Boeing, an American aircraft maker, is to sell 20 airliners to its national carrier for around \$25 billion. That followed a deal in January to buy 118 planes worth \$27 billion from Boeing's European rival, Airbus.

Nothing could better symbolise the transformation of Iran's relations with the outside world than the re-equipping of its state airline with Western aircraft. However, both deals depend on the US Treasury issuing export licences (Airbus planes have many American-made parts, including engines). The approvals will probably be granted. But the uncertainty feeds a growing Iranian perception that America is using its remaining sanctions to stop Iran from getting its reward for meeting its nuclear obligations.

On that front, the news is mostly good. A month ago, the International Atomic Energy Agency (IAEA) issued its second report on Iran's compliance with the deal. The impression it gave was of Iran acquiescing in all the verification and monitoring procedures required. It also appeared to be meeting its commitments in terms of freezing work on its heavy-water reactor at Arak, maintaining its stock of heavy water at permitted levels and continuing to abide

by agreed levels and quantities of uranium enrichment. Mark Fitzpatrick, a proliferation expert at the International Institute for Strategic Studies, says the IAEA found "little to complain about".

Yet some worry that the IAEA is giving Iran too easy a time. David Albright of the Washington-based Institute for Science and International Security laments a lack of technical detail in the agency's reporting, and a consequent loss of the promised full transparency.

Mr Fitzpatrick reckons that the absence of specifics reflects a new co-operative relationship between Iran the IAEA, and that member governments are getting more information than is being put into the public domain. Mr Albright is less confident. He thinks that the IAEA has given in to Iranian pressure for secrecy and that the White House has not pushed back. His fear is that by cutting Iran too much slack, for example over the cap on low-enriched uranium, the calculations on the time it would take from "breaking out" of the deal to producing a nuclear weapon (the deal aims for at least a year) could be affected.

Mr Albright is particularly worried about reports that Iran's Atomic Energy Organisation has been shopping on the sly for carbon fibre, a material it would need if it were planning to build advanced uranium centrifuges. He says: "They could be stockpiling for a surge in enrichment when

the [nuclear deal] starts to expire in 10 to 15 years; or they could be planning for a breakout capacity at a clandestine facility if the deal collapses." Mr Fitzpatrick agrees America must ensure that the IAEA provides rapid notification of any backsliding.

For now, that seems unlikely. The costs of breakout for Iran would be very high. Yet the accusation that America is denying Iran the sanctions relief it has earned, stoked by opponents of the deal, could provide an excuse. John Kerry, America's secretary of state, is busily encouraging European banks to finance investments in Iran, something their US counterparts are still barred from doing. He fears that if the benefits fail to materialise soon the standing of President Hassan Rohani and other reformers will be damaged.

Still a risky place to do business

But without cast-iron legal reassurance from Washington that its enforcement agencies will not come after them, European banks may not want to risk it. Previous sanctions-busters have been hit with multi-billion dollar fines. And business in Iran is uncertain at the best of times: corruption is rife and the Islamic Revolutionary Guards Corps has its fingers in nearly every major deal.

Iran's neighbours are also reserving judgment about the nuclear agreement. It has removed, at least for some time, the threat of Iran as a "threshold" nuclear power. A recent report by Robert Einhorn and Richard Nephew (both former negotiators with Iran) for the Brookings Institution, a think-tank, argued that the nuclear deal had reduced the risk of proliferation in the Middle East, with nuclear "hedging", even for Saudi Arabia, a much lower priority than before.

But there is also a widely-shared belief ►►

▶ that the deal has if anything increased Iran's misbehaviour in the region. The Gulf Arabs, in particular, remain convinced that Iran has only postponed its nuclear ambitions, and will use the next 15 years to develop more advanced centrifuges and missile delivery systems.

In the short term, the greatest threat to the nuclear deal may well be Iran's disappointment. The Iranians expected big benefits from sanctions relief; if these do not materialise, their enthusiasm may cool. Other risks lie ahead: the election of a President Trump, perhaps, or hardliners becoming even more assertive in Tehran. If Iran is found to be cheating, too, that would undoubtedly scupper everything. The nuclear deal was not a one-off event. If it is to reach its 15th birthday, it needs to be nurtured by all sides. ■

Fighting in Fallujah

Down, but not yet out

FALLUJAH

A report from the front line in the war against Islamic State

ON JUNE 18th Iraq's prime minister, Haider al-Abadi, declared that his forces had regained control of Fallujah, a stronghold seized by Islamic State (IS) two and a half years ago that lies just 60km (40 miles) from the capital, Baghdad. Yet the next day the thud of mortars and rockets could still be heard inside the supposedly liberated city, and armoured convoys were still rumbling into the fray. "Daesh is still here," said Qusay Hamid, an Iraqi special-forces major, using the Arabic acronym for IS as he waited on a sun-baked Fallujah street to move his men into battle near a mosque.

Lieutenant-General Abdul Wahab al-Saadi, dressed in a T-shirt and black trousers, commands the battle from a plastic table on the concrete floor of a construction site that has been turned into an improvised command post. Officers radio back grid co-ordinates to Australian counterparts, who then guide American Hellfire missiles to strike IS positions in the city.

The crash of a rocket fired towards Fallujah from a nearby sector controlled by the Iranian-backed Badr organisation punctuates the roar of fighter jets. Two years into the campaign against IS, Iraqi security forces, their Iranian-backed Shia militia allies and the American-led international coalition seem to have settled into an uneasy coexistence. The Shia militias that make up the bulk of Iraq's "popular mobilisation forces" have been relegated to a supporting role in the fight for Sunni Fallujah, which makes political sense. "Sometimes

they come after we've cleared the neighbourhoods and they write their own graffiti on the walls to take credit for it," says one young special-forces fighter, already a veteran of three big battles.

Fallujah appears to have been damaged far less than Ramadi, the provincial capital, was during a much longer battle earlier this year. In neighbourhoods cleared by special forces and now being handed over to an emergency local police force, most buildings are intact. But it will be at least six months before civilians are allowed to return home. Pockets of IS fighters remain. Neighbourhoods will have to be swept house by house for weapons and explosives. Reconnecting electricity and water will take time.

Handling refugees will be another huge problem for the Iraqi authorities. Tens of thousands of civilians fled Fallujah as IS retreated last week. Dozens of people died in the process, either from drowning in the Euphrates river or from being hit by shells or bombs. One traumatised family being evacuated by the security forces tells of seeing three of their daughters and their mother torn apart by shelling as they tried to escape on foot.

Despite months of planning by the Iraqi government and foreign aid organisations, the thousands who have managed to flee have been left to fend for themselves in the desert. "There was nothing here two days ago," said Karl Schembri, of the Norwegian Refugee Council (NRC), looking out at a dusty field that is now home to hundreds of displaced families. The NRC, one of the few aid groups working in Anbar province, has described the relief effort as chaos. And these are people who have been living on dried dates for weeks, as IS fighters seized and hoarded food for themselves. "It was the only thing we could afford," says one woman, explaining that she would grind the date stones as a substitute for flour to make bread.

As families leave Fallujah, Iraqi security forces, relying on information from local committees, are taking their young men



and older teenage boys for screening to determine whether they belonged to IS. "They have people with their faces covered come and point out who was Daesh," says one displaced Fallujah resident, who said he was spared the investigation because he was too old.

Some of the investigators are intent on revenge rather than justice. Human-rights groups say dozens of the young men taken for questioning have been beaten or tortured; and that some have been killed. Notably absent from the scene are Anbar's politicians and religious leaders, many of whom waited out the conflict in the comfort of Kurdistan in the north, or in neighbouring Jordan. "We will never again trust our politicians or tribal leaders or imams," said one Fallujah resident bitterly. "They left us here with this." ■

Bahrain's crackdown

Brutal king, cowardly allies

CAIRO

The authorities in Bahrain try to crush dissent, as America and Britain look on

OVER the past decade, Britain has stripped 27 people of their citizenship on national-security grounds. Bahrain's native population is 1% of Britain's, but since 2014 the kingdom has revoked the citizenship of over 300 people for supposedly similar reasons. The latest is Ayatollah Sheikh Isa Qassim, regarded as the spiritual leader of the country's Shia majority. On June 20th the Sunni-led government said he had been promoting extremism and sectarianism. He was also an outspoken critic of an increasingly ruthless regime.

This is merely the latest example of a crackdown on peaceful dissent. On June 14th the authorities banned the biggest opposition group, al-Wefaq, having extended the prison term of its leader, Sheikh Ali Salman, from four years to nine. A day earlier they detained Nabeel Rajab, a human-rights activist. Another prominent dissident, Zainab al-Khawaja, fled the country in early June after being told that she would be rearrested.

The government, which is dominated by the royal family, claims the opposition is sowing discord. But activists blame the authorities themselves. During the Arab spring in 2011, a large portion of the population took to the streets to demand wide-ranging political reforms. The regime, backed by Saudi Arabia and the United Arab Emirates, also Sunni-led monarchies, responded with violence. Amid calls for his overthrow, King Hamad bin Isa al-Khalifa did create a commission that documented the state's human-rights abuses. ▶▶

▶ He even made some changes, with British assistance, such as setting up a prisons inspectorate. Yet the repression continues.

Protests are now banned in Manama, the capital, while new laws have made it easier to lock up and revoke the citizenship of critics. Ms Khawaja says she has been arrested 11 times, once for ripping up a picture of the king. Her father, Abdulhadi, a human-rights activist, was arrested in 2011 and sentenced to life in prison for plotting against the state (ie, calling for democracy). "Building 10 in Jaw prison has become known as the torture building, and I have personally been hearing the screams of the victims," he wrote last year.

Critics of the government are often accused of serving "foreign interests". That usually means Iran, which officials say fomented the uprising in 2011. The claim has been debunked; but it wins support in the region. Ayatollah Qassim and al-Wefaq are accused of having ties to foreign powers. Al-Wefaq, which is mainly Shia and seeks a constitutional monarchy, upset the regime by boycotting the general election of 2014.

Bahrain paid millions of dollars to Western PR firms to clean up its image after 2011. Now it seems contemptuous of foreign opinion. After the authorities prevented opposition members from attending a meeting at the UN this month, the body's high commissioner for human rights said that "repression will not eliminate people's grievances; it will increase them." Bahrain's foreign minister responded on Twitter: "We will not waste our time listening to the words of a high commissioner who has no strength or power."

Juan Méndez, the UN's special rapporteur on torture, has said that Bahrain considers itself shielded from scrutiny due to its relations with Britain, which is building

a naval base in the kingdom, and America, which keeps its Fifth Fleet there. Last year America lifted restrictions on arms sales to Bahrain, in place since 2011, citing progress on human rights. But at least it has condemned the recent crackdown. When Philip Hammond, Britain's foreign secretary, visited the kingdom last month he wrote approvingly of its "commitment to continuing reforms".

America and Britain view Bahrain as a steady ally in a tough neighbourhood. But the kingdom's stability may be illusory. The state's actions have provoked the opposition, in particular Shias, who have long complained of discrimination. Left with no other choice, some may become violent or even turn to Iran for help. Bahrain may be bringing on itself exactly what it claims to be preventing. ■



The dogs of Gaza

If you want a friend in this town ...

JABALIA

A new vogue for an unclean animal

FOUR years ago, when Muhammad Abu Khair took in his first dog, it caused a family feud. His daughter brought home a stray that was wandering the streets of Jabalia, a district of Gaza City. He was unhappy about keeping it, a common feeling in Gaza's conservative society: Islam views dogs as unclean and frowns on owning them as pets. But he relented, hoping to make his daughter happy. His relatives were not so understanding. For a while they stopped visiting the house.

Today he struggles to keep the visitors away. A group of enthusiasts organised a dog show in a public park in February, the first of its kind in Gaza. The event was covered in local media, and the pictures set off a canine craze across the territory. A Facebook group called "German Shepherds of Gaza," which posts photos and information about different breeds, has added more than 70,000 members.

Dozens of owners even hope to earn a living as breeders, though dogs are an impossible indulgence for many in Gaza, where nearly half the population of 1.8m is unemployed and 75,000 families are still internally displaced after a devastating 2014 war with Israel. A small puppy can fetch \$500, a larger breed twice as

much, if you can find one to buy.

The agriculture ministry has had no budget for animal vaccines for the past five years, so some pets are getting ill. Rabies is rare, but owners worry about parvovirus, a gastrointestinal bug that is often fatal to puppies. Hamas, the Islamist group that controls Gaza, does little to help; it won't even issue licences or health certificates for dogs. Some imams try to remind the faithful about the religious prohibition.

Their edicts, though, are no match for the widely-shared photos of dogs frolicking on the beach. Reliably cheerful and blissfully unaware of history or politics, the dogs offer Gazans a rare escape from the grimness of their lives.

Mr Abu Khair now owns seven. Most live on the roof of his building, where he built wooden kennels with thatched roofs. He says they helped him through a long bout of depression after he lost his job as an engineer. His favourite, a golden retriever named Mickey, was born in Israel, only to slip across the heavily fortified border into Gaza. "All of us want to go in the other direction," Mr Abu Khair jokes. As for Mickey, "he gives us a lot of positive feelings. That's hard to find in Gaza today."



Who will speak up for the sheikh?

Kenya

Heating up

NAIROBI

A year of increasingly nasty politics

WHAT is hate speech? In Kenya, a country where most educated people speak three languages—English, Swahili and one of around 40 tribal languages—it is a question people are grappling with. This month Moses Kuria, an MP from Jubilee, the governing party, was recorded appearing to call for Raila Odinga, Kenya's main opposition leader, to be assassinated. Mr Kuria, from the Kikuyu tribe, said that Mr Odinga should “eat corn”. In Kikuyu, “corn” is slang for bullets, but Mr Kuria says he was misinterpreted.

Whatever he meant, Mr Kuria's words have landed him in jail on charges of “hate speech” and inciting violence, together with seven of his colleagues—three others from the government and four from the opposition. All eight are accused of stoking ethnic tension ahead of Kenya's presidential election. Polling day is still over a year away, but the rhetoric is already heated.

The government now seems determined to calm things down: the arrests came as President Uhuru Kenyatta agreed to negotiate with the opposition about the make-up of the Independent Electoral and Boundaries Commission (IEBC). That brought an end to a month of bloody protests. But while peace has resumed, few are confident that it will last.

After the 2007 election, perhaps 1,200 people were killed. The vote was extremely close: Mr Odinga came within two percentage points of the winner, the then-president Mwai Kibaki. Allegations that it was rigged circulated on local radio stations, helping to spark the violence. Afterwards, Mr Odinga became prime minister in a government of national unity intended to heal the divisions.

In 2013, however, he lost comprehensively. Instead, Mr Kenyatta, like Mr Kibaki a Kikuyu, came to power by building an alliance with William Ruto, a politician from the Rift Valley who had been part of the opposition in 2007. Their coalition, which brought together voters from Mr Ruto's Kalenjin-speaking people with Mr Kenyatta's supporters, won comfortably.

Despite some tensions between the two, Mr Kenyatta and Mr Ruto are fighting together again this time—and most people expect them to win. But Mr Odinga has been trying to cut into Mr Ruto's base. Two prominent Kalenjin politicians, Isaac Ruto, a governor in the Rift Valley (no relation to William) and Gideon Moi, the son of a former president, Daniel arap Moi, are sup-

porting the opposition.

Added to that is the dispute over the election commission. Over the past month, supporters of Mr Odinga have marched through Nairobi and other cities protesting at corruption in the IEBC. The police have responded heavy-handedly—according to Human Rights Watch, an NGO, six people were killed by gunfire in the west of the country in protests in late May and early June. Some suspect Mr Odinga's real aim is to discredit the commission before an election he is likely to lose.

For the moment, the dispute has cooled. Diplomats from Britain and America stepped in and offered to mediate between the government and Mr Odinga about how to reform the IEBC. Protests are on hold until the negotiations finish. But there is still a year until the election. And in a country where government is still primarily a source of largesse, the costs of losing are far too high. ■

Nigeria and its militants

Avengers unite!

YENAGOA

Violence in the Delta has cut oil output by a third. It may get even worse

IN THE Niger Delta, a gun is an investment that yields excellent returns. Jamnogo Blessing, a gang member, recently turned up in Yenagoa, a turbulent city in the oil-pumping Niger Delta, to buy a stash of weapons from militants who hung up their boots seven years ago. “The only language the government listens to is violence,” he says. Once rearmed, his gang will attack oil companies operating around his home town of Idheze, he adds.

An army of unemployed young men like Mr Blessing is threatening to rise up in southern Nigeria and blow up oil pipelines. The industry, on which Nigeria depends for nearly all government revenues, could be crippled, as it was for much of the early 2000s. Production has already fallen to about 1.5m barrels a day (b/d), down from 2.2m last year, as attacks gather pace.



This has helped push the global oil price back up to almost \$50 a barrel. And it could spell disaster for President Muhammadu Buhari, who is trying to stave off recession. His budget assumed almost double that level of output this year.

Responsibility for much of the damage has been claimed by a mysterious and skilful band called the Niger Delta Avengers. Earlier this year they set off an explosion six metres under water, cutting output by 250,000b/d. Foreign oil firms are giving up on repairs, since the saboteurs just strike again. Local producers who rely on pipelines have been forced to turn off the taps. “We've had not a drop of oil for four and a half months,” laments Kola Karim, the boss of Shoreline Energy, one such group.

The Avengers say they want more local control of resources. This is what gunmen in the Niger Delta always say. And by “local”, they mean they'd like a taste of the money themselves. “It's just old wine in a new jar,” says Jonjon Oyeinfe, an activist. The last set of militants more or less stopped fighting after they were bought off with an amnesty in 2009, and a monthly stipend of 60,000 naira each (about \$400 at the time). That is a huge sum in a region where most people live on less than a dollar a day, and gives other men a reason to take up arms.

Many Niger Deltans sympathise with the rebels. Until last year a local man, Goodluck Jonathan, was president of Nigeria and showered goodies on his home region. Mr Buhari, who hails from the north, has cancelled a number of pipeline security contracts that had been given to southerners, including Mr Tompolo, and slashed the budget for paying off ex-fighters by 70%. Unemployed former rebels moan that it has been four months since they got their last monthly stipend. They are also furious that a proposed oil-law amendment would scrap the royalty that went to local communities. “Right now everybody in the Niger Delta is an Avenger, because everyone is angry,” says one former fighter, sitting by a swimming pool. Other rebel groups with comic-book titles such as the Niger Delta Suicide Squad seem to pop up almost every day.

Some of their complaints are fair. Nigeria's oil business is a labyrinth of patronage and corruption, where politicians skim off profits and cartels steal hundreds of millions of barrels every year. Oil pollution kills fish and impoverishes fishermen. Yet there is no reason to think that it would be better managed if control were devolved to the Delta. For years a hefty 13% of oil revenue has been pumped back into the producing states, but governors have generally squandered it. Another war would only make matters worse. “This will not stop until they do things right,” says the retired militant. “The time will come when Nigeria is producing no oil at all.” ■

The return of the machinery question



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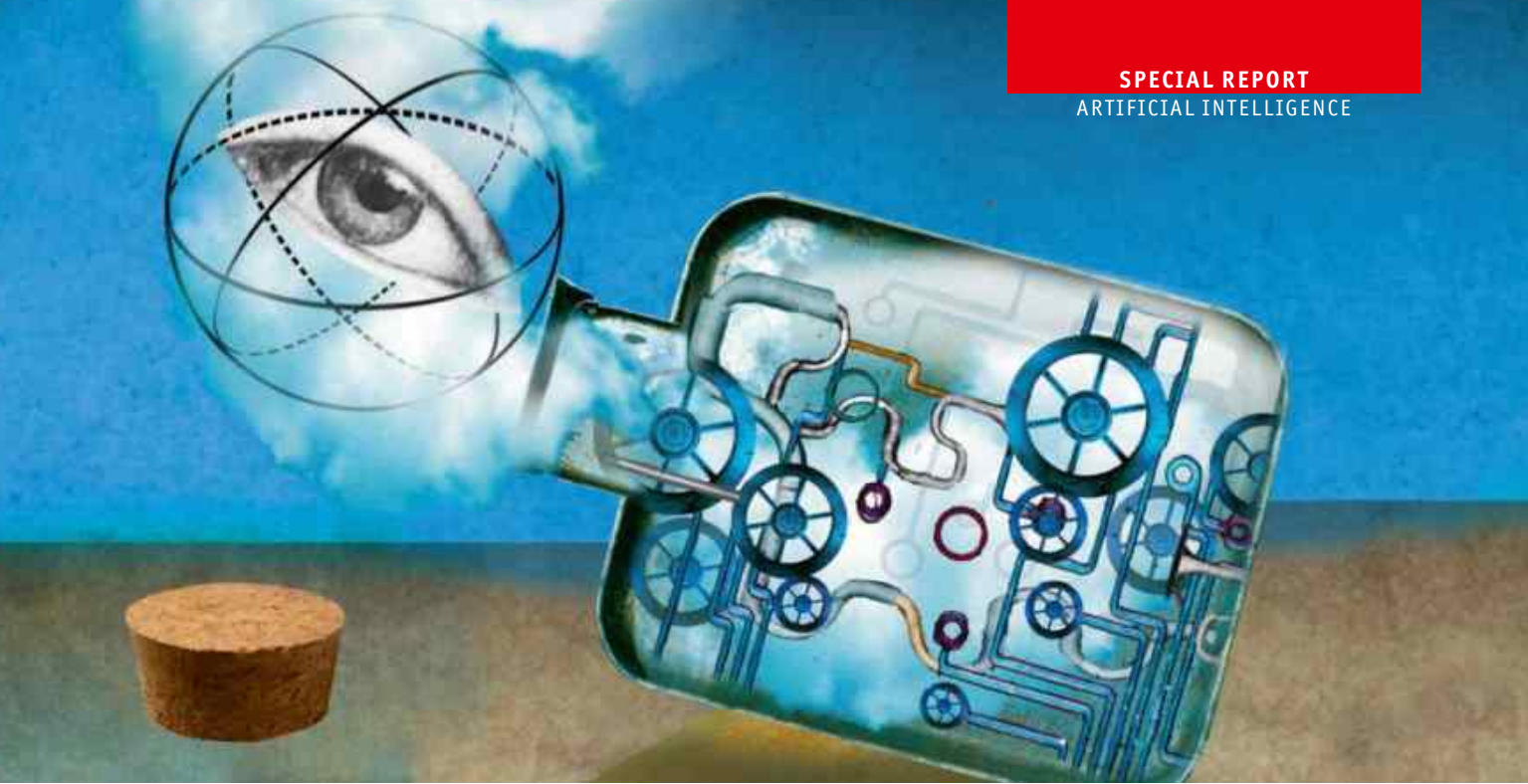


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The return of the machinery question

After many false starts, artificial intelligence has taken off. Will it cause mass unemployment or even destroy mankind? History can provide some helpful clues, says Tom Standage

THERE IS SOMETHING familiar about fears that new machines will take everyone's jobs, benefiting only a select few and upending society. Such concerns sparked furious arguments two centuries ago as industrialisation took hold in Britain. People at the time did not talk of an "industrial revolution" but of the "machinery question". First posed by the economist David Ricardo in 1821, it concerned the "influence of machinery on the interests of the different classes of society", and in particular the "opinion entertained by the labouring class, that the employment of machinery is frequently detrimental to their interests". Thomas Carlyle, writing in 1839, railed against the "demon of mechanism" whose disruptive power was guilty of "oversetting whole multitudes of workmen".

Today the machinery question is back with a vengeance, in a new guise. Technologists, economists and philosophers are now debating the implications of artificial intelligence (AI), a fast-moving technology that enables machines to perform tasks that could previously be done only by humans. Its impact could be profound. It threatens workers whose jobs had seemed impossible to automate, from radiologists to legal clerks. A widely cited study by Carl Benedikt Frey and Michael Osborne of Oxford University, published in 2013, found that 47% of jobs in America were at high risk of being "substituted by computer capital" soon. More recently Bank of America Merrill Lynch predicted that by 2025 the "annual creative disruption impact" from AI could amount to \$14 trillion-33 trillion, including a \$9 trillion reduction in employment costs thanks to AI-enabled automation of knowledge work; cost reductions of \$8 trillion in manufacturing and health care; and \$2 trillion in efficiency gains from the deployment of self-driving cars and drones. The McKinsey Global Institute, a think-tank, says AI is contributing to a transformation of society "happening ten times faster and at 300 times the scale, or roughly 3,000 times the impact" of the Industrial Revolution.

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Answering the machinery question

A list of sources is at Economist.com/specialreports

Just as people did two centuries ago, many fear that machines will make millions of workers redundant, causing inequality and unrest. Martin Ford, the author of two bestselling books on the dangers of automation, worries that middle-class jobs will vanish, economic mobility will cease and a wealthy plutocracy could “shut itself away in gated communities or in elite cities, perhaps guarded by autonomous military robots and drones”. Others fear that AI poses an existential threat to humanity, because superintelligent computers might not share mankind’s goals and could turn on their creators. Such concerns have been expressed, among others, by Stephen Hawking, a physicist, and more surprisingly by Elon Musk, a billionaire technology entrepreneur who founded SpaceX, a rocket company, and Tesla, a maker of electric cars. Echoing Carlyle, Mr Musk warns that “with artificial intelligence, we’re summoning the demon.” His Tesla cars use the latest AI technology to drive themselves, but Mr Musk frets about a future AI overlord becoming too powerful for humans to control. “It’s fine if you’ve got Marcus Aurelius as the emperor, but not so good if you have Caligula,” he says.

It’s all Go

Such concerns have been prompted by astonishing recent progress in AI, a field long notorious for its failure to deliver on its promises. “In the past couple of years it’s just completely exploded,” says Demis Hassabis, the boss and co-founder of DeepMind, an AI startup bought by Google in 2014 for \$400m. Earlier this year his firm’s AlphaGo system defeated Lee Sedol, one of the world’s best players of Go, a board game so complex that computers had not been expected to master it for another decade at least. “I was a sceptic for a long time, but the progress now is real. The results are real. It works,” says Marc Andreessen of Andreessen Horowitz, a Silicon Valley venture-capital firm.

In particular, an AI technique called “deep learning”, which allows systems to learn and improve by crunching lots of examples rather than being explicitly programmed, is already being used to power internet search engines, block spam e-mails, suggest e-mail replies, translate web pages, recognise voice commands, detect credit-card fraud and steer self-driving cars. “This is a big deal,” says Jen-Hsun Huang, chief executive of NVIDIA, a firm whose chips power many AI systems. “Instead of people writing software, we have data writing software.”

Where some see danger, others see opportunity. Investors are piling into the field. Technology giants are buying AI startups and competing to attract the best researchers from academia. In 2015 a record \$8.5 billion was spent on AI companies, nearly four times as much as in 2010, according to Quid, a data-analysis com-

pany. The number of investment rounds in AI companies in 2015 was 16% up on the year before, when for the technology sector as a whole it declined by 3%, says Nathan Benaich of Playfair Capital, a fund that has 25% of its portfolio invested in AI. “It’s the Uber for x” has given way to “It’s x plus AI” as the default business model for startups. Google, Facebook, IBM, Amazon and Microsoft are trying to establish ecosystems around AI services provided in the cloud. “This technology will be applied in pretty much every industry out there that has any kind of data—anything from genes to images to language,” says Richard Socher, founder of MetaMind, an AI startup recently acquired by Salesforce, a cloud-computing giant. “AI will be everywhere.”

What will that mean? This special report will examine the rise of this new technology, explore its potential impact on jobs, education and policy, and consider its ethical and regulatory implications. Along the way it will consider the lessons that can be learned from the original response to the machinery question. AI excites fear and enthusiasm in equal measure, and raises a lot of questions. Yet it is worth remembering that many of those questions have been asked, and answered, before. ■

Technology

From not working to neural networking

The artificial-intelligence boom is based on an old idea, but with a modern twist

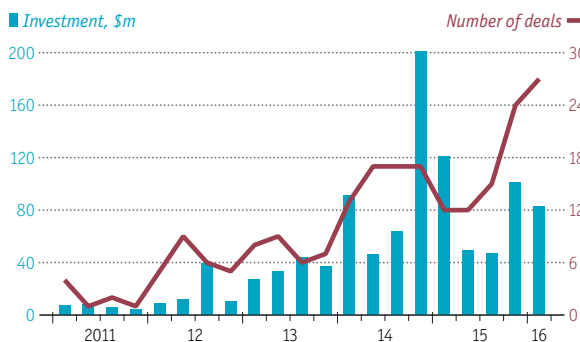
HOW HAS ARTIFICIAL intelligence, associated with hubris and disappointment since its earliest days, suddenly become the hottest field in technology? The term was coined in a research proposal written in 1956 which suggested that significant progress could be made in getting machines to “solve the kinds of problems now reserved for humans...if a carefully selected group of scientists work on it together for a summer”. That proved to be wildly overoptimistic, to say the least, and despite occasional bursts of progress, AI became known for promising much more than it could deliver. Researchers mostly ended up avoiding the term, preferring to talk instead about “expert systems” or “neural networks”. The rehabilitation of “AI”, and the current excitement about the field, can be traced back to 2012 and an online contest called the ImageNet Challenge.

ImageNet is an online database of millions of images, all labelled by hand. For any given word, such as “balloon” or “strawberry”, ImageNet contains several hundred images. The annual ImageNet contest encourages those in the field to compete and measure their progress in getting computers to recognise and label images automatically. Their systems are first trained using a set of images where the correct labels are provided, and are then challenged to label previously unseen test images. At a follow-up workshop the winners share and discuss their techniques. In 2010 the winning system could correctly label an image 72% of the time (for humans, the average is 95%). In 2012 one team, led by Geoff Hinton at the University of Toronto, achieved a jump in accuracy to 85%, thanks to a novel technique known as “deep learning”. This brought further rapid improvements, producing an accuracy of 96% in the ImageNet Challenge in 2015 and surpassing humans for the first time.

The 2012 results were rightly recognised as a breakthrough, but they relied on “combining pieces that were all there before”, ▶▶

Hotting up

Financing of AI startups



Source: CB Insights

► says Yoshua Bengio, a computer scientist at the University of Montreal who, along with Mr Hinton and a few others, is recognised as a pioneer of deep learning. In essence, this technique uses huge amounts of computing power and vast quantities of training data to supercharge an old idea from the dawn of AI: so-called artificial neural networks (ANNs). These are biologically inspired networks of artificial neurons, or brain cells.

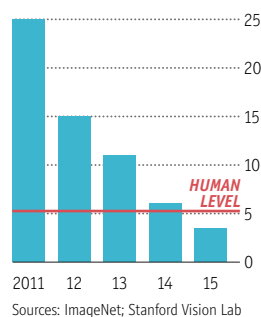
In a biological brain, each neuron can be triggered by other neurons whose outputs feed into it, and its own output can then trigger other neurons in turn. A simple ANN has an input layer of neurons where data can be fed into the network, an output layer where results come out, and possibly a couple of hidden layers in the middle where information is processed. (In practice, ANNs are simulated entirely in software.) Each neuron within the network has a set of “weights” and an “activation function” that controls the firing of its output. Training a neural network involves adjusting the neurons’ weights so that a given input produces the desired output (see diagram, next page). ANNs were starting to achieve some useful results in the early 1990s, for example in recognising handwritten numbers. But attempts to get them to do more complex tasks ran into trouble.

In the past decade new techniques and a simple tweak to the activation function has made training deep networks feasible. At the same time the rise of the internet has made billions of documents, images and videos available for training purposes. All this takes a lot of number-crunching power, which became readily available when several AI research groups realised around 2009 that graphical processing units (GPUs), the specialised chips used in PCs and video-games consoles to generate fancy graphics, were also well suited to running deep-learning algorithms. An AI research group at Stanford University led by Andrew Ng, who subsequently moved to Google and now works for Baidu, a Chinese internet giant, found that GPUs could speed up its deep-learning system nearly a hundredfold. Suddenly, training a four-layer neural network, which had previously taken several weeks, took less than a day. It is a pleasing symmetry, says Jen-Hsun Huang, the boss of NVIDIA, which makes GPUs, that the same chips that are used to conjure up imaginary worlds for gamers can also be used to help computers understand the real world through deep learning.

The ImageNet results showed what deep learning could do. Suddenly people started to pay attention, not just within the AI community but across the technology industry as a whole. Deep-learning systems have since become more powerful: networks 20 or 30 layers deep are not uncommon, and researchers at Microsoft have built one with 152 layers. Deeper net-

Ever cleverer

Error rates on ImageNet Visual Recognition Challenge, %



works are capable of higher levels of abstraction and produce better results, and these networks have proved to be good at solving a very wide range of problems.

“What got people excited about this field is that one learning technique, deep learning, can be applied to so many different domains,” says John Giannandrea, head of machine-intelligence research at Google and now in charge of its search engine too. Google is using deep learning to boost the quality of its web-search results, understand commands spoken into smartphones, help people search their photos for particular images, suggest automatic answers to e-mails, improve its service for translating web pages from one language to another, and help its self-driving cars understand their surroundings.

Learning how to learn

Deep learning comes in many flavours. The most widely used variety is “supervised learning”, a technique that can be used to train a system with the aid of a labelled set of examples. For e-mail spam filtering, for example, it is possible to assemble an enormous database of example messages, each of which is labelled “spam” or “not spam”. A deep-learning system can be trained using this database, repeatedly working through the examples and adjusting the weights inside the neural network to improve its accuracy in assessing spamminess. The great merit of this approach is that there is no need for a human expert to draw up a list of rules, or for a programmer to implement them in code; the system learns directly from the labelled data.

Systems trained using labelled data are being used to classify images, recognise speech, spot fraudulent credit-card transactions, identify spam and malware, and target advertisements—all applications in which the right answer is known for a large number of previous cases. Facebook can recognise and tag your friends and family when you upload a photograph, and recently launched a system that describes the contents of photographs for blind users (“two people, smiling, sunglasses, outdoor, water”). There is a huge reservoir of data to which supervised learning can be applied, says Mr Ng. Adoption of the technology has allowed existing firms in financial services, computer security and marketing to relabel themselves as AI companies. ►►

What got people excited about this field is that one technique, deep learning, can be applied to so many different domains



▶ Another technique, unsupervised learning, involves training a network by exposing it to a huge number of examples, but without telling it what to look for. Instead, the network learns to recognise features and cluster similar examples, thus revealing hidden groups, links or patterns within the data.

Unsupervised learning can be used to search for things when you do not know what they look like: for monitoring network traffic patterns for anomalies that might correspond to a cyber-attack, for example, or examining large numbers of insurance claims to detect new kinds of fraud. In a famous example, when working at Google in 2011, Mr Ng led a project called Google Brain in which a giant unsupervised learning system was asked to look for common patterns in thousands of unlabelled YouTube videos. One day one of Mr Ng's PhD students had a surprise for him. "I remember him calling me over to his computer and saying, 'look at this'," Mr Ng recalls. On the screen was a furry face, a pattern distilled from thousands of examples. The system had discovered cats.

Reinforcement learning sits somewhere in between supervised and unsupervised learning. It involves training a neural network to interact with an environment with only occasional feedback in the form of a reward. In essence, training involves adjusting the network's weights to search for a strategy that consistently generates higher rewards. DeepMind is a specialist in this area. In February 2015 it published a paper in *Nature* describing a reinforcement-learning system capable of learning to play 49 classic Atari video games, using just the on-screen pixels and the game score as inputs, with its output connected to a virtual controller. The system learned to play them all from scratch and achieved human-level performance or better in 29 of them.

Gaming the system

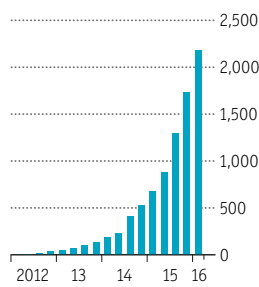
Video games are an ideal training ground for AI research, says Demis Hassabis of DeepMind, because "they are like microcosms of the real world, but are cleaner and more constrained." Gaming engines can also generate large quantities of training data very easily. Mr Hassabis used to work in the video-games industry before taking a PhD in cognitive neuroscience and starting DeepMind. The company now operates as an AI research arm for Google, from offices near King's Cross station in London.

DeepMind made headlines in March when its AlphaGo system defeated Lee Sedol, one of the world's best Go players, by 4-1 in a five-game match in Seoul. AlphaGo is a reinforcement-learning system with some unusual features. It consists of several interconnected modules, including two deep neural networks, each of which specialises in a different thing—just like the modules of the human brain. One of them has been trained by analysing millions of games to suggest a handful of promising moves, which are then evaluated by the other one, guided by a technique that works by random sampling. The system thus combines biologically inspired techniques with non-biologically inspired ones. AI researchers have argued for decades over which approach is superior, but AlphaGo uses both. "It's a hybrid system because we believe we're going to need more than deep learning to solve intelligence," says Mr Hassabis.

He and other researchers are already looking to the next

Spotting cats

Number of projects at Google using TensorFlow*



*Google's main software library for machine learning
Source: Google

step, called transfer learning. This would allow a reinforcement-learning system to build on previously acquired knowledge, rather than having to be trained from scratch every time. Humans do this effortlessly, notes Mr Hassabis. Mr Giannandrea recalls that his four-year-old daughter was able to tell that a penny-farthing was a kind of bicycle even though she had never seen one before. "Computers can't do that," he says.

MetaMind, an AI startup recently acquired by Salesforce, is pursuing a related approach called multitask learning, where the same neural-network architecture is used to solve several different kinds of problems in such a way that experience of one thing makes it better at another. Like DeepMind, it is exploring modular architectures; one them, called a "dynamic memory network", can, among other things, ingest a series of statements and then answer questions about them, deducing the logical connections between them (Kermit is a frog; frogs are green; so Kermit is green). MetaMind has also combined natural-language and image-recognition networks into a single system that can answer questions about images ("What colour is the car?"). Its technology could be used to power automated customer-service chatbots or call-centres for Salesforce's customers.

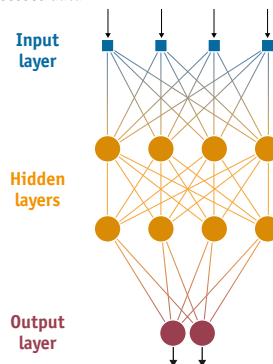
In the past, promising new AI techniques have tended to run out of steam quickly. But deep learning is different. "This stuff actually works," says Richard Socher of MetaMind. People are using it every day without realising it. The long-term goal to which Mr Hassabis, Mr Socher and others aspire is to build an "artificial general intelligence" (AGI)—a system capable of solving a wide range of tasks—rather than building a new AI system for each problem. For years, AI research has focused on solving specific, narrow problems, says Mr Socher, but now researchers are "taking these more advanced Lego pieces and putting them together in new ways". Even the most optimistic of them think it will take another decade to attain human-level AGI. But, says Mr Hassabis, "we think we know what the dozen or so key things are that are required to get us close to something like AGI."

Meanwhile AI is already useful, and will rapidly become more so. Google's Smart Reply system, which uses two neural networks to suggest answers to e-mails, went from being a deep-learning research project to a live product in just four months (though initially it had to be discouraged from suggesting the reply "I love you" to nearly every message). "You can publish a paper in a research journal and literally have a company use that system the next month," says Mr Socher. There is a steady flow of academic papers from AI companies both large and small; AI researchers have been allowed to continue publishing their results in peer-reviewed journals, even after moving into industry. ▶▶

Layer cake

How an artificial neural network processes data

A neural network is organised into layers. Information is fed into the input layer, and artificial neurons in a series of "hidden" layers combine signals by applying different weights to them, and passing the result to the next layer. A "deep" network with many hidden layers can detect increasingly subtle features of the input data. Training the network involves adjusting its internal weights so that it gives the desired response when presented with particular inputs.



► Many of them maintain academic posts alongside working for companies. “If you won’t let them publish, they won’t work for you,” explains Chris Dixon of Andreessen Horowitz.

Google, Facebook, Microsoft, IBM, Amazon, Baidu and other firms have also made some of their deep-learning software available free on an open-source basis. In part, this is because their researchers want to publish what they are doing, so it helps with recruitment. A more cynical view is that big internet firms can afford to give away their AI software because they have a huge advantage elsewhere: access to reams of user data for training purposes. This gives them an edge in particular areas, says Shivon Zilis of Bloomberg Beta, an investment fund, but startups are finding ways into specific markets. Drone startups, for example, can use simulation data to learn how to fly in crowded environments. And lots of training data can be found on the internet, says Sam Altman, president of Y Combinator, a startup incubator. He notes that humans can learn from modest amounts of data, which “suggests that intelligence is possible without massive training sets”. Startups pursuing less data-hungry approaches to AI include Numenta and Geometric Intelligence.

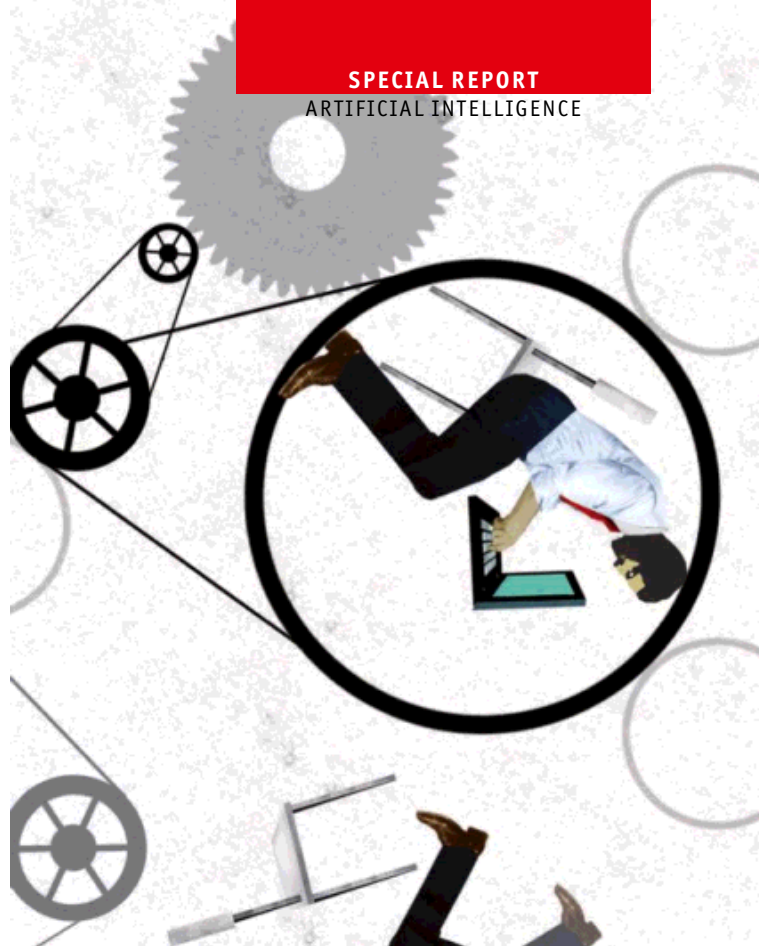
Pick and mix

Companies are lining up to supply shovels to participants in this AI gold rush. The name that comes up most frequently is NVIDIA, says Mr Dixon; every AI startup seems to be using its GPU chips to train neural networks. GPU capacity can also be rented in the cloud from Amazon and Microsoft. IBM and Google, meanwhile, are devising new chips specifically built to run AI software more quickly and efficiently. And Google, Microsoft and IBM are making AI services such as speech recognition, sentence parsing and image analysis freely available online, allowing startups to combine such building blocks to form new AI products and services. More than 300 companies from a range of industries have already built AI-powered apps using IBM’s Watson platform, says Guru Banavar of IBM, doing everything from filtering job candidates to picking wines.

To most people, all this progress in AI will manifest itself as incremental improvements to internet services they already use every day. Search engines will produce more relevant results; recommendations will be more accurate. Within a few years everything will have intelligence embedded in it to some extent, predicts Mr Hassabis. AI technology will allow computer interfaces to become conversational and predictive, not simply driven by menus and icons. And being able to talk to computers will make them accessible to people who cannot read and write, and cannot currently use the internet, says Mr Bengio.

Yet steady improvements can lead to sudden changes when a threshold is reached and machines are able to perform tasks previously limited to humans. Self-driving cars are getting better fast; at some point soon they may be able to replace taxi drivers, at least in controlled environments such as city centres. Delivery drones, both wheeled and airborne, could similarly compete with human couriers. Improved vision systems and robotic technology could allow robots to stack supermarket shelves and move items around in warehouses. And there is plenty of scope for unexpected breakthroughs, says Mr Dixon.

Others are worried, fearing that AI technology could supercharge the existing computerisation and automation of certain tasks, just as steam power, along with new kinds of machinery, seemed poised to make many workers redundant 200 years ago. “Steam has fearfully accelerated a process that was going on already, but too fast,” declared Robert Southey, an English poet. He worried that “the discovery of this mighty power” has come “before we knew how to employ it rightly”. Many people feel the same way about artificial intelligence today. ■



The impact on jobs

Automation and anxiety

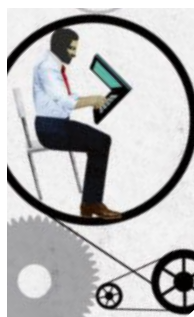
Will smarter machines cause mass unemployment?

SITTING IN AN office in San Francisco, Igor Barani calls up some medical scans on his screen. He is the chief executive of Enlitic, one of a host of startups applying deep learning to medicine, starting with the analysis of images such as x-rays and CT scans. It is an obvious use of the technology. Deep learning is renowned for its superhuman prowess at certain forms of image recognition; there are large sets of labelled training data to crunch; and there is tremendous potential to make health care more accurate and efficient.

Dr Barani (who used to be an oncologist) points to some CT scans of a patient’s lungs, taken from three different angles. Red blobs flicker on the screen as Enlitic’s deep-learning system examines and compares them to see if they are blood vessels, harmless imaging artefacts or malignant lung nodules. The system ends up highlighting a particular feature for further investigation. In a test against three expert human radiologists working together, Enlitic’s system was 50% better at classifying malignant tumours and had a false-negative rate (where a cancer is missed) of zero, compared with 7% for the humans. Another of Enlitic’s systems, which examines x-rays to detect wrist fractures, also handily outperformed human experts. The firm’s technology is currently being tested in 40 clinics across Australia.

A computer that dispenses expert radiology advice is just one example of how jobs currently done by highly trained ►►

▶ white-collar workers can be automated, thanks to the advance of deep learning and other forms of artificial intelligence. The idea that manual work can be carried out by machines is already familiar; now ever-smarter machines can perform tasks done by information workers, too. What determines vulnerability to automation, experts say, is not so much whether the work concerned is manual or white-collar but whether or not it is routine. Machines can already do many forms of routine manual labour, and are now able to perform some routine cognitive tasks too. As a result, says Andrew Ng, a highly trained and specialised radiologist may now be in greater danger of being replaced by a machine than his own executive assistant: “She does so many different things that I don’t see a machine being able to automate everything she does any time soon.”



So which jobs are most vulnerable? In a widely noted study published in 2013, Carl Benedikt Frey and Michael Osborne examined the probability of computerisation for 702 occupations and found that 47% of workers in America had jobs at high risk of potential automation. In particular, they warned that most workers in transport and logistics (such as taxi and delivery drivers) and office support (such as receptionists and security guards) “are likely to be substituted by computer capital”, and that many workers in sales and services (such as cashiers, counter and rental clerks, telemarketers and accountants) also faced a high risk of computerisation. They concluded that “recent developments in machine learning will put a substantial share of employment, across a wide range of occupations, at risk in the near future.” Subsequent studies put the equivalent figure at 35% of the workforce for Britain (where more people work in creative fields less susceptible to automation) and 49% for Japan.

Economists are already worrying about “job polarisation”, where middle-skill jobs (such as those in manufacturing) are declining but both low-skill and high-skill jobs are expanding. In effect, the workforce bifurcates into two groups doing non-routine work: highly paid, skilled workers (such as architects and senior managers) on the one hand and low-paid, unskilled workers

(such as cleaners and burger-flippers) on the other. The stagnation of median wages in many Western countries is cited as evidence that automation is already having an effect—though it is hard to disentangle the impact of offshoring, which has also moved many routine jobs (including manufacturing and call-centre work) to low-wage countries in the developing world. Figures published by the Federal Reserve Bank of St Louis show that in America, employment in non-routine cognitive and non-routine manual jobs has grown steadily since the 1980s, whereas employment in routine jobs has been broadly flat (see chart). As more jobs are automated, this trend seems likely to continue.

And this is only the start. “We are just seeing the tip of the iceberg. No office job is safe,” says Sebastian Thrun, an AI professor at Stanford known for his work on self-driving cars. Automation is now “blind to the colour of your collar”, declares Jerry Kaplan, another Stanford academic and author of “Humans Need Not Apply”, a book that predicts upheaval in the labour market. Gloomiest of all is Martin Ford, a software entrepreneur and the bestselling author of “Rise of the Robots”. He warns of the threat of a “jobless future”, pointing out that most jobs can be broken down into a series of routine tasks, more and more of which can be done by machines.

What determines vulnerability to automation is not so much whether the work concerned is manual or white-collar but whether or not it is routine

In previous waves of automation, workers had the option of moving from routine jobs in one industry to routine jobs in another; but now the same “big data” techniques that allow companies to improve their marketing and customer-service operations also give them the raw material to train machine-learning systems to perform the jobs of more and more people. “E-discovery” software can search mountains of legal documents much more quickly than human clerks or paralegals can. Some forms of journalism, such as writing market reports and sports summaries, are also being automated.

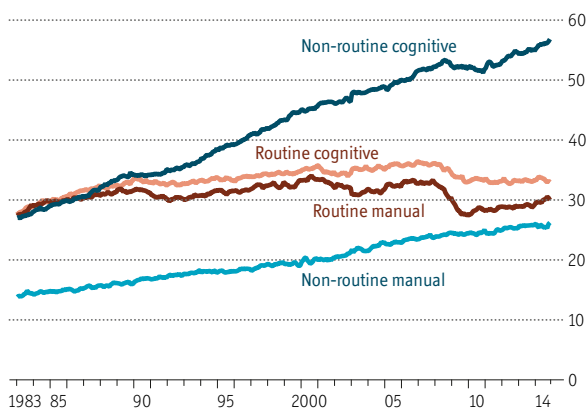
Predictions that automation will make humans redundant have been made before, however, going back to the Industrial Revolution, when textile workers, most famously the Luddites, protested that machines and steam engines would destroy their livelihoods. “Never until now did human invention devise such expedients for dispensing with the labour of the poor,” said a pamphlet at the time. Subsequent outbreaks of concern occurred in the 1920s (“March of the machine makes idle hands”, declared a *New York Times* headline in 1928), the 1930s (when John Maynard Keynes coined the term “technological unemployment”) and 1940s, when the *New York Times* referred to the revival of such worries as the renewal of an “old argument”.

As computers began to appear in offices and robots on factory floors, President John F. Kennedy declared that the major domestic challenge of the 1960s was to “maintain full employment at a time when automation...is replacing men”. In 1964 a group of Nobel prizewinners, known as the Ad Hoc Committee on the Triple Revolution, sent President Lyndon Johnson a memo alerting him to the danger of a revolution triggered by “the combination of the computer and the automated self-regulating machine”. This, they said, was leading to a new era of production “which requires progressively less human labour” and threatened to divide society into a skilled elite and an unskilled underclass. The advent of personal computers in the 1980s provoked further hand-wringing over potential job losses.

Yet in the past technology has always ended up creating ▶▶

Think

United States employment, by type of work, m



Sources: US Population Survey; Federal Reserve Bank of St. Louis

► more jobs than it destroys. That is because of the way automation works in practice, explains David Autor, an economist at the Massachusetts Institute of Technology. Automating a particular task, so that it can be done more quickly or cheaply, increases the demand for human workers to do the other tasks around it that have not been automated.

There are many historical examples of this in weaving, says James Bessen, an economist at the Boston University School of Law. During the Industrial Revolution more and more tasks in the weaving process were automated, prompting workers to focus on the things machines could not do, such as operating a machine, and then tending multiple machines to keep them running smoothly. This caused output to grow explosively. In America during the 19th century the amount of coarse cloth a single weaver could produce in an hour increased by a factor of 50, and the amount of labour required per yard of cloth fell by 98%. This made cloth cheaper and increased demand for it, which in turn created more jobs for weavers: their numbers quadrupled between 1830 and 1900. In other words, technology gradually changed the nature of the weaver's job, and the skills required to do it, rather than replacing it altogether.

In a more recent example, automated teller machines (ATMs) might have been expected to spell doom for bank tellers by taking over some of their routine tasks, and indeed in America their average number fell from 20 per branch in 1988 to 13 in 2004, Mr Bessen notes. But that reduced the cost of running a bank branch, allowing banks to open more branches in response to customer demand. The number of urban bank branches rose by 43% over the same period, so the total number of employees increased. Rather than destroying jobs, ATMs changed bank employees' work mix, away from routine tasks and towards things like sales and customer service that machines could not do.

The same pattern can be seen in industry after industry after the introduction of computers, says Mr Bessen: rather than destroying jobs, automation redefines them, and in ways that reduce costs and boost demand. In a recent analysis of the American workforce between 1982 and 2012, he found that employment grew significantly faster in occupations (for example, graphic design) that made more use of computers, as automation sped up one aspect of a job, enabling workers to do the other parts better. The net effect was that more computer-intensive jobs within an industry displaced less computer-intensive ones. Computers thus reallocate rather than displace jobs, requiring workers to learn new skills. This is true of a wide range of occupations, Mr Bessen found, not just in computer-related fields such as software development but also in administrative work, health care and many other areas. Only manufacturing jobs expanded more slowly than the workforce did over the period of study, but that had more to do with business cycles and offshoring to China than with technology, he says.

So far, the same seems to be true of fields where AI is being deployed. For example, the introduction of software capable of analysing large volumes of legal documents might have been expected to reduce the number of legal clerks and paralegals, who

Catalogue of fears

Probability of computerisation of different occupations, 2013 (1 = certain)

Job	Probability
Recreational therapists	0.003
Dentists	0.004
Athletic trainers	0.007
Clergy	0.008
Chemical engineers	0.02
Editors	0.06
Firefighters	0.17
Actors	0.37
Health technologists	0.40
Economists	0.43
Commercial pilots	0.55
Machinists	0.65
Word processors and typists	0.81
Real-estate sales agents	0.86
Technical writers	0.89
Retail salespeople	0.92
Accountants and auditors	0.94
Telemarketers	0.99

Source: "The Future of Employment: How Susceptible are Jobs to Computerisation?", by C. Frey and M. Osborne (2013)

act as human search engines during the "discovery" phase of a case; in fact automation has reduced the cost of discovery and increased demand for it. "Judges are more willing to allow discovery now, because it's cheaper and easier," says Mr Bessen. The number of legal clerks in America increased by 1.1% a year between 2000 and 2013. Similarly, the automation of shopping through e-commerce, along with more accurate recommendations, encourages people to buy more and has increased overall employment in retailing. In radiology, says Dr Barani, Enlitic's technology empowers practitioners, making average ones into experts. Rather than putting them out of work, the technology increases capacity, which may help in the developing world, where there is a shortage of specialists.

And while it is easy to see fields in which automation might do away with the need for human labour, it is less obvious where technology might create new jobs. "We can't predict what jobs will be created in the future, but it's always been like that," says Joel Mokyr, an economic historian at Northwestern University. Imagine trying to tell someone a century ago that her great-grandchildren would be

video-game designers or cybersecurity specialists, he suggests. "These are jobs that nobody in the past would have predicted."

Similarly, just as people worry about the potential impact of self-driving vehicles today, a century ago there was much concern about the impact of the switch from horses to cars, notes Mr Autor. Horse-related jobs declined, but entirely new jobs were created in the motel and fast-food industries that arose to serve motorists and truck drivers. As those industries decline, new ones will emerge. Self-driving vehicles will give people more time to consume goods and services, increasing demand elsewhere in the economy; and autonomous vehicles might greatly expand demand for products (such as food) delivered locally.

Only humans need apply

There will also be some new jobs created in the field of AI itself. Self-driving vehicles may need remote operators to cope with emergencies, or ride-along concierges who knock on doors and manhandle packages. Corporate chatbot and customer-service AIs will need to be built and trained and have dialogue written for them (AI firms are said to be busy hiring poets); they will have to be constantly updated and maintained, just as websites are today. And no matter how advanced artificial intelligence becomes, some jobs are always likely to be better done by humans, notably those involving empathy or social interaction. Doctors, therapists, hairdressers and personal trainers fall into that category. An analysis of the British workforce by Deloitte, a consultancy, highlighted a profound shift over the past two decades towards "caring" jobs: the number of nursing assistants increased by 909%, teaching assistants by 580% and careworkers by 168%.

Focusing only on what is lost misses "a central economic mechanism by which automation affects the demand for labour", notes Mr Autor: that it raises the value of the tasks that can be done only by humans. Ultimately, he says, those worried that automation will cause mass unemployment are succumbing to what economists call the "lump of labour" fallacy. "This notion ►►

▶ that there's only a finite amount of work to do, and therefore that if you automate some of it there's less for people to do, is just totally wrong," he says. Those sounding warnings about technological unemployment "basically ignore the issue of the economic response to automation", says Mr Bessen.

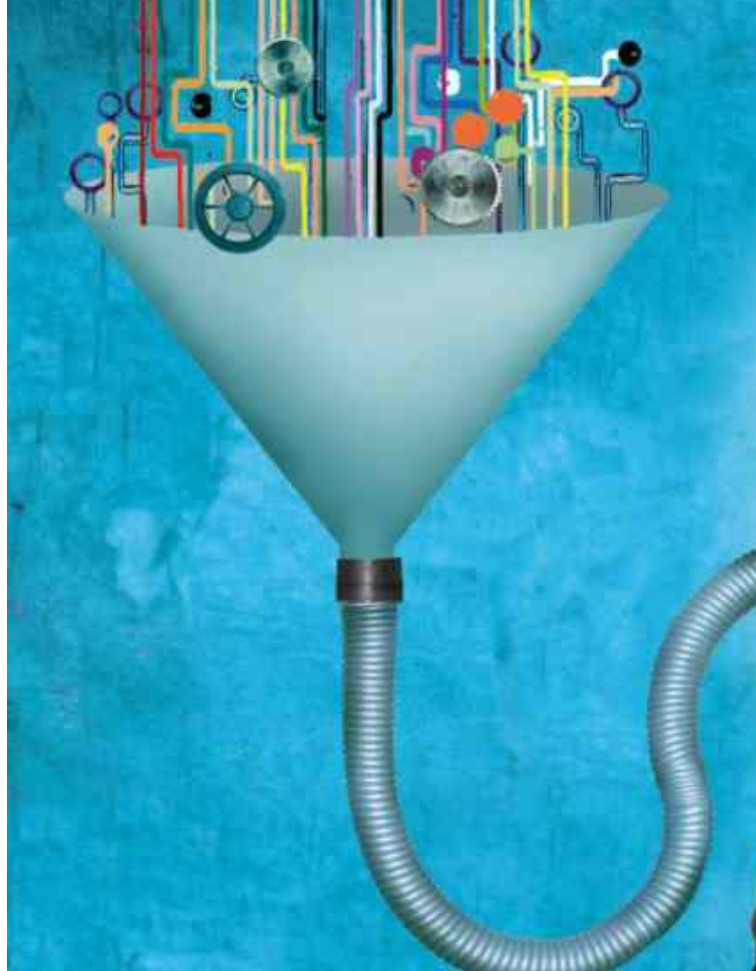
But couldn't this time be different? As Mr Ford points out in "Rise of the Robots", the impact of automation this time around is broader-based: not every industry was affected two centuries ago, but every industry uses computers today. During previous waves of automation, he argues, workers could switch from one kind of routine work to another; but this time many workers will have to switch from routine, unskilled jobs to non-routine, skilled jobs to stay ahead of automation. That makes it more important than ever to help workers acquire new skills quickly. But so far, says Mr Autor, there is "zero evidence" that AI is having a new and significantly different impact on employment. And while everyone worries about AI, says Mr Mokyr, far more labour is being replaced by cheap workers overseas.

Another difference is that whereas the shift from agriculture to industry typically took decades, software can be deployed much more rapidly. Google can invent something like Smart Reply and have millions of people using it just a few months later. Even so, most firms tend to implement new technology more slowly, not least for non-technological reasons. Enlitic and other companies developing AI for use in medicine, for example, must grapple with complex regulations and a fragmented marketplace, particularly in America (which is why many startups are testing their technology elsewhere). It takes time for processes to change, standards to emerge and people to learn new skills. "The distinction between invention and implementation is critical, and too often ignored," observes Mr Bessen.

What of the worry that new, high-tech industries are less labour-intensive than earlier ones? Mr Frey cites a paper he co-wrote last year showing that only 0.5% of American workers are employed in industries that have emerged since 2000. "Technology might create fewer and fewer jobs, while exposing a growing share of them to automation," he says. An oft-cited example is that of Instagram, a photo-sharing app. When it was bought by Facebook in 2012 for \$1 billion, it had tens of millions of users, but only 13 employees. Kodak, which once employed 145,000 people making photographic products, went into bankruptcy at around the same time. But such comparisons are misleading, says Marc Andreessen. It was smartphones, not Instagram, that undermined Kodak, and far more people are employed by the smartphone industry and its surrounding ecosystems than ever worked for Kodak or the traditional photography industry.

Is this time different?

So who is right: the pessimists (many of them techie types), who say this time is different and machines really will take all the jobs, or the optimists (mostly economists and historians), who insist that in the end technology always creates more jobs than it destroys? The truth probably lies somewhere in between. AI will not cause mass unemployment, but it will speed up the existing trend of computer-related automation, disrupting labour markets just as technological change has done before, and requiring workers to learn new skills more quickly than in the past. Mr Bessen predicts a "difficult transition" rather than a "sharp break with history". But despite the wide range of views expressed, pretty much everyone agrees on the prescription: that companies and governments will need to make it easier for workers to acquire new skills and switch jobs as needed. That would provide the best defence in the event that the pessimists are right and the impact of artificial intelligence proves to be more rapid and more dramatic than the optimists expect. ■



Education and policy

Re-educating Rita

Artificial intelligence will have implications for policymakers in education, welfare and geopolitics

IN JULY 2011 Sebastian Thrun, who among other things is a professor at Stanford, posted a short video on YouTube, announcing that he and a colleague, Peter Norvig, were making their "Introduction to Artificial Intelligence" course available free online. By the time the course began in October, 160,000 people in 190 countries had signed up for it. At the same time Andrew Ng, also a Stanford professor, made one of his courses, on machine learning, available free online, for which 100,000 people enrolled. Both courses ran for ten weeks. Mr Thrun's was completed by 23,000 people; Mr Ng's by 13,000.

Such online courses, with short video lectures, discussion boards for students and systems to grade their coursework automatically, became known as Massive Open Online Courses (MOOCs). In 2012 Mr Thrun founded an online-education start-up called Udacity, and Mr Ng co-founded another, called Coursera. That same year Harvard University and the Massachusetts Institute of Technology got together to form edX, a non-profit MOOC provider, headed by Anant Agarwal, the head of MIT's artificial-intelligence laboratory. Some thought that MOOCs would replace traditional university teaching. The initial hype around MOOCs has since died down somewhat (though millions of students have taken online courses of some kind). But the MOOC boom illustrated the enormous potential for deliver- ▶▶



just as the Industrial Revolution did in the 19th century. As factory jobs overtook agricultural ones, literacy and numeracy became much more important. Employers realised that more educated workers were more productive, but were reluctant to train them themselves because they might defect to another employer. That prompted the introduction of universal state education on a factory model, with schools supplying workers with the right qualifications to work in factories. Industrialisation thus transformed both the need for education and offered a model for providing it. The rise of artificial intelligence could well do the same again, making it necessary to transform educational practices and, with adaptive learning, offering a way of doing so.

“The old system will have to be very seriously revised,” says Joel Mokyr of Northwestern University. Since 1945, he points out, educational systems have encouraged specialisation, so students learn more and more about less and less. But as knowledge becomes obsolete more quickly, the most important thing will be learning to relearn, rather than learning how to do one thing very well. Mr Mokyr thinks that education currently treats people too much like clay—“shape it, then bake it, and that’s the way it stays”—rather than like putty, which can be reshaped. In future, as more tasks become susceptible to automation, the tasks where human skills are most valuable will constantly shift. “You need to keep learning your entire life—that’s been obvious for a long time,” says Mr Ng. “What you learn in college isn’t enough to keep you going for the next 40 years.”

Education will therefore have to be interwoven with full-time work. “People will have to continuously learn new skills to stay current,” says Mr Thrun. Hence his firm’s focus on “nanodegrees” which can be completed in a few months, alongside a job. Studying for a nanodegree in, say, data science or website programming costs \$200 a month, but students who complete a course within 12 months get a 50% refund. A host of websites now offer courses in all kinds of skills, from user-experience design to project management to leadership. Some, like Udacity, charge by the course; others, like Lynda.com, which is owned by LinkedIn, a business-networking site, charge a monthly fee for access to all courses. (It is not difficult to imagine LinkedIn comparing the skill sets of its users against those required to apply for a particular job—and then offering users the courses necessary to fill the gaps.) Users and their potential employers sometimes find it difficult to tell which ones offer good value. More co-operation between government, training providers and employers over certification would help.

America and other developed countries should also put more emphasis on vocational and technical education, as Germany does, rather than encouraging everyone to go to university, says David Autor at MIT. But that does not simply mean offering more apprenticeships, which typically involve five to seven years of training. “That doesn’t make sense if the skills you need are changing every three to five years,” says James Bessen at the Boston University School of Law. So the traditional apprenticeship model will have to be tweaked. Community colleges are setting up all kinds of schemes that combine education with learning on the job, says Mr Bessen. For example, Siemens, a German industrial giant, has launched a four-year “earn and learn” programme for apprentices at its wind-turbine factory in Charlotte, North Carolina. Apprentices graduate with a degree in mechatronics from a local community college, certification from the local department of labour—and no student debt.

As on-the-job skills come and go, having a solid foundation of basic literacy and numeracy skills will become even more vital. But teaching “soft” skills, too, will be increasingly important. In a paper published in 2013, James Heckman and Tim Kautz of America’s National Bureau of Economic Research argue for more

▶ ing education online, in bite-sized chunks.

The fact that Udacity, Coursera and edX all emerged from AI labs highlights the conviction within the AI community that education systems need an overhaul. Mr Thrun says he founded Udacity as an “antidote to the ongoing AI revolution”, which will require workers to acquire new skills throughout their careers. Similarly, Mr Ng thinks that given the potential impact of their work on the labour market, AI researchers “have an ethical responsibility to step up and address the problems we cause”; Coursera, he says, is his contribution. Moreover, AI technology has great potential in education. “Adaptive learning”—software that tailors courses for each student individually, presenting concepts in the order he will find easiest to understand and enabling him to work at his own pace—has seemed to be just around the corner for years. But new machine-learning techniques might at last help it deliver on its promise.

Adapt and survive

At the moment, adaptive-learning techniques work best in areas where large numbers of pupils have to learn the same material and a lot of data can be collected, says Mr Ng. Geekie, a Brazilian adaptive-learning startup, guides pupils through the high-school syllabus in thousands of the country’s schools. Other startups working in this area include Knewton, Smart Sparrow and DreamBox. Education giants are also paying attention. McGraw-Hill bought ALEKS, another adaptive-learning system, in 2013; Pearson recently announced an expansion of its partnership with Knewton. In a report published in February, Pearson suggests that AI could make learning “more personalised, flexible, inclusive and engaging”. Such systems do not replace teachers, but allow them to act as mentors rather than lecturers.

Even outside the AI community, there is a broad consensus that technological progress, and artificial intelligence in particular, will require big changes in the way education is delivered,

► emphasis on “character skills” such as perseverance, sociability and curiosity, which are highly valued by employers and correlate closely with employees’ ability to adapt to new situations and acquire new skills. Character is a skill, not a trait, they say, and schemes that teach it are both lasting and cost-effective.

Basic attraction

Concerns about AI and automation have also led to calls for a stronger safety net to protect people from labour-market disruption and help them switch to new jobs. In particular, many AI commentators support the idea of a universal basic income: a dramatic simplification of the welfare system that involves paying a fixed amount (say, \$10,000 a year) to everyone, regardless of their situation, and doing away with all other welfare payments. Similar ideas were touted during the Industrial Revolution by Thomas Paine and John Stuart Mill, among others. Its chief merit, say its supporters, is that people who are not working, or are working part-time, are not penalised if they decide to work more, because their welfare payments do not decline as their incomes rise. It gives people more freedom to decide how many hours they wish to work, and might also encourage them to retrain by providing them with a small guaranteed income while they do so. Those who predict apocalyptic job destruction see it as a way to keep the consumer economy going and support the non-working population. If most jobs are automated away, an alternative mechanism for redistributing wealth will be needed.

Compared with the complexity of overhauling the education system, a basic income appears to offer a simple, attractive and easily understood solution. The idea enjoys broad support within the technology industry: γ Combinator, a startup incubator, is even funding a study of the idea in Oakland, California. Sam Altman, its president, argues that in a world of rapid technological change, a basic income could help ensure “a smooth transition to the jobs of the future”. The idea seems to appeal to techie types in part because of its simplicity and elegance (replacing existing welfare and tax systems, which are like badly written programming code, with a single line) and in part because of its Utopianism. A more cynical view is that it could help stifle complaints about technology causing disruption and inequality, allowing geeks to go on inventing the future unhindered. Mr Altman says that in his experience the techies who support basic income do so for “fairly charitable reasons”.

Though it is an attractive idea in principle, the devil is in the details. A universal basic income that replaced existing welfare budgets would be steeply regressive. Divide existing spending on social, pension and welfare schemes (excluding health care) equally, and each citizen would get a basic income of around \$6,000 a year in America and \$6,200 in Britain, for example (at purchasing-power parity). Compared with existing welfare schemes, that would reduce income for the poorest, while giving the rich money they do not need. But means-testing a basic income risks undermining its simplicity, and thus its low administrative cost. Funding a basic income that would provide a reasonable living would require much higher taxes than at present. Negative income taxes, or schemes such as earned-income tax

credits, might be a less elegant but more practical approach.

Many countries, notably Finland and the Netherlands, are planning to experiment with limited forms of basic income next year. A big concern among economists is that a basic income could actually discourage some people from retraining, or indeed working at all—why not play video games all day?—though studies of previous experiments with a basic income suggest that it encourages people to reduce their working hours slightly, rather than giving up work altogether. Another problem is that a basic income is not compatible with open borders and free movement of workers; without restrictions on immigration or entitlement it might attract lots of freeloaders from abroad and cause domestic taxpayers to flee.

This points to another area where policymakers may have to grapple with the impact of advancing automation: its geopolitical implications as it benefits people in some countries more than others. Automation could have a much bigger impact in developing economies than in rich ones, says Mr Autor, because

much of what they provide is essentially embodied labour: cheap goods made by low-wage workers, cheap services such as operating call-centres, or doing domestic and construction work overseas. If automation makes rich countries more self-sufficient in these areas, they will have less need for the products and services that have been driving exports and growth in the developing world. Automation could “erode the comparative advantage of much of the developing world”, says Mr Autor. Another worry, he says, is that rich countries own the technologies and patents associated with robots and AI, and stand to benefit if they cause a surge in productivity. For the developing world, “it’s not clear that they are on the winning side of the bargain” if machines end up outperforming humans in a wide range of activities.

The risk is that automation could deny poorer countries the opportunity for economic development through industrialisation. Economists talk of “premature deindustrialisation”; Dani Rodrik of Harvard University notes that manufacturing employment in Britain peaked at 45% just before the first world war, but has already

peaked in Brazil, India and China with a share of no more than 15%. This is because manufacturing is much more automated than it used to be. China recently overtook America as the largest market for industrial automation, according to a report by Citi, a bank, and Oxford University’s Martin School. Industrial automation may mean that other emerging economies, such as those in Africa and South America, will find it harder to achieve economic growth by moving workers from fields to factories, and will need to find new growth models. Without manufacturing jobs to build a middle class, observes Tyler Cowen, an economist at George Mason University, such countries “may have high income inequality baked into their core economic structures”.

During the Industrial Revolution, John Stuart Mill wrote that “there cannot be a more legitimate object of the legislator’s care” than looking after those whose livelihoods are disrupted by machines. At the moment it is mostly rich countries that worry about the effects of automation on education, welfare and development. But policymakers in developing countries will increasingly need to consider them too. ■



Automation could have a much bigger impact in developing economies than in rich ones

Ethics

Frankenstein's
paperclips

Techies do not believe that artificial intelligence will run out of control, but there are other ethical worries

AS DOOMSDAY SCENARIOS go, it does not sound terribly frightening. The “paperclip maximiser” is a thought experiment proposed by Nick Bostrom, a philosopher at Oxford University. Imagine an artificial intelligence, he says, which decides to amass as many paperclips as possible. It devotes all its energy to acquiring paperclips, and to improving itself so that it can get paperclips in new ways, while resisting any attempt to divert it from this goal. Eventually it “starts transforming first all of Earth and then increasing portions of space into paperclip manufacturing facilities”. This apparently silly scenario is intended to make the serious point that AIs need not have human-like motives or psyches. They might be able to avoid some kinds of human error or bias while making other kinds of mistake, such as fixating on paperclips. And although their goals might seem innocuous to start with, they could prove dangerous if AIs were able to design their own successors and thus repeatedly improve themselves. Even a “fettered superintelligence”, running on an isolated computer, might persuade its human handlers to set it free. Advanced AI is not just another technology, Mr Bostrom argues, but poses an existential threat to humanity.

The idea of machines that turn on their creators is not new, going back to Mary Shelley's “Frankenstein” (1818) and earlier; nor is the concept of an AI undergoing an “intelligence explosion” through repeated self-improvement, which was first suggested in 1965. But recent progress in AI has caused renewed concern, and Mr Bostrom has become the best-known proponent of the dangers of advanced AI or, as he prefers to call it, “superintelligence”, the title of his bestselling book.

His interest in AI grew out of his analysis of existential threats to humanity. Unlike pandemic disease, an asteroid strike or a supervolcano, the emergence of superintelligence is something that mankind has some control over. Mr Bostrom's book prompted Elon Musk to declare that AI is “potentially more dangerous than nukes”. Worries about its safety have also been expressed by Stephen Hawking, a physicist, and Lord Rees, a former head of the Royal Society, Britain's foremost scientific body. All three of them, and many others in the AI community, signed an open letter calling for research to ensure that AI systems are “robust and beneficial”—ie, do not turn evil. Few would disagree that AI needs to be developed in ways that benefit humanity, but agreement on how to go about it is harder to reach.

Mr Musk thinks openness is the key. He was one of the co-founders in December 2015 of OpenAI, a new research institute with more than \$1 billion in funding that will carry out AI research and make all its results public. “We think AI is going to have a massive effect on the future of civilisation, and we're trying to take the set of actions that will steer that to a good future,” he says. In his view, AI should be as widely distributed as possible. Rogue AIs in science fiction, such as HAL 9000 in “2001: A Space Odyssey” and SKYNET in the “Terminator” films, are big, centralised machines, which is what makes them so dangerous when they turn evil. A more distributed approach will ensure that the benefits of AI are available to everyone, and the consequences less severe if an AI goes bad, Mr Musk argues.

Not everyone agrees with this. Some claim that Mr Musk's real worry is market concentration—a Facebook or Google monopoly in AI, say—though he dismisses such concerns as “petty”. For the time being, Google, Facebook and other firms are making much of their AI source code and research freely available in any case. And Mr Bostrom is not sure that making AI technology as widely available as possible is necessarily a good thing. In a recent paper he notes that the existence of multiple AIs “does not guarantee that they will act in the interests of humans or remain under human control”, and that proliferation could make the technology harder to control and regulate.

Fears about AIs going rogue are not widely shared by people at the cutting edge of AI research. “A lot of the alarmism comes from people not working directly at the coal face, so they think a lot about more science-fiction scenarios,” says Demis Hassabis of DeepMind. “I don't think it's helpful when you use very emotive terms, because it creates hysteria.” Mr Hassabis considers the paperclip scenario to be “unrealistic”, but thinks Mr Bostrom is right to highlight the question of AI motivation. How to specify the right goals and values for AIs, and ensure they remain stable over time, are interesting research questions, he says. (DeepMind has just published a paper with Mr Bostrom's Future of Humanity Institute about adding “off switches” to AI systems.) A meeting of AI experts held in 2009 in Asilomar, California, also concluded that AI safety was a matter for research, but not immediate concern. The meeting's venue was significant, because biologists met there in 1975 to draw up voluntary guidelines to ensure the safety of recombinant DNA technology.

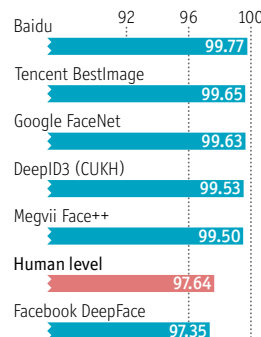
Sci-fi scenarios

Mr Bostrom responds that several AI researchers do in fact share his concerns, but stresses that he merely wishes to highlight the potential risks posed by AI; he is not claiming that it is dangerous now. For his part, Andrew Ng of Baidu says worrying about superintelligent AIs today “is like worrying about overpopulation on Mars when we have not even set foot on the planet yet”, a subtle dig at Mr Musk. (When he is not worrying about AIs, Mr Musk is trying to establish a colony on Mars, as an insurance policy against human life being wiped out on Earth.) AI scares people, says Marc Andreessen, because it combines two deep-seated fears: the Luddite worry that machines will take all the jobs, and the Frankenstein scenario that AIs will “wake up” and do unintended things. Both “keep popping up over and over again”. And decades of science fiction have made it a more tangible fear than, say, climate change, which poses a much greater threat.

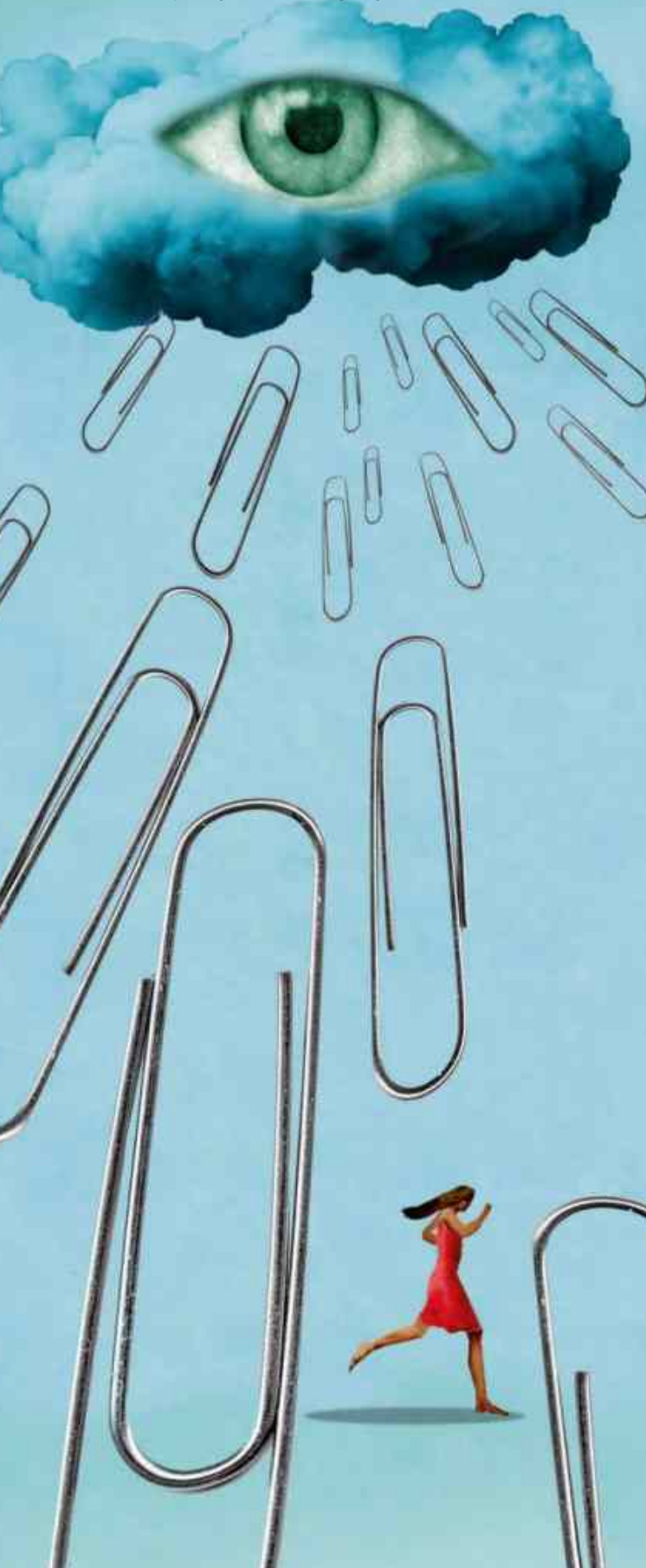
AI researchers point to several technical reasons why fear of AI is overblown, at least in its current form. First, intelligence is not the same as sentience or consciousness, says Mr Ng, though all three concepts are commonly elided. The idea that machines will “one day wake up and change their minds about what they will do” is just not realistic, says Francesca Rossi, who works on the ethics of AI at IBM. Second, an “intelligence explosion” is considered unlikely, because it would require an AI to make each version of itself in less

I've just seen a face

Accuracy of facial-recognition algorithms, 2014, %



Source: University of Massachusetts Amherst



► time than the previous version as its intelligence grows. Yet most computing problems, even much simpler ones than designing an AI, take much longer as you scale them up.

Third, although machines can learn from their past experiences or environments, they are not learning all the time. A self-driving car, for example, is not constantly retraining itself on each journey. Instead, deep-learning systems have a training phase in which neural-network parameters are adjusted to build a computational model that can perform a particular task, a number-crunching process that may take several days. The resulting model is then deployed in a live system, where it can run using much less computing horsepower, allowing deep-learning models to be used in cars, drones, apps and other products. But those cars, drones and so on do not learn in the wild. Instead, the data they gather while out on a mission are sent back and used to improve the model, which then has to be redeployed. So an individual system cannot learn bad behaviour in a particular environment and “go rogue”, because it is not actually learning at the time.

The black-box problem

Amid worries about rogue AIs, there is a risk that nearer-term ethical and regulatory concerns about AI technologies are being overlooked. Facial-recognition systems based on deep learning could make surveillance systems far more powerful, for example. Google’s FaceNet can determine with 99.6% accuracy whether two pictures show the same person (humans score around 98%). Facebook’s DeepFace is almost as good. When the social-network giant recently launched an app called Moments, which automatically gathers together photos of the same person, it had to disable some of its facial-recognition features in Europe to avoid violating Irish privacy laws.

In Russia, meanwhile, there has been a recent outcry over an app called FindFace, which lets users take photos of strangers and then determines their identity from profile pictures on social networks. The app’s creators say it is merely a way to make contact with people glimpsed on the street or in a bar. Russian police have started using it to identify suspects and witnesses. The risk is clear: the end of public anonymity. Gigapixel images of a large crowd, taken from hundreds of metres away, can be analysed to find out who went on a march or protest, even years later. In effect, deep learning has made it impossible to attend a public gathering without leaving a record, unless you are prepared to wear a mask. (A Japanese firm has just started selling Privacy Visor, a funny-looking set of goggles designed to thwart facial-recognition systems.)

Deep learning, with its ability to spot patterns and find clusters of similar examples, has obvious potential to fight crime—and allow authoritarian governments to spy on their citizens. Chinese authorities are analysing people’s social-media profiles to assess who might be a dissident, says Patrick Lin, a specialist in the ethics of AI at Stanford Law School. In America, meanwhile, police in Fresno, California, have been testing a system called “Beware” that works out how dangerous a suspect is likely to be, based on an analysis of police files, property records and social-media posts. Another system, called COMPAS, provides guidance when sentencing criminals, by predicting how likely they are to reoffend. Such systems, which are sure to be powered by deep learning soon if they are not already, challenge “basic notions about due process”, says Mr Lin.

A related concern is that as machine-learning systems are embedded into more and more business processes, they could be unwittingly discriminatory against particular groups of people. In one infamous example, Google had to apologise when the automatic tagging system in its Photos app labelled black people as “gorillas”. COMPAS has been accused of discriminat- ►►

ing against black people. AI technology “is already touching people’s lives, so it’s important that it does not incorporate biases”, says Richard Socher of MetaMind. Nobody sets out to make a system racist, he says, but “if it trains on terrible data it will make terrible predictions.” Increasingly it is not just intellectual work, but also moral thinking and decision-making, says Mr Lin, that is being done “by what are in effect black boxes”.

Fortunately there are ways to look inside these black boxes and determine how they reach their conclusions. An image-processing neural network, for example, can be made to highlight the regions of an input image which most influenced its decision. And many researchers are working on varieties of a technique called “rule extraction” which allows neural networks to explain their reasoning, in effect. The field in which this problem has received most attention is undoubtedly that of self-driving cars.

Such vehicles raise other ethical issues, too, particularly when it comes to how they should behave in emergencies. For example, should a self-driving car risk injuring its occupants to avoid hitting a child who steps out in front of it? Such questions are no longer theoretical. Issues such as who is responsible in an accident, how much testing is required and how to set standards need to be discussed now, says Mr Hassabis. Mr Ng comes at the question from a different angle, suggesting that AI researchers have a moral imperative to build self-driving cars as quickly as possible in order to save lives: most of the 3,000 people who die in car accidents every day are victims of driver error. But even if self-driving cars are much safer, says Daniel Susskind, an economist at Oxford University, attitudes will have to change. People seem to tolerate road deaths caused by humans, but hold machines to much higher standards. “We compare machines to perfection, not to humans doing the same tasks,” he says.

Killer app

Many people are worried about the military use of AI, in particular in autonomous weapons that make life-and-death decisions without human intervention. Yoshua Bengio of the University of Montreal says he would like an “outright ban” on the military use of AI. Life-and-death decisions should be made by humans, he says, not machines—not least because machines cannot be held to account afterwards. Mr Hassabis agrees. When Google acquired his firm, he insisted on a guarantee that its technology would not be used for military purposes. He and Mr Bengio have both signed an open letter calling for a ban on “offensive autonomous weapons”. (Ronald Arkin of the Georgia Institute of Technology, by contrast, argues that AI-powered military robots might in fact be ethically superior to human soldiers; they would not rape, pillage or make poor judgments under stress.)

Another of Mr Hassabis’s ideas, since borrowed by other AI firms, was to establish an ethics board at DeepMind, including some independent observers (though the company has been criticised for refusing to name the board’s members). Even if AI firms disagree with the alarmists, it makes sense for them to demonstrate that there are at least some things they think are worth worrying about, and to get involved in regulation before it is imposed from outside. But AI seems unlikely to end up with its own regulatory agency on the lines of America’s Federal Aviation Authority or Food and Drug Administration, because it can be applied to so many fields. It seems most likely that AI will require existing laws to be updated, rather than entirely new laws to be passed. The most famous rules governing the behaviour of AI systems are of course the “Three Laws of Robotics” from Isaac Asimov’s robot stories. What made the stories interesting was that the robots went wrong in unexpected ways, because the laws simply do not work in practice. It will soon be time to agree on laws that do. ■

Conclusion

Answering the machinery question

Glimpses of an AI-enabled future

THE ORIGINAL MACHINERY question, which had seemed so vital and urgent, eventually resolved itself. Despite the fears expressed by David Ricardo, among others, that “substitution of machinery for human labour...may render the population redundant”, the overall effect of mechanisation turned out to be job creation on an unprecedented scale. Machines allowed individual workers to produce more, reducing the price of many goods, increasing demand and generating a need for more workers. Entirely new jobs were created to oversee the machines. As companies got bigger, they required managers, accountants and other support staff. And whole new and hitherto unimagined industries sprang up with the arrival of the railways, telegraphy and electrification.

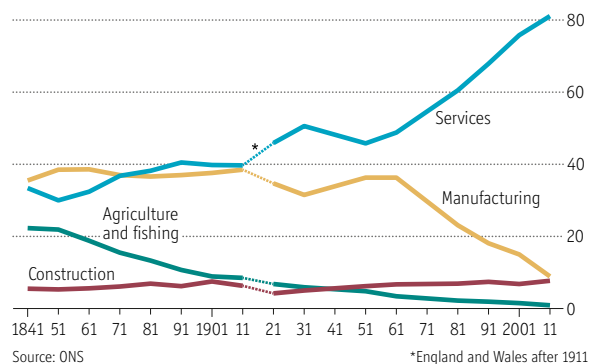
To be sure, all this took time. Industrialisation caused pervasive labour-market upheaval as some jobs vanished, others changed beyond recognition and totally new ones emerged. Conditions in factories were grim, and it took several decades before economic growth was reflected in significant wage gains for workers—a delay known as “Engels’ pause”.

Worries about unemployment gave way to a much wider argument about employment conditions, fuelling the rise of socialist and communist ideas and creating the modern labour movement. By the end of the 19th century the machinery question had faded away, because the answer was so obvious. In 1896 Arthur Hadley, an American economist, articulated the view of the time when he observed that rather than destroying jobs, mechanisation had brought about “a conspicuous increase of employment in those lines where improvements in machinery have been greatest”.

What does all this tell us today? Historical analogies are never perfect, but they can be informative. Artificial intelligence is now prompting many of the same concerns as mechanisation did two centuries ago. The 19th-century experience of industrialisation suggests that jobs will be redefined, rather than destroyed; that new industries will emerge; that work and leisure ►►

Jobs come and go

Share of employment in Britain by industry, %



▶ will be transformed; that education and welfare systems will have to change; and that there will be geopolitical and regulatory consequences.

In many ways, the two big debates about AI—whether it will destroy jobs, and whether it might destroy humanity—are really arguments about the rate of change. If you believe that AI is improving so rapidly that human-level artificial general intelligence (AGI) is just around the corner, you are more likely to worry about unexpected and widespread job losses and the possibility that the technology may suddenly get out of control. It seems more probable, however, that AI will improve steadily, and that its impact over the next decade or two, while significant, will not be on the same scale as the epochal shift from a mostly agricultural to a mostly industrial economy.

AGI is probably still a couple of decades away, perhaps more, so the debate about what it might or might not be able to do, and how society should respond to it, is still entirely theoretical. This special report has therefore focused on the practical effects of AI in the nearer term. These are likely to be a broadening and quickening of the spread of computers into the workplace and everyday life, requiring people to update their skills faster and more frequently than they do at the moment. Provided educational systems are upgraded and made more flexible, which is beginning to happen, that should be entirely feasible.

The debates about whether AI will destroy jobs, and whether it might destroy humanity, are really arguments about the rate of change

So far the debate has been dominated by the gloomy possibilities of massive job losses and rogue AIs. More positive scenarios, in which AI dramatically changes the world for the better, tend to attract less attention. So here are three examples. First, AI could transform transport and urban life, starting with self-driving vehicles. Being able to summon one at will could remove the need to own a car, greatly reduce the number of vehicles on the roads and all but eliminate road deaths. Urban environments will enjoy a renaissance as pollution declines and space previously devoted to parking is reallocated to parks, housing and bicycle paths.

Second, AI could soon enable people to converse with a wide range of things: their home and their car, most obviously, just as people talk to a disembodied computer in “Star Trek”, but also AI avatars of companies and other organisations, information services, AI advisers and tutors. A host of AI-powered personal assistants, such as Alexa, Cortana, Siri and Viv, are already jostling for position, and could become an important new way to interact with computers and access information, like the web browser and touchscreen before them. Speech alone is not always the best way to interact with a computer, so such conversations will often be accompanied by graphics (perhaps in the form of “augmented reality” overlays on people’s vision). AI also has huge potential to help humans talk to one another, by facilitating real-time translation between people using different languages. Basic versions of this technology exist today, and will get better.

The indefatigable helper

Third, AI could make a big difference by turbocharging scientific and medical research. “The thing that excites me the most is using AI to help speed up scientific breakthroughs,” says Demis Hassabis of DeepMind. An AI could act as a relentless research assistant, he reckons, in fields from cancer research to climate change, helping solve problems by sifting through data, reading thousands of scientific papers and suggesting hypotheses or pointing out correlations that might be worth investigating. IBM is already working in this area, using its Watson AI technology to analyse large volumes of medical data. Deep Learning will be used to analyse the data from the “100,000 Genomes” project now under way in England’s National Health Service; the same techniques can help physicists sift reams of data from particle colliders for new discoveries.

After years of frustration with AI’s slow rate of progress, it is ironic that many now think it is moving too quickly. Yet a sober assessment suggests that AI should be welcomed, not feared. In the 1840s John Stuart Mill wrote that “the proof of the ultimate benefit to labourers of mechanical inventions...will hereafter be seen to be conclusive.” A future economist may say the same of the benefits of AI, not just for labourers but for everyone. ■



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Spain reruns its election

Out, caste

SEVILLE

The rise of Podemos and the resistance of Rajoy

IN THE shade of a futuristic curving roof of wood and concrete slats, some 2,000 people have gathered at the Plaza de la Encarnación in the heart of Seville for a campaign rally by Unidos Podemos (“Together we can”), Spain’s new left-wing party. Among them are Luis Maroto, a teacher, and Reyes Santana, a pharmacist, both in their 30s, and their 14-day-old baby, Rafa. Ms Santana used to vote for the centre-left Socialists, who have governed Spain for 21 of the past 34 years. Unable to open her own business, she still works in her mother’s pharmacy. This time her vote, and that of Mr Maroto, will go to Podemos. “They have restored hope,” he says.

If the polls are right Podemos, formed only in 2014, will overtake the Socialist party in the election on June 26th to become the main force on the Spanish left. It will thus become the chief adversary of the centre-right People’s Party (PP) of Mariano Rajoy, the prime minister since 2011. That would present Pedro Sánchez, the Socialist leader, with an agonising choice: allow the PP to remain in power, or play second fiddle to Pablo Iglesias (pictured), Podemos’s leader, in a left-wing government. The first option would grate with the Socialists’ traditional supporters. But the second would horrify business and the Socialists’ own regional leaders. They fear Spain would face the sort of severe economic reversals that befell Greece when it put the far left in power last year.

In a general election last December the rise of Podemos and of Ciudadanos, a new liberal party, upended a stable two-party system. The PP won the most seats, but Mr Rajoy lost his parliamentary majority. Mr Sánchez tried to form a centre-left coalition. He reached agreement with Albert Rivera, the leader of Ciudadanos. But his talks with Mr Iglesias foundered, prompting a new election.

Spain is not Greece. Its economy grew by 3.2% last year, more than that of any other large country in the Eurozone; it added 450,000 jobs in the second quarter of this year. The unemployment rate is down to 20%, from 26% in 2013. Household spending is reviving. That is why the PP is again likely to come first. Mr Rajoy claims credit for the recovery, and points to his experience compared with the other parties’ young leaders. Coming to office in the depth of recession, his government cut the fiscal deficit, cleaned up the financial system and reformed a rigid labour market.

But years of recession and austerity left deep scars in society. Income per person is still well below its peak of 2008. Those who find jobs face lower wages and less security. The national statistics institute says that 14% of the population has insufficient income to last until the end of the month.

In the eyes of many younger Spaniards, the PP and the Socialists share the blame. Both have suffered corruption scandals (the PP more so) which, though minor com-

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pared with serious kleptocracies, are rendered intolerable by austerity. That has given rise to a political generation gap. More than half of under-35s voted for the two new parties in December; most over-54s voted for the traditional ones.

Podemos, in particular, has tapped the frustration of the young. Mr Iglesias has redefined Spanish politics as a struggle against *la cásta* (“the caste”), by which he means the leaders and hangers-on of the traditional parties who colonised institutions from the courts to the savings banks and the boardrooms of corporate Spain. Last year Podemos found allies among nationalists and leftists in Catalonia, Valencia and Galicia. In May, Mr Iglesias agreed to merge with the United Left (the former Communists), which won 3.7% in December. The electoral system may reward the merged Unidos Podemos (UP) with some 20 extra seats, overtaking the Socialists.

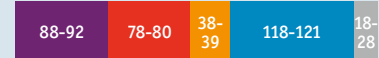
UP promises an end to austerity and an extra €15 billion (\$16.9 billion) a year of public spending, even though Spain still has a large fiscal deficit and public debt, of 5.1% and over 100% of GDP respectively. It would increase income tax on those earn- ▶▶

We can get bigger

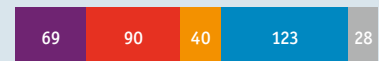
Spain’s lower house after elections, seats
Total=350

Podemos PSOE Ciudadanos
PP Others

May 2016 projection



December 2015 election result



Source: CIS/El País

ing above €60,000 and on companies. Podemos's leaders, a group of university political scientists, advised Venezuela's Hugo Chávez and are friends of Alexis Tsipras, Greece's leftist prime minister—links they now play down. Mr Iglesias has rebranded Podemos's ideology as “new social democracy”, in an attempt to steal the Socialists' clothes. Though the liturgy of UP's campaign is that of the Ibero-American far left, it has banned red flags and other communist touches that might cost it votes.

Its ever-changing programme is not what defines Podemos's leaders. “What matters to them is power and the message, and ‘when we're in power we'll see what we do’,” says José Rodríguez de la Borbolla, a former Socialist leader. As Mr Iglesias puts it, “in Latin America we learned that it's possible to win.” In his negotiations

with Mr Sánchez, he demanded control not of health and education but of hard power: the interior and justice ministries, state television and the intelligence service. Many in Spain worry that this revealed authoritarian tendencies. But others trust in Spanish institutions. “We have democracy. In four years' time they would go if they make mistakes,” says Mr Maroto, the teacher.

While the Socialists' base is among the poor and the old, Podemos represents “an impoverished, fed-up, tired middle class” as well as a generational transition, says Xavier Collier, a sociologist at Pablo de Olavide university in Seville. “We are immersed in a historic process of political change,” Iñigo Errejón, the deputy leader of Podemos, told his fired-up supporters in Seville. “The question is whether they [the

traditional parties] will be able to delay this...for four more years.”

Mr Rajoy's riposte is a grand coalition of “moderate” parties. If such a coalition pushes through reforms—of the judiciary and of regional financing—it might help to restore the credibility of the old order. But Mr Rivera says his condition for allowing the PP to govern is that Mr Rajoy himself steps down. And Mr Sánchez refuses to contemplate any agreement with the PP.

A lower turnout this time may give the PP and Ciudadanos a few more seats. Breaking the deadlock may even require a third election. A grand coalition could buy time for economic growth to heal some social scars. But if Mr Errejón is to be proved wrong, it will take a much bigger effort from the PP, and especially the Socialists, to reconnect with a lost generation. ■

Russia's Olympic ban

Doping and punishment

MOSCOW

Russian athletes' drug use gets their entire team disqualified

WHAT does the International Association of Athletics Federations (IAAF), the governing body of global track and field sports, have in common with the Nazis? According to Dmitry Kiselev, Russia's propagandist-in-chief, they both believe in collective punishment: the Nazis “knowingly took innocents prisoner and shot them for the conduct of others”, while the IAAF last week extended a ban on Russia's athletics federation for doping, barring the team from this summer's Olympics. On June 21st the International Olympic Committee (IOC) upheld the ban, while leaving open the possibility that athletes who can prove they are clean might be allowed to compete.

The initial IAAF ban followed a report last year from the World Anti-Doping Agency (WADA) that detailed a “deeply rooted culture of cheating” in Russian sport. WADA's findings have been reinforced by whistleblowers: a former director of Russia's anti-doping laboratory claims that a secret state-run programme hid drug use by Russian champions at the 2014 winter Olympics in Sochi. (The Kremlin calls this “slander”.) Recent re-examinations of samples from the 2008 Beijing and 2012 London games revealed that even more Russian athletes were dirty than had been realised.

After initial denials, Russian officials opted for a hasty clean-up, hoping to avoid a ban. The minister of sport, Vitaly Mutko, apologised and introduced new anti-doping measures. A Western public-relations firm, Burson-Marsteller, was hired. But the IAAF was not persuaded.



Barring an entire team from the Olympics for rule violations is extremely rare. “This is about a Russian system that has failed...and there need to be consequences,” explained Rune Andersen, who headed the IAAF inquiry.

Yet where international sport sees a disregard for the rules, Russia sees a Western plot. Aleksei Pushkov, chairman of the Russian parliament's foreign affairs committee, called the IAAF decision “revenge for Russia's independent foreign policy”. Yelena Isinbaeva, a Russian pole-vaulting champion, charged the IAAF with discriminating against Russians just because they are Russian. One nationalist Duma deputy even suggested hosting a parallel Olympics in Russia. He did not specify who would oversee the drug testing.

The EU's Russia sanctions

Small carrot, medium stick

ST PETERSBURG AND WASHINGTON, DC

Blocking investment has only slightly restrained Russia

AT last week's St Petersburg International Economic Forum, Vladimir Putin's flagship economic conference, a pair of guests raised Russia's increasingly fervent hopes for a rapprochement with the European Union. Matteo Renzi, Italy's prime minister, regaled the crowd with references to shared cultural history. The European Commission's president, Jean-Claude Juncker, chided Russia for its aggression in Ukraine, but also spoke of building bridges. Nonetheless, when the sanctions come up for re-approval at the end of this month, the EU looks set to extend the toughest ones until January 2017.

The EU is holding the line on sanctions with strong backing from Germany, despite the usual squabbling. But questions remain about their effectiveness. Some Western critics say the sanctions merely allow American and European governments to show that they are doing something, without changing Russia's behaviour or helping to stabilise Ukraine.

American diplomats argue that the sanctions deterred Russia from seizing more Ukrainian territory in 2014. In fact, new offensives were launched long after the sanctions were in place. More importantly, Russia's goal in the Donbas, unlike in Crimea, was not to seize territory. Rather, it sought to destabilise Ukraine, showing both its own people and other former Soviet republics that any revolt would be followed by bloodshed.

One goal of maintaining sanctions now is to keep up pressure to implement the ▶▶

▶ Minsk peace accord for eastern Ukraine. Yet Russia has done little to end the conflict. America's chief diplomat on the issue, Victoria Nuland, is meeting officials in Kiev and Moscow this week, but the process remains frozen. The Minsk format, says one senior American official, provides Russia with a framework to change its policy. But the Kremlin shows no sign of doing so.

Another stated purpose of the sanctions is to convince Mr Putin's inner circle to persuade him to moderate his policies. Yet asset and travel bans on influential individuals have only reinforced Russia's fortress mentality. Bans on technology transfers may hurt the oil industry in the long run, but they have yet to bite: Russian oil firms reported record output in 2015.

Most economists agree that the sanctions matter far less than the collapse in oil prices. Evsey Gurvich and Ilya Prilepsky of Moscow's Economic Expert Group estimate that cheaper oil cost the Russian economy more than three times what sanctions did. The rouble's performance against the dollar tracks global oil prices; it has had little correlation with sanctions.

The most effective sanctions are those restricting lending to key Russian banks and companies. Their deliberate vagueness has a ripple effect: investors refuse to finance even firms that are not directly named. One foreign bank's compliance department approved only one of 20 deals it closed. Even Chinese lenders, who Moscow hoped would help fill the vacuum left by the West, have been reluctant. The Russian government, which does not fall directly under sanctions, had trouble raising funds last month during its first bond offering since 2013, as Western governments pressured banks not to take part. The Kremlin has been pushing import substitution, in part by imposing its own "counter-sanctions"—import bans on Western food. But the results have been extremely limited, mainly to agriculture.

What the Russian economy really needs is investment. Foreign direct investment has collapsed (see chart). Yet even sanctions relief might not revive Russia. The World Bank reckons that lifting them

would provide only a 0.9% boost to GDP in 2017. Their effect on Russian policy may be paradoxical: the war in Ukraine was partly Mr Putin's answer to a slowing economy at home. Most importantly, the Kremlin still believes that Ukrainian ineptitude, European divisions or an electoral victory by Donald Trump could bring an end to sanctions all by themselves. While Russia entertains such hopes, sanctions alone will not tame its behaviour. ■

Turkey's embattled liberals

Radiohead and Ramadan

ISTANBUL

Islamists are making secular Turks nervous

ON JUNE 17th Radiohead, a British rock band, played an unexpected cameo role in Turkey's increasingly bitter conflict between secularists and zealots. About two dozen men, some armed with pipes, stormed an Istanbul record shop where fans of the group had gathered to listen to their new album. Incensed by the sight of people drinking beer outdoors during the Muslim fast of Ramadan, the attackers pelted them with glass bottles. "We will burn you in there," one yelled.

Radiohead released a statement deploring the violence. Turkey's president, Recep Tayyip Erdogan, suggested both sides were to blame: "Using brute force to interfere is as wrong as organising an event spilling onto the street during Ramadan." The next evening in Cihangir, a chic neighbourhood up the hill from the record shop, hundreds of people protested against the attack, which they linked to Mr Erdogan's pandering to his religious base. They were met by riot police. "Whether I choose to drink is my business," said Baris Canyazar, one of the young protesters, his eyes smarting from tear gas. "But we are under siege."

Until 2002, when their votes propelled Mr Erdogan's Justice and Development (AK) party into power, Turkey's conservatives complained of being consigned to second-class status by the country's secular establishment. Today, it is secularists and liberals who feel the government is trampling on their way of life. Mr Erdogan has pledged to raise "a pious generation"; religious schools have multiplied. Earlier this year, the AK speaker of parliament called for an Islamic constitution. Other party members have campaigned to convert Hagia Sophia (originally a Byzantine church, then a mosque, now a museum) back into a mosque. Repeated tax increases on alcohol have sent prices skyrocketing.

Turkey remains nominally secular, and Islamic extremism is far from widespread.

The share of Turks who support *sharia* law has not increased much over the past decade, hovering near 10%. Per capita, Turkey is believed to have been the source of fewer Islamic State (IS) fighters than many European countries.

But government rhetoric has emboldened the bigots. Mr Erdogan regularly denounces opponents as traitors, and sometimes as atheists. Courts try people for criticising Mr Erdogan, but turn a blind eye to Islamists who preach violence. When extremists vowed to disrupt Istanbul's gay pride parade, the local governor responded by banning the parade. A few dozen human-rights activists defied the ban; police sprayed them with rubber bullets.

Pro-AK pundits ridicule Cihangir as a sheltered ghetto of wealthy liberals and expats with tiny dogs. Yet there are signs that non-hipsters, too, are holing up in enclaves, whether religious or secular, across the country. One study this year found that 76% of Turks do not want people with different political convictions as neighbours.

Mr Erdogan thrives on such divisions. He has shored up nationalist votes by stoking the conflict in the Kurdish south-east, which has killed over a thousand people and forced 500,000 to flee since last summer. A day after the attack on the record shop, he revived a mothballed plan to turn Gezi Park, one of the few green spaces in central Istanbul, into a replica of an Ottoman barracks that once stood there. The gesture was a thumb in the eye of secular civil-society types, who in 2013 staged large protests against the plan. Mr Erdogan accused them of conspiring with Turkey's enemies to foment a coup, then tear-gassed them off the streets. Eight people died in the unrest. As long as the president exploits Turkey's culture wars for political gain, they will not subside. ■



Fighting for the right to rock

Times of troubles



Charlemagne | Commented out

Europe must rediscover the virtues of civil political debate



“NEVER read the comments” is useful advice. It is rare for the discussions that take place underneath online articles to resemble Socratic quests for truth. Instead, warring antagonists stake out opposing positions and complex political debates are reduced to a stream of insults and vitriol.

Easy enough to ignore. But what to do when life starts to resemble the comments box? Exhibit A is the United States, where polarisation has poisoned politics, gummed up lawmaking and bestowed Donald Trump upon the world. In Europe, by contrast, multiparty systems, consensual traditions and memories of war have long mitigated against polarisation. But here, too, the air has begun to grow foul.

Start with the growing fashion for referendums, which by their nature force voters into opposing tribes. The Brexit campaign has been a carnival of bad-tempered distortion and exaggeration; even the brutal murder one week before the vote of Jo Cox, an anti-Brexit MP, failed to shame many partisans into dialling down the invective. Greece’s quixotic referendum on a bailout offer one year ago set the country’s pro-European elite on a collision course with the majority, whose resounding Oxi (“No”) was promptly ignored by the rest of the euro zone. Later this year a referendum on constitutional reform in Italy threatens to unsettle the delicate mood, not least because Matteo Renzi, the prime minister, has promised to quit should he lose.

The British and Greek referendums were held to heal divisions in ruling parties. Neither worked: Greece’s governing party split, and the cleavages among Britain’s Conservatives gape more widely than ever. Worse, they sharpened differences among voters and made arriving at compromise harder. Locked inside their respective echo chambers, particularly on social media, usually even-handed commentators lost their bearings. Straw men bestrode the landscape, and paranoia and conspiracy theories flourished. One British poll found that one-fifth of voters suspected intelligence agents of secretly working to keep Britain in the EU. It will be difficult to pick up the pieces after all this.

But it does not take referendums to entrench difference. Since winning office (on a minority vote) last October, Poland’s nationalist government has taken to dismissing opponents as communists, thieves or vegetarian cyclists. In Spain, which holds

an election on June 26th, Podemos, a surging leftist party, urges voters to wrench control from *la casta*, the supposedly kleptocratic elite of bankers, politicians and media barons. Most worrying is the polarisation in Turkey, where President Recep Tayyip Erdogan, backed by toadying advisers and belligerent state media, hisses accusations of treachery at anyone who dares oppose his government. Politics shrinks to a binary choice: for or against?

More secure democracies have not been spared. The refugee crisis in countries like the Netherlands and Germany has at times resembled another referendum: with refugees or against them? Germany’s most recent elections, a clutch of regional votes in March, were interpreted in precisely this fashion. Some saw in the success of the Alternative for Germany (AfD), an anti-immigrant party, a sign that Germans had turned decisively against Angela Merkel’s open-door policy. Others disagreed, noting that politicians who backed Mrs Merkel’s position also did well. Though the atmosphere in Germany has calmed as the arrivals have slowed, a senior member of the Green Party recently felt obliged to remind supporters that not all AfD voters were Nazis.

This points to a fresh axis of division in many countries: between mainstream parties and populist challengers who seek to break their stranglehold. For Marine Le Pen in France, the main political cleavage today is between “patriots”, of left or right, and “globalists”. Such rhetoric is echoed in other European right-wing populist parties, several of which convened last week in Vienna for a “Patriotic Spring” summit where they slammed Euro-elites, called for restrictions on immigration and urged Brexit.

The populist challenge has forced mainstream politicians into a defensive crouch, says Cas Mudde of the University of Georgia. Former antagonists now share a common purpose: to keep the newcomers out. Worse, this can lead to a self-righteous form of politics in which neither side feels able to compromise. Identity politics presents a similar conundrum. Many campaigners for Scottish independence defeated in the 2014 referendum took the loss to heart; today over half the supporters of the pro-independence Scottish Nationalist Party say that they consider political attacks on the party to be personal insults.

Can’t we all just get along?

Blame social media, blame lazy elites, blame the collapse of trust in institutions: the edges of politics have sharpened for many reasons. That is no excuse for inaction. Perhaps the most urgent task is to establish the contours for debates on immigration. These will vary: concerns about EU migrant workers in Britain have little to do with Germany’s agonies over refugees. But the temperature must be turned down everywhere. Sceptics should allow that welcoming migrants does not violate the precepts of patriotism. Advocates might accept concerns about identity and social change as legitimate, rather than reducing migration to an economic discussion (or, worse, dismissing opponents as xenophobes). The end of the Brexit campaign is a chance for Europe’s leaders to take control of the conversation from the populists.

If such a plea sounds naive, Charlemagne accepts the charge. Democratic politics must be a contact sport, and blows will be landed. But today’s antagonists are talking past one another and losing interest in the middle ground that most voters still occupy. If there are lessons from Britain’s miserable referendum campaign, let them be this: persuasion trumps browbeating, arguments are better than “narratives”, and compromise need not mean capitulation. Oh, and never read the comments. ■



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Britons were voting on whether to stay in the EU as *The Economist* went to press. For continuing coverage of the referendum see

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Working poverty

When a job is not enough

The number of working poor is growing. Blame high house prices, low productivity and too little full-time work

“**W**ORK remains the best route out of poverty,” the British government argues. The hourly minimum wage for workers aged 25 years or more now stands at £7.20 (\$10.60), worth £252 a week to someone who works 35 hours. Unemployment benefit for the same age group is only £73.10 a week at best but Britain is a nation of strivers, not skivers. More working-age people are economically active than before: the employment rate, at 74%, is the highest ever and unemployment, at 5%, is near historical lows.

All this, you might think, should mean fewer poor people. Not so, it seems. The official measure of “absolute” poverty includes all those in households with income less than 60% of the national median

in 2010-11, in constant prices (around £280 a week for a couple with no children today). In calculating absolute poverty it is usual to look at what income remains after rent or mortgage payments; this “after-housing-costs” measure is about £240 a week now.

Though more Britons than ever before are working, the rate of absolute poverty after housing costs has drifted up over the past decade (see chart). The composition of poor households has also changed. In the early 2000s about 40% of absolutely poor people lived in “working” households, which included people in some sort of employment. Today over half of the poor do. The effect on children, especially, is dismaying: after a sharp fall in the 2000s, absolute child poverty is rising.

Admittedly, the growth of in-work poverty looks a bit worse than it is. There has been a stunning improvement in the lot of the elderly. As the chart shows, the proportion of pensioners in absolute poverty has fallen from 50% in the early 1990s to about 15% today. Oldies enjoy a generous state pension: they are protected by a “triple lock”, which ensures that pensions rise along with prices, earnings or by 2.5%, whichever is higher. Increases in other welfare benefits have helped oldsters too, and they have done better out of private pension schemes than their offspring are ever likely to do. As poor pensioners have become fewer, people in working households constitute an ever-larger chunk of Britain’s poor.

Yet this is not just a statistical trick: Britain’s workers really are struggling. By the absolute-poverty measure, the number of people in working-poor households has grown by more than 2m over the past decade, a rise in the rate of over one-quarter. Even among households in which all wage-earners have full-time work the proportion in poverty has risen over the period. For parents in full-time work the rate of absolute household poverty has increased from 5% to 8% in the past decade.

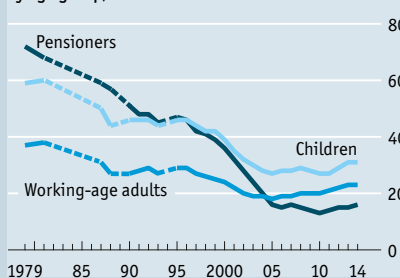
It is hard to pin the rise in working poverty entirely on the government’s austerity programme. After all, the share of non-retired workless families who are in absolute poverty has fallen in recent years. This is a group that relies heavily on state handouts.

A better explanation must include the soaring cost of housing. Since the depths of the recession in 2009, the average price of a home has increased by a tenth in real terms. In London, where about 13% of the population lives, it has risen by around 50% over the same period. On average London tenants now pay about a third of their disposable income on rent, up from a quar- ▶▶

The poor and the poorest

People in Britain living in absolute poverty after housing costs

By age group, %



Sources: FES; FRS; ONS; *The Economist*

Proportion of households, by work status, %



►ter a decade ago.

Another reason for the swelling ranks of the working poor is the labour market itself. The first difficulty is the relative scarcity of full-time jobs. Though the economy has been growing for six years, many people—particularly those at the bottom end of the labour market, whose skills are least in demand—do not work as many hours as they would like. About one in every 25 people in employment work part-time even though they would prefer full-time employment, up from one in 40 before the recession. Analysis by the Institute for Fiscal Studies, a think-tank, suggests that 21% of employees in the bottom quarter of wage-earners are in “relative” poverty (ie, receive less than 60% of the current median income) if they work at least 30 hours a week. The percentage rises to 28% if they work fewer than 16 hours a week.

The second difficulty is that median hourly real wages are still 7% below their pre-recession level. This is largely because of measly growth in productivity. In its most recent forecast, in March, the Office for Budget Responsibility, a government watchdog, sharply cut its forecast for future productivity increases. One positive development is that wage growth at the low end of the earnings distribution has outpaced the median in recent years, thus helping reduce relative poverty.

There are few signs that any of this will change soon, even though the government talks up its poverty-busting measures. Most important among them is the “national living wage” (NLW), which was introduced in April. By 2020 minimum hourly pay will be about £9.00, or 60% of projected median earnings. That will boost overall pay by an estimated £4 billion, according to official estimates. The government has chosen the level of the new NLW carefully. By pushing up wages to at least this level it implies that all workers could escape from relative poverty.

Summer exams

Books versus football

A tricky exam season for young Muslim football fans

ON THE evening of June 20th, England and Wales played their final matches in the opening stages of Euro 2016, a big football tournament, both winning through to the next round. The following day pupils sat a crucial history GCSE, an exam taken at age 16. GCSE results influence whether children make it to university two years later. Research has shown that their chances of doing well in the exams are harmed by the timing of such tournaments.

In the battle for a 16-year-old’s attention, football trumps maths and history, meaning that results suffer in years with big football competitions. Since 1998 the average percentage-point increase in the number of pupils achieving five good grades at GCSE has been only 1.1 in World Cup or European Championship years, compared with 1.5 in years without. A study by academics at the University of Bristol in 2014 found that the negative impact was “large and significant” for all pupils, says Simon Burgess, one of the authors: on average, students do about

half a grade worse in one GCSE than expected. Boys and those from poor families fare especially badly.

Muslim pupils also face a difficult task this summer. GCSEs this year fall during Ramadan, the holiest period in the Muslim calendar, which means that many children take the exams while fasting by day. The Association of School and College Leaders, a trade union, has recommended that fasting pupils have access to resting space and cool classrooms. Some exams have been moved to the morning. Such measures are welcome, says Ibrahim Mogra of the Muslim Council of Britain, but most children will take the situation in their stride anyway. “Fasting in challenging circumstances is seen as part of being a Muslim,” he says.

In any event pupils from Bangladeshi and Pakistani backgrounds are doing increasingly well in their GCSEs. Educationalists now fret about the performance of poor white boys. Changing exam dates would help. So would less successful British football teams.

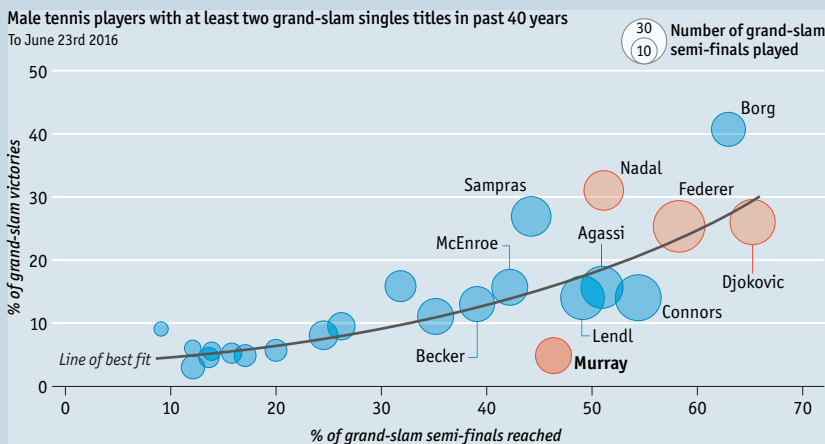
In reality, however, the NLW is a poor way of dealing with working penury. The new minimum wage is likely to cause some rise in unemployment. Those workers priced out of the labour market will mostly be poor and low skilled. Among those who stand to gain, meanwhile, are second earners in high-income families; many of the poorest Britons do not work at all. A household in the seventh income decile (ie, nearer the rich end of the spectrum) will benefit three times as much as

someone in the bottom decile, according to the Resolution Foundation, a think-tank.

The distributional effects of the new living wage are especially worrying given other measures advocated by the government. The pledge to shave £12 billion from the working-age welfare bill by 2020 will hit the poorest hard. Even if the £4 billion in extra pay expected under the NLW went to the very same people, it could not offset these cuts. This is no time to work your way out of poverty in Britain. ■

Born out of his time

Pity Andy Murray, Britain’s number one tennis player and the world’s number two. Another Wimbledon tournament begins on June 27th and he is far from a shoo-in to win it. His overall record is impressive. He has won two grand slams (including Wimbledon in 2013) as well as an Olympic gold medal, and he regularly makes at least the final four in big tournaments. Yet his conversion rate of grand-slam semi-finals to victories, at 19 to two, is the lowest in the modern game (see chart). It is his misfortune to be playing at the same time as outperformers like Roger Federer, Rafael Nadal and Novak Djokovic, whom he has faced in seven of his ten finals. In any other era he might have been at least a John McEnroe. Just not this one.



Bagehot | Whitehall, Inc.

From its politicians to its public services, Britain's state is a booming international brand



WALK down Whitehall and it is not hard to imagine its imperial heyday. Stern, grey-stone ministries loom over the buses and taxis. The most majestic is the Foreign Office, completed in 1868 and designed as “a kind of national palace”. From this building one-fifth of the planet and one-quarter of its population was once governed.

Those days are long gone, but today Britain is establishing a new, looser, more mercurial sort of global administrative network. As new economic powers join the rich world, they want to have rich-world states: responsive, efficient, well-run Leviathans that care for people when they get ill, educate them and keep them safe. In building these machines, such countries are looking disproportionately to Britain.

Take health care. The National Health Service (NHS) has a strong international brand. Already Moorfields Eye Hospital in London has a branch in Dubai; Great Ormond Street, a children's hospital, provides training in the United Arab Emirates. At a trade fair in Dubai in 2013 the British government launched Healthcare UK, a new body to help other NHS entities (and private firms) sell services overseas. Since then the value to Britain of foreign health-care contracts has risen from £556m (\$816m) in 2013-14 to £3.6 billion in 2015-16.

Meanwhile more British schools are opening offshoots overseas. The grander “public” (independent) schools have led the way: Harrow, for example, has branches in Beijing and Hong Kong, with another due to open in Shanghai in August. In 2018 the first state school will follow suit, when the Bohunt Education Trust, an academy in Hampshire, opens for business in Wenzhou in eastern China. More are expected to follow.

Despite punitive visa restrictions, foreigners flock to Britain's universities, where the proportion of non-EU students has risen from 9% in 2004-05 to 13.5% in 2013-14. The government hopes that new reforms creating a more open market, encouraging new providers and startups, will see this increase further. Total education exports (including fees paid by foreign students in Britain) are on track to hit £30 billion in 2020, up from £18 billion in 2012.

And then there are Britain's myriad service-providers that have sprung up over decades of public-sector liberalisation and outsourcing. G4S, a London-based security giant, is the largest of

its type in the world. Other “diversified” service companies such as Serco, Interserve and Capita—providing everything from waste collection and call centres to prisons and air-traffic control systems—increasingly operate overseas. Serco runs Dubai's metro. Britain's vast defence sector sells all sorts of equipment and kit to foreign governments and security forces.

Emerging economic powers also need expertise and administrators to run their increasingly sophisticated states. Here too Britain is a top exporter. Two of the world's largest consultancies—EY and PwC—are based in London. The capital is dotted with smaller practices too, many staffed by former Whitehall types, selling advice to foreign governments. Lord Maude, until recently a trade minister, is reportedly setting up a public-sector procurement consultancy. Alastair Campbell and Peter Mandelson, Tony Blair's consiglieri, hawk communications and strategy advice about the world. The former prime minister himself has (not uncontroversially) worked for a succession of foreign governments.

Britons also train foreign leaders. This is not new: Oxford and Cambridge have long turned out presidents as well as prime ministers. But more universities are now offering degrees explicitly focused on public policy. The latest example is Oxford's six-year-old Blavatnik School of Government, whose gleaming campus—a Guggenheim-esque cylinder of swirling concrete—was opened by Prince William on May 11th. Although the courses and students are impeccably global (88 nationalities and counting), Ngaire Woods, the dean, notes the benefits of being in Britain: “Compared with most other countries, British politicians and civil servants are especially reflective.” Many of the school's lecturers are former Whitehall officials and in March it announced a partnership with the Cabinet Office: a “Government Outcomes Lab” investigating new ways of commissioning public services.

Fluent mandarin

The spread of English as the world's second language, thanks in part to America's global pre-eminence, gives Britain a huge advantage. Its own imperial past has made much of Britain's cultural and administrative life familiar even to peoples on the other side of the world. Speaking to health-care exporters, head teachers bombarded with offers of plum jobs overseas and the instructors of tomorrow's world leaders, Bagehot repeatedly encounters the claim that the country's reputation for fair play and high professional standards gives it the edge when rulers in Beijing or Mexico City or New Delhi look abroad for inspiration and advice.

But Britain does not just have institutions worth emulating; plenty of countries have schools, hospitals and transport systems that outshine Britain's. Crucially, it is also a sponge for influences from elsewhere. Large numbers of migrants work for the NHS and other bits of the public sector. London-based firms peddling their wares to governments—from Serco to Tony Blair Associates—are overwhelmingly international in their expertise, personnel and operations. Much of the appeal of Britain's education sector is that it is so global: attending a British university means learning or researching alongside people from many other countries.

Such is the country's real genius: an ability to absorb and synthesise, to connect ideas and people. The Blavatnik's airy atrium, with its Babel of languages, is as good a symbol of Britain's new role as the forbidding Foreign Office is of its past one. As Ms Woods puts it: “Today you can't divide the world into those who must teach and those who must learn, empire and colonies. The 21st century is about learning to learn from other countries.” ■



Higher education

Flying high

HELSINKI AND NEEDHAM, MASSACHUSETTS

A new crop of hands-on universities is transforming how students learn

WHEN Christine Ortiz imagines her ideal university she sees “no lectures, no classrooms, no majors, no departments”. Students will work on tough practical problems in huge open spaces. If they need to swot up they will consult the internet, not a lecturer. Her vision is far removed from the traditional model of higher education. But it will soon become a reality: in July, after six years as dean of graduate education at MIT, the materials scientist will leave to found a new university. It should open in the next five years.

It will exemplify a trend that is reshaping how some students learn. Geoff Mulgan of Nesta, a British think-tank, calls it the “rise of the challenge-driven university”. In the past 15 years dozens such institutions have been set up, from Chile to China. Many more are planned. Though they differ in scope, they share an approach. They reject the usual ways of getting young adults to learn: lectures, textbooks, slogs in the library, exams—and professors. Instead students work on projects in teams, trying to solve problems without clear answers. Companies often sponsor the projects and provide instructors. Courses combine arts, humanities and sciences. (The slogan of Zeppelin University, founded in 2003 in Germany, reads: “The problems within our society are ill-disciplined, and so are we!”)

There have been earlier attempts to disrupt higher education. Experimental College, in Wisconsin, attracted hundreds of

free-spirited students when it was founded in 1927 without schedules or mandatory classes. The Experimental University, in Paris, was established by frustrated intellectuals after the protests of 1968. Both closed within a few years. (The Parisians may have been too eager to expand access: one lecturer gave a degree to someone she met on a bus.) Other experiments, however, continue. University College of North Staffordshire, renamed Keele University in 1962, became the first English university to offer dual honours courses when it was set up in 1949 by A.D. Lindsay, an Oxford don who complained about academic overspecialisation. “[The] man who only knows more and more about less and less is becoming a public danger,” he warned.

Renaissance kids

Worry about the state of young minds is also behind the latest initiatives. Champions of “deeper learning”, an increasingly popular idea in American education, argue that today’s teaching methods stifle understanding. Tony Wagner, the author of “Creating Innovators”, says that schools and universities are failing to spark young people’s curiosity. He points to research by Richard Arum of New York University and Josipa Roksa of the University of Virginia, who in 2011 estimated that despite four years of study 36% of newly minted American graduates failed to improve their scores on the Collegiate Learning Assess-

ment, a test of critical thinking. Advocates of the new model also often cite the studies of Kyung Hee Kim of the College of William and Mary, which suggest that American scores on a standardised test of creativity have fallen since 1990, even as average IQ scores have risen.

These tests define critical thinking and creativity narrowly. Nevertheless, some young people do want to be taught in different ways. As tuition fees rise, and pricey master’s degrees become more common, students are behaving more like customers. They do not want to sit in 500-seat lecture halls. About 96% of the 27,000 students polled last year by Zogby, a research firm, said they wanted universities to promote an entrepreneurial environment.

Rising demand for degrees has made universities complacent, says Nick Hillman of the Higher Education Policy Institute, a think-tank in Britain. Universities have almost all plumped for the same sorts of three- and four-year courses in everything, adds Andy Westwood of Manchester University. François Taddei, director of the Centre for Research and Interdisciplinarity, a university he founded in Paris in 2005, says that although students often complain about teaching, they graduate before they can force changes. Academics, meanwhile, stay put. Governments have entrenched the status quo, adds Mr Mulgan, by offering incentives for universities to rise up international rankings that reward standard education models.

All this is frustrating employers. About half the companies surveyed last year by the Confederation of British Industry, a lobby group, said graduates are unprepared for business jobs. A report last year by the Association of American Colleges & Universities concluded that students lack applied knowledge, critical thinking and communication skills. ▶▶

Complaints from bosses about education are hardly new. But more are now acting on their frustration. Some are offering further education courses—for example, through the Starbucks “University”. Others, as in the case of the McKinsey Academy, are trying to sell versions of their training to outsiders. And a few are offering alternatives to university. For example, PwC, an accountancy firm, will this year hire about 160 school-leavers. Those who complete the dedicated programmes can join the same “graduate scheme” as university-leavers—with less debt.

Though the line between corporate training and higher education is blurring, for ambitious youngsters choosing a job over a university spot remains rare. But new universities—as well as a few farsighted older ones—are adapting to the changing needs of students and employers.

One is Olin College, an engineering university in Needham, Massachusetts. During their four years, students complete 20-25 projects (one, to make a device that hops like an insect, is pictured on the previous page). They spend about four-fifths of their time in teams and combine ideas from different disciplines, for example biology and history in a course entitled “Six microbes that changed the world”. Richard Miller, Olin’s president, argues that projects strengthen recall and hone communication skills. Since its first class in 2002, Olin has received visits from 658 universities from 45 countries keen to learn about its approach. The Indian School of Design and Innovation in Mumbai, the Singapore University of Technology and Design, and Pohang University, in South Korea, are using a similar teaching model.

In 2017 the New Model in Technology & Engineering (NMITE) will open in England, the country’s first private non-profit university for about 30 years. As at Olin, which has advised NMITE, lecturers will be hired for their teaching expertise rather than publication records. Students will need good school-leaving qualifications, but not need to have studied maths or physics. They will have to study arts and social science. Classes will be small (20-30 students), and students will get 3.5 hours of contact time with teachers each day.

Another example is the Design Factory, part of Aalto University on the outskirts of Helsinki. Inspired by Stanford’s “d.school”, it brings engineering, art and business students together to design, build and market a product (some are pictured to the right). Kalevi Ekman, its founder, says that he is trying to “bring theory and practice closer together”. His model has expanded to nine other countries, including America, Australia and South Korea.

The new institutions are technologically savvy. Many use “flipped learning”, whereby students learn the basics through online courses and come to university

ready to get their hands dirty. Others go further. One, “42”, is named after the meaning of life—at least according to Deep Thought, a supercomputer in Douglas Adams’s cult novel, “The Hitchhiker’s Guide to the Galaxy”. Specialising in programming, it was founded in Paris in 2013 and in November will open a campus in Fremont, California. Students follow a curriculum based on levels, as in computer games. There are no formal entrance requirements, but students must pass a test of coding skills.

Though their precise methods differ, “challenge-driven universities” share an openness to the world beyond the ivory towers. Design Factory students make their products for companies such as Kone, Airbus and Philips. If an idea is good, they can turn it into a business at the adjacent “startup sauna”, an incubator run by Aalto students. At Hyper Island, which has sites in countries including England, Singapore and Sweden, master’s degrees in digital media are overseen by experts from the likes of IBM, a computing giant, and IDEO, a design consultancy. The projects are done for companies, including Saatchi & Saatchi, Google and Sony. Last year a Hyper Island team in England designed bespoke emoji for Manchester City Football Club.

Collaborators are not always businesses. Students linked to Harvard’s Ash Centre for Democratic Governance and Innovation spend semesters working for the city of Somerville, outside Boston. The founders of NMITE say they will work with a nearby special-forces regiment and GCHQ, Britain’s signal-intelligence agency.

These new-model universities can be expensive. Low staff-to-student ratios make learning more interesting, but come at a cost. Olin was set up with one of the largest university donations ever, a \$460m grant from the Franklin W. Olin Foundation, which focused on education. And yet after eight years of not charging tuition the university began doing so in 2010. (Students this year typically received financial

aid covering about half of the \$61,125 costs.) There is a limit to the size of many of the providers, concedes Tuija Pulkkinen, Aalto’s vice-president. Most of the new ones have fewer than a thousand students.

Critics worry that students will miss out on core concepts, such as the physics behind engineering. And there have been no thorough evaluations of whether these university teaching approaches improve scores on the sort of tests cited by Mr Wagner. Mr Taddei says institutions like his are not for the average student, but for “ugly ducklings”: bright, but bored by lectures and books. Luke Morris, a mechanical-engineering student at Olin, praises the freedom to pursue personal projects (he is building a racing car) and the lack of competition. “I don’t even know how I am graded,” he says.

Design for life

The new approach is only one part of broader changes in higher education. But too often governments get in the way of fresh thinking. Though most Chinese universities offer courses in how to innovate or become an entrepreneur, the education ministry seems lukewarm. The South University of Science and Technology in China opened in 2011 pledging to award its own degrees (rather than being accredited by the ministry) and to admit students who had not sat the *gaokao*, the national college-entrance exam. But last year it was forced to abandon both pledges.

More seriously, there remain few incentives for lecturers to teach in novel ways: research is what matters in building an academic career. Student-rating websites have helped shame the worst professors. But governments can do more, too. Britain, for example, is introducing a Teaching Excellence Framework, intended to reward good teaching. This pleases Aalto’s Mr Ekman. “There are very few Da Vincis,” he says. “The rest of us have a responsibility to prepare students for the future.” ■



Beats sitting in a lecture

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Health care

All about the base

SAN DIEGO

New businesses eye the opportunities in managing genome data

THE project to understand the human genome has long promised to revolutionise the way that diseases are diagnosed, drugs are designed and even the way that medicine is practised. An ability to interpret human genetic information holds the promise of doing everything from predicting which drugs will work on a particular patient to identifying a person's predisposition to develop diseases.

Genomic information is already transforming some medical practices. Sequencing has changed the way that fetuses are screened for Down's syndrome, from a risky invasive test to one where abnormalities in fetal DNA can be picked up from blood drawn from the mother. In time this sort of method will extend to other genetic disorders and other medical applications. One area of promise is treating some types of cancer. Using blood tests to detect genetic changes in tumours could allow doctors to discover more quickly when drugs are no longer effective. This is so promising that there is already speculation that performing such "liquid" biopsies could be a \$11 billion business by 2022.

Realising the vast potential of genomic medicine is a commercial project as well as a scientific one. It relies on a small but growing group of companies that are vying to produce data more cheaply, analyse them more quickly, store them securely and then to translate them all into useful information.

These tasks have proved harder than expected. As genome data have started to be collected and sifted, nuggets of genetic gold are emerging. Yet creating and using this torrent of information is an endeavour of enormous scale and complexity. Each human genome comprises about a hundred gigabytes of data. The amount gathered is doubling every seven months; by 2025 it could require more storage capacity than for every YouTube video on the planet, or for all the information astronomers have drawn from the heavens.

One firm in particular has been at the heart of this nascent genomic-data industry. Illumina, based in San Diego, is the main provider of the machines that sequence genetic information. Its domi-

nance, and its role in reducing costs (see chart), has led to comparisons with Intel's grip on chipmaking. It controls 70% of a market worth \$3.3 billion in 2015, according to Research and Markets, a research firm. As its customers, now mainly researchers, expand to include medical practitioners, that market could grow to between \$12 billion and \$20 billion by 2020.

Illumina's continued dominance is by no means assured. Pacific Biosciences, based in Menlo Park, California, has developed a machine that does a similar job. It is selling well because it is better at some jobs than Illumina's machines. Thermo Fisher, of Waltham, Massachusetts, is another rival; its machine should appeal to clinics because it is easier to operate and more efficient at targeting those sequences that are likely to be of most interest.

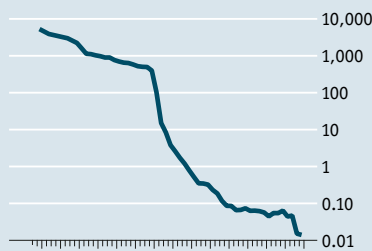
Pore man, rich man

New technologies threaten both Illumina and its current competitors. Oxford Nanopore, a small British company, has pioneered a new method of sequencing. It passes DNA through tiny holes, whose changing electrical resistance is recorded as different molecular "letters", or bases, pass by. Existing methods tag the four letters of DNA with a different marker and then read the sequence of tags.

Using pores is not yet as accurate as using markers, but is allowing sequencing machines to be built that are small, portable and quicker at reading data. That would eventually allow for new services such as diagnostics in the field and on-the-spot testing for infections. Although it is unclear whether the technology can compete in the business of sequencing entire human genomes, the British minnow does seem to pose a threat. In February Illumina filed two lawsuits against the company for patent infringement. ▶▶

Illuminating

Human genome-sequencing costs
 Per megabase, \$, log scale



Source: National Human Genome Research Institute

Once sequenced, genetic data are the raw materials for other business ventures. One flourishing area of activity lies in making sense of it all. Craig Venter, a pioneer of genomics and boss of Human Longevity Inc (HLI), also in San Diego, is assembling the largest and most comprehensive database of genomic and clinical data in order to hunt through it for targets for new drugs.

Understanding the genetic basis of a disease or disorder can be critical in identifying therapies that will fix these problems. With this in mind HLI recently signed a ten-year deal reportedly worth hundreds of millions of dollars with AstraZeneca, a British drug company, to sequence half a million genomes. The potential to find targets for drugs is such that Mr Venter thinks HLI might one day transform itself into a pharmaceutical company.

The race to identify promising targets is likely to encourage more of these partnerships as drugmakers try to get their hands on data that will help them improve their drug pipelines. Indeed, in another deal ten companies, including AbbVie, Biogen, Roche, Takeda and GSK, have partnered with Genomics England, a company set up by the British government to sequence the genomes of 100,000 patients.

Genome data have to be stored as well as analysed. That relies on cloud-computing firms. Mr Venter says his company pays Amazon \$1m a month for computing and storage. This is not yet a big business, but it is growing. According to one estimate, cloud-computing firms could charge \$1 billion a year by 2018 as the quantities of digital information continue to grow. Firms including Amazon and Google are jostling to become the platform of choice for managing genome sequences.

One way to attract business is for the cloud firms also to offer tools to make sense of the data. In February Microsoft announced a collaboration with Spiral Genetics, which has developed methods for managing and analysing genome sequences. In May Huawei launched China Precision Medicine Cloud which, by including tools from Wuxi NextCODE, an analytics firm, allows thousands of complete human genomes to be analysed in one go. Plenty of other companies are offering ways of slicing and dicing data in the cloud, including DNAnexus, Seven Bridges and Illumina's BaseSpace.

As genetic testing becomes ever cheaper, it will open up new opportunities. Invitae, based in San Francisco, is already trying to set itself up as the Amazon of genome sequencing by making the process of ordering medical-grade tests so easy and cheap that testing for genetically inherited diseases becomes as simple as ordering books online. Other applications stretch beyond medicine. Genome sequencing could be used to check if food is safe to eat, for example, or to clamp down on the ille-

gal trade in wildlife or to monitor the spread of antibiotic resistance.

But profits are not guaranteed to flow quickly. Health-care providers and governments are an obvious source of sales, but they are notoriously slow to spend their money on new forms of testing. And the business of direct-to-consumer genetic testing relies on convincing individuals that such tests are worthwhile and regulators that they are safe and accurate. Genomics has long blended huge promise and practical difficulties. That won't change. ■

Security businesses in Europe

Silver linings

PARIS

Migration, terrorism and austerity help contractors prosper

REFUGEES arriving on Aegean islands are whisked to "hotspots"—registration centres run by the European Asylum Support Office. It is often a traumatic moment. Those who fear being sent back to Turkey can turn angry or violent. "We have had a number of riots, staff have had to be evacuated quickly," says an EASO spokesman, Jean-Pierre Schembri. So, for the first time, a private-security firm, G4S, has been contracted to guard the hotspots, backing up the Greek police. "We felt we needed additional security," Mr Schembri adds.

Austrian officials, struggling with a refugee influx late in 2015, brought in ORS Services, a Swiss firm that was already running some of its camps, to take control of all of them. ORS also runs asylum centres across Switzerland. In Germany, where security firms employ 235,000 people, business is booming after over a million refu-

gees arrived last year. Revenues for German security firms reached €7 billion (\$7.9 billion) last year, up by 15% from 2014 as staff were hired for refugee shelters. This year will be a bumper one, too.

"More missions previously done by the police, or by public authorities, are now given to private companies," says Catherine Piana, head of COESS, a pan-European industry lobby group based in Brussels. She estimates there are 2.2m licensed guards in Europe, roughly as many as there are police. Infrastructure, such as airports, ports, nuclear plants and hospitals, is mostly protected by privately contracted firms these days.

Migration is not the only reason why such firms are flourishing. Anxiety over terrorism is a second explanation for a recent upsurge in demand—and, perhaps counter-intuitively, for why more people seek jobs as guards, despite low pay. Olivier Duran of SNES, a body representing small French security companies, suggests that after a privately employed guard foiled a bomb attack at Stade de France during the terrorist assaults in November, there has been a surge in job applications—mostly from immigrants, who say they want to serve their new country.

CNAPS, a French organisation of bigger contractors, calls this an exceptional "year of maximum mobilisation", because of the terror attacks and because France is hosting the Euro 2016 football tournament, which has brought hundreds of thousands of fans to French cities. Among 90,000 extra security personnel deployed to police the football, around 15,000 are private staff, working for around 60 firms.

Whether or not this turns out to be a good year, the long-term growth prospects for the private security industry are helped by lower public spending in Europe. James Kelly, who heads BSIA, an association for 450 private-security firms in Britain, says ►►



A leg up for security firms

► austerity has lifted demand for their services. He says that G4s, for example, conducts “street to suite” operations: its staff collects suspects arrested by the police, takes them into custody and processes paperwork. He predicts that private contractors, operating under the police code, will conduct arrests before too long.

Such intimate co-operation between police and private firms is less common

elsewhere in Europe but is on the rise. Mr Duran says that private guards operating side by side with police at the Euro 2016 tournament will spread “the concept of co-working”. He points to courts, ministries and public offices that are now largely guarded by private operators, often under the authority of a policeman. He also suggests that counter-terrorism efforts would be boosted if France’s 150,000 private

guards—mostly drawn from immigrant communities—were encouraged to be extra “eyes and ears” for the police.

Private security firms can find other ways to expand. Diversification is one possibility, as they supply receptionists, maintenance workers and other staff in roles other than security. In security itself, customers increasingly demand technology rather than more human guards, says Ms Piana, so bigger companies, with access to capital, may be better placed to grow. Such firms offer hardware, like surveillance cameras and electronic gates, as well as algorithms and analytics to assess the huge quantities of data that are gathered. In Britain some equipment is mostly deployed by private firms: an industry body estimates that 96% of CCTV cameras are privately owned and operated.

What hampers growth, at least according to bigger firms, is a lack of harmonisation that makes it harder for firms to operate across borders. They also want stricter rules to raise standards by, for example, requiring more training for guards. “We want more regulation, we champion it, to remove cowboys,” says Mr Kelly, who foresees industry consolidation as firms such as G4s and Securitas look for more economies of scale.

Not all rules are welcome. Companies in France, for example, complain that strong unions and strict labour laws make it costly to hire staff. But with no let-up in sight to migration, terrorism and austerity, a gloomy continent makes the prospects for Europe’s private security firms look reassuringly bright. ■

YouTube and copyright

Free and easy listening

SAN BRUNO, CALIFORNIA

The music industry lobbies Congress to keep YouTube at bay

IN LOVE or in business, it is not a good idea to be on the wrong side of Taylor Swift. She has slated ex-boyfriends in her songs. And last year she publicly criticised Apple Music’s plan not to pay artists during the streaming service’s launch period. Apple quickly relented. Now Ms Swift has joined nearly 200 musicians and record labels in a campaign aimed at the largest streaming service, YouTube. They complain that it gives away too much of their work for free.

Their call for a change in copyright law is sure to fail, but the underlying gripe with Google’s streaming service will find sympathetic ears. Streaming of music via on-demand video services more than doubled in America last year, to 172.4 billion songs, according to Nielsen, a research firm. Ms Swift, Sir Paul McCartney, U2 and others signed a letter, published in several Washington periodicals on June 20th, asking Congress to make it more difficult and costly for those streaming services to host versions of songs uploaded by users. Google and Facebook, among others, will vigorously oppose any change to the Digital Millennium Copyright Act, which grants them “safe harbour” from liability for copyright infringement.

A more realistic goal for the music industry is to persuade YouTube to pay more for playing their songs. The service is the leading destination for on-demand music but a small source of revenue. IFPI, a trade body, reckons that 900m people used ad-supported user-upload services such as YouTube to listen to music last year, but that the industry got only \$634m from those streams. Subscription-based services, including Spotify, paid \$2.3 billion to musicians in 2015.

YouTube executives argue that they are creating a new source of revenue for the industry, even if it seems small now. Many of those free-riders are unlikely ever to pay for a subscription service, they suggest. A popular user-uploaded video promotes the original work and



A chorus of disapproval

generates ad revenue for the industry. YouTube can take down such videos, but the company notes that labels and publishers usually want to make what money they can from them.

Music executives might warm to these arguments if YouTube comes up with more cash for them. That is not out of the question. Analysts reckon YouTube collected up to \$9 billion in advertising revenue in 2015, some \$5 billion of which would have been due to content creators and rights-holders. Those figures could double or even triple by 2020. By then YouTube might be making money. (Alphabet, Google’s parent company, does not break out YouTube’s results but it is widely reckoned to make a loss.)

Three big record labels—Universal Music Group, Warner Music and Sony Music Entertainment—are negotiating new deals with YouTube that they hope will lead to a bigger slice of the pie. Some music publishers will seek new terms soon, too. Their lobbying may not sway Congress, even with Ms Swift’s help. But it does not hurt to have the singer on their side of the bargaining table.

3D printing

Print my ride

A mass-market carmaker starts customising vehicles individually

ANOTHER milestone has been passed in the adoption of additive manufacturing, popularly known as 3D printing. Daihatsu, a Japanese manufacturer of small cars and a subsidiary of Toyota, an industry giant, announced on June 20th that it would begin offering car buyers the opportunity to customise their vehicles with 3D-printed parts. This brings to drivers with more modest budgets the kind of individual tailoring of vehicles hitherto restricted to the luxury limousines and sports cars of the super-rich.

The service is available only to buyers of the Daihatsu Copen, a tiny convertible two-seater. Customers ordering this car from their local dealer can choose one of 15 “effect skins”, decorative panels embel- ►►



A bumper business

► lished with intricate patterns in ten different colours. The buyers can then use a website to tinker with the designs further to create exactly the look they want. The skins are printed in a thermoplastic material using additive-manufacturing machines from Stratasys, an American company. The results are then stuck on the front and rear body panels.

Copen buyers will like selecting unique add-ons rather than choosing from a list of standard accessories, reckons Osamu Fujishita of Daihatsu. The company is testing the service in a few markets but plans to make it widely available by early 2017. “I think the Copen project is just the start,” adds Mr Fujishita.

Other carmakers are watching closely. Generally, personal customisation is available only where money is no object—on cars such as Rolls-Royces and Ferraris. But 3D printers change the economics of production. Since software, rather than skilled craftsmen working in wood or metal, is behind the process, changes can be made easily and cheaply; traditional machine tools used in mass-production factories make design alterations expensive and slow. And 3D printing saves on retooling costs to make small runs of parts (and spares if they suffer damage later).

The aerospace industry is already well advanced in using 3D printers for custom parts. Airlines often specify customised fittings for the interiors of their aircraft; Airbus prints internal cabin fittings for some variants of its new A350XWB commercial jet, for instance. Specialised parts are 3D-printed for racing cars too, but until Daihatsu’s move, mainstream carmakers have mainly used 3D machines to make prototype vehicles rather than production parts.

Local Motors, a tiny Arizona company, shows where things may head next. It prints substantial parts for a variety of ve-

hicles using “large-area” 3D printers that can cope with bigger jobs than standard machines. Local Motors prints cars using a blend of plastic and lightweight carbon fibre. One of its vehicles, the LM3D roadster, is 75% printed. The firm’s latest creation is an autonomous electric minibus which can carry 12 passengers.

Local Motors reckons that the use of 3D printing will make it possible to produce vehicles to individual designs in microfactories anywhere in the world to cater to local motoring tastes. This would represent a return to an earlier age of motoring when coach builders would be engaged to design and fabricate bespoke bodies for Bugattis, Duesenbergs or Rollers. The wheel is turning back. ■

Elon Musk’s empire

Clouds appear

Tesla’s purchase of SolarCity is a bold bet, but a worrying one

ELON MUSK, a South African entrepreneur, embodies the creative daring of Silicon Valley. He has defied sceptics and overcome setbacks over the years, all the while pushing on with innovations of improbable ambition. Yet even a man of his self-belief will have been taken aback by the negative response to an announcement on June 21st that Tesla Motors, the electric-carmaker and battery-manufacturer he runs, would buy SolarCity, a company that makes solar panels and that counts Mr Musk as its largest shareholder. Tesla will pay with up to \$2.8 billion of its own shares if investors vote the deal

through (Mr Musk says he will not take part in the ballot).

Mr Musk’s pitch is that combining Tesla and SolarCity creates a vertically integrated energy company that can sell consumers all they need for green living. The rich and virtuous can already buy an electric car from Tesla, and a Powerwall, a battery that stores solar energy and powers the home at night. A combination of Tesla and SolarCity could put solar panels in the carmaker’s retail stores, expanding SolarCity’s range of customers and helping them charge their cars in a cleaner way.

Investors were unconvinced. The day after the announcement Tesla’s shares fell by around 10%, shedding some \$3 billion from its market value. Some think the deal looks suspiciously like a bail-out for SolarCity, which has been losing money and failing to hit targets. The firm’s debts and the fears of some analysts that California, its biggest market, is becoming swamped with solar panels make any synergies pale in comparison with the risks.

SolarCity and the larger, more successful Tesla, are also ravenous for new capital. The carmaker recently announced plans, met with widespread incredulity, to double its production target for 2020 to 1m cars. Combined, the pair would burn \$2.8 billion in cash between them in 2016 alone, says Barclays, a bank.

The deal shows how Mr Musk, chairman of SolarCity and boss of both Tesla and SpaceX, a rocketry firm he founded, is willing to combine his professional and personal interests. That has advantages. Mr Musk is one of the world’s busiest bosses. Combining two of the three firms he cares about could, in theory, focus his energies, streamline decision-making and bring his assertive personality more effectively to bear on promoting the companies.

There is a downside, though. SolarCity was founded in 2006 by two of Mr Musk’s cousins, Lyndon and Peter Rive. Lyndon is the current boss. When SolarCity was trying to raise money this year and last, SpaceX quietly bought most of the bonds on offer. Mr Musk has also taken out around \$500m in personal credit lines and bought shares in Tesla and SolarCity when they needed capital. This network of ties—allied to Mr Musk’s tendency to make expansive promises and willingness to use unconventional manoeuvres—makes some investors uncomfortable.

Mr Musk’s risk-taking has paid off in the past. He put around \$180m (which he got from the sale in 2002 of PayPal, a firm he co-founded) into Tesla and SpaceX, and struggled to keep them afloat when they ran into trouble in 2008, forcing him to borrow money from friends. His confident, all-in bets have made him a Silicon Valley star. This latest one is a high-stakes strategy that could tarnish his image, whether or not shareholders vote against it. ■



SoftBank

Short and sweet

TOKYO

Nikesh Arora exits the Japanese telecoms firm

THE unpredictable ways of “Masa” Son, the founder of SoftBank, a Japanese telecoms and technology firm, are well known in Japan. Even so, the news that he would immediately part company with Nikesh Arora, a former Google executive he named just over a year ago as his successor, was a shock. “He and I love each other,” gushed Mr Arora in one of a hail of explanatory tweets afterwards. Circumstance would suggest otherwise.

SoftBank’s official reason for Mr Arora’s resignation is that Mr Son decided he wanted to carry on as chief executive for another five years or more. Mr Arora wanted to take over sooner. But his brief record at the company must have had something to do with his departure.

Mr Son believed his protégé’s connections in Silicon Valley could land him the right tech deals. Mr Arora’s investment spree include a \$1 billion punt on Coupang, a loss-making South Korean unicorn. Hundreds of millions also went into an array of cash-bleeding ride-hailing firms in Asia, including India’s Ola. But the mood has shifted. Now SoftBank’s activities are widely viewed as symptoms of the frothiness and mania that have gripped the tech sector.

Mr Arora’s free rein to back startups particularly annoyed shareholders. One group of disgruntled investors led a campaign to oust him. They judged his continued role as an adviser to Silver Lake, an American technology-investment firm, to cause a conflict of interest. When they listed their complaints earlier this year, Mr Son pledged “complete trust” in Mr Arora.

Telecoms

Oi boy

SÃO PAULO

Another casualty of Brazil’s battered economy

“OI” IS a cheerful, informal greeting in Brazilian Portuguese. But after the telecoms operator of the same name made the largest bankruptcy-protection filing in Brazilian history on June 20th, the country may finally be saying goodbye to its hopes of creating a strong, state-backed national champion. Brazil’s interim government says it will not bail out the company, which is in debt to the tune of 65 billion reais (\$19 billion). State-controlled banks have not been prepared to forgive what the firm owes to them. Parts of the company could be sold off to foreign buyers.

Oi was once treated more favourably by the government. The product of a state-sponsored merger eight years ago aimed at building a homegrown giant in a market dominated by foreign firms, Oi was even regarded as a potential global player. It is the country’s largest fixed-line firm, but has struggled to compete with international rivals in the much more lucrative mobile market, where it is Brazil’s fourth-largest operator, despite lots of official funding and regulatory changes in its favour.

Like many firms in the country, Oi piled on debt during the boom years. It has subsequently been caught out as the economy has floundered because of the misguided interventionism of Dilma Rousseff, who had to step aside from the presidency in May after Brazil’s Senate voted to hold an impeachment trial against her, compounded by the falling prices of commodities.

Mismanagement has not helped Oi. As the company has struggled to digest a merger with Portugal Telecom, it has chewed through six chief executives in

five years. Now its three larger mobile competitors—Spain’s Telefónica; América Móvil, belonging to Carlos Slim, a Mexican billionaire; and TIM Participações—are poised to make gains at Oi’s expense, as the firm goes through Brazil’s complicated bankruptcy process.

The firm’s predicament is the latest shock to hit the country’s battered economy. The interim president, Michel Temer, has a more pro-business outlook than Ms Rousseff. Privatisations are seriously being considered for the first time this century. But time is running out for a string of heavily indebted Brazilian companies, from steelmakers to construction firms. The question is whether they can restructure their debts and avoid the fate of Oi. If they fail several big firms will be saying “tchau” instead.



A bad call

On June 20th, a special committee of SoftBank board members concluded that the various complaints were “without merit”. Yet a day later he resigned.

Mr Arora’s rapid rise had also irked the executives who helped Mr Son build his cash-generating mobile-telecoms empire after buying Vodafone’s struggling Japanese mobile unit in 2006. A particular issue was Mr Arora’s pay. In the 2014 fiscal year he took home ¥16.5 billion (\$156m), and last year he pocketed ¥8 billion, in a country in which bosses receive on average around ¥100m a year.

Mr Son’s gamble on Mr Arora was one of two big recent bets. The other was the acquisition of Sprint, an ailing American telecoms firm that SoftBank bought for \$22 bil-

lion in 2013. Mr Son is taking steps to reduce risk by selling assets and paying down some of the debts his firm has accumulated, in part through buying Sprint. SoftBank has agreed to sell some of its stake in Alibaba, a Chinese e-commerce giant, for \$10 billion, and is to dispose of a stake in Supercell, a Finnish game developer.

Mr Son will now need to decide what to do about SoftBank’s internet-investment strategy. With the aid of Mr Arora, he had planned to invest as much as \$10 billion over the next decade on startups in India, the country of Mr Arora’s birth. After his anointed successor’s premature exit, Mr Son will struggle to attract another plugged-in technology superstar to Tokyo. His shareholders may not be too sorry. ■

Schumpeter | Sleepy giant

China Inc needs better management to become more productive



CHINESE business leaders will gather on June 26th in Tianjin, a charmless industrial city near Beijing, for the annual “Summer Davos” conference. This talking shop for big shots, organised by the World Economic Forum, will feature endless discussions about the fourth industrial revolution, panels on the internet of things and briefings on other whizzy topics that occupy the minds of business leaders the world over. China’s bosses will lap it up. The country wants to shift from its position as the world’s sweatshop to become a powerhouse of creativity and invention. The priority for corporate chiefs, runs the fashionable refrain, must now be to embrace trailblazing innovation and technology. In fact, a better bet would be to concentrate on the nuts and bolts of management.

China does need to shift from brawn to brain, but Chinese companies are not going to turn into Google or Apple overnight. Most of them, especially those controlled by the state, will continue to plod on in unsexy industries, such as steel or cement, for some time yet. For this cohort of firms, the central problem is not a lack of futuristic thinking or transformative innovation but how to get better at what they do.

Many are struggling just to get by, according to a report released on June 23rd by the McKinsey Global Institute (MGI), a think-tank. It calculates that over four-fifths of all “economic profits” (which take into account the cost of capital) generated in China come from one industry: finance. And that is not the result of the brilliance of China’s bankers, but rather of state-run banks being guaranteed profits by the regulatory system. By the same measure, almost half of the 20 biggest industries make a loss.

That points to China Inc’s dirty secret. Outside the country, its firms are often portrayed as mighty enterprises poised to conquer the world. China’s best are indeed world-beaters (think of Huawei, a telecoms-equipment giant, or Haier, an innovative white-goods goliath). Export-oriented manufacturers (nearly all of them private) have sharpened up dramatically. Mainly thanks to their efforts, productivity in China rose sharply between 1990 and 2010, outpacing many countries.

But that growth rate should not distract from the absolute levels of productivity, which are still abysmal. Across a variety of industries, in services and manufacturing, Chinese labour produc-

tivity is still just 15-30% of the OECD average despite those two decades of improvement. This is not just because the economy is biased toward heavy industry and dominated by stodgy state-owned enterprises (SOEs) that overinvest and underperform. Productivity lags behind badly at firms across the economy.

The boffins at MGI scrutinised the financial performance of some 10,000 Chinese and American companies. They found that three-quarters of the gap in returns between the two groups is explained by the performance of individual companies, not merely the mix of businesses in the Chinese economy. If local firms could improve performance by enough to match the average return on equity of American firms, it would lift the economy-wide return on invested capital in China from 7.4% to 10.2%.

How might this happen? Some things only the government can do. Letting failing firms go bust would be the most powerful reform of all. At the moment, no big company, public or private, can go bankrupt in China. Official subsidies, cheap loans and the inevitable bail-outs from local officials, worried about jobs and social upheaval, ensure survival. Another way to boost productivity would be to open up to competition the many parts of the economy (energy, telecoms, banking, airlines) that are run by oligopolistic SOEs.

Rather than wait for liberal reforms that may never come, however, managers in China must crack on with their own productivity efforts. The country has some extraordinarily efficient factories run by contract manufacturers such as Taiwan’s Foxconn and America’s Flex (formerly Flextronics). But it has a far greater number of poor performers. Globally proven management techniques like Six Sigma, a data-driven approach to running a company, and “lean manufacturing” have been tried only in name. They must now be taken up in earnest.

Technology need not be right at the cutting edge to help corporate officers do the basics better. More automation would boost productivity. Although China is the world’s biggest buyer of industrial robots, it still has only 36 per 10,000 manufacturing workers—half the global level and less than a tenth of the proportion in South Korea. Digital technology is another path to productivity gains. China’s logistics industry, for example, is a fragmented, over-regulated and corruption-riddled mess. Digital platforms that co-ordinate scheduling, warehousing and deliveries could boost the efforts of the 700,000 firms in this business.

Boards have a role to play, too, in realigning incentives for managers so that long-term productivity gains are rewarded. Most firms pay executives a salary and bonus that is determined by short-term performance. A study of firms listed on Chinese stock exchanges by BCG, another consultancy, found no correlation between executive pay and company performance.

Be normal

In the end, the most important thing managers in China need to change is their outlook. After a long period of double-digit growth, many firms are still on an expansionist course. But with the economy now slowing, bosses must shift away from the strategy of growing at all costs to an approach that emphasises the boring stuff: cost cutting, restructuring and operational efficiencies. As MGI’s Jonathan Woetzel puts it, companies in China need to do more everyday “blocking and tackling”. This sort of talk may not impress the Davos set, but the resulting productivity gains are much more likely than all the guff in Tianjin to spark China’s next industrial revolution. ■



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India's economy

Two stumbles forward, one back

MUMBAI

The government takes a long, winding path towards reform

LAST November, two days after India's ruling party suffered a drubbing at local polls in the state of Bihar, the government unexpectedly opened a dozen new industries to foreign direct investment (FDI). A gushing official called it "the biggest path-breaking and the most radical changes in the FDI regime ever undertaken".

On June 20th, two days after Raghuram Rajan, the respected governor of India's central bank, abruptly announced that he would soon step down, the government covered its embarrassment with another impromptu salute to FDI. The slim package of enticements, amounting to a slight lowering of barriers in some of the same industries, has made India "the most open economy in the world for FDI," said the office of Narendra Modi, the prime minister.

Hyperbole is not unexpected from a government keen to burnish its liberalising credentials. But it has not lived up to its cheery slogans ("Startup India", "We Unobstacle", "Minimum Government, Maximum Governance"). Two years after clinching a sweeping electoral mandate, and with the opposition in disarray, Mr Modi's reform agenda should be in full swing. Instead, as with previous governments, his ill-focused initiatives have run up against India's statist bureaucracy.

To be fair, much of what has been done is useful. Corruption has been stemmed, at least at ministerial level. A vital bankrupt-

cy law has been approved. Yet for all the evidence that Mr Modi's team is doing a better job running the existing economic machinery, it has shown limited appetite for overhauling it.

Pessimists see Mr Rajan's departure as evidence of a further wilting of ambition. After all, as a former chief economist of the IMF, he is an enthusiastic advocate of structural reform. Then again, at the central bank he has focused chiefly on bringing down inflation. Optimists hope he is being eased out because of his habit of speaking his mind, thereby occasionally contradicting the government line, rather than to pave the way for retrograde policies.

Thanks to a mix of lower oil prices and prudent fiscal policies (and perhaps also flawed statistics) the economy grew by 7.9% in the first quarter, compared with the same period the year before, the fastest pace among big economies. Ministers think further acceleration is possible.

That may prove difficult. India's public-sector banks, which hold 70% of the industry's assets, are stuffed with bad loans; the central bank reckons that some 17.7% are "stressed". That Mr Rajan forced them to disclose this fact will not have endeared him to politically connected tycoons now being badgered to repay the banks. Bank shares rose after he said he was leaving, presumably in the hope that his successor will go easy on them. Rating agencies fret

that they will still need recapitalising, blowing a hole in the government's finances. In the meantime, credit to industry has all but ground to a halt.

India's overweening bureaucracy is another drag on growth. Copious red-tape and poor infrastructure put India 130th out of 189 countries in the World Bank's "Ease of doing business" rankings. Getting permits to build a warehouse in Mumbai involves 40 steps and costs more than 25% of its value, compared with less than 2% in rich countries. It takes 1,420 days, on average, to enforce a contract.

A slew of liberalising reforms in 1991, when India was in far worse shape than now, were left unfinished as the economy gradually recovered. Whereas product markets were freed from the "licence Raj", which no longer dictates how much of what each factory can produce, inputs such as land, labour and capital are still heavily regulated. Having once sought to prise those open, the Modi government now encourages state governments to take the lead with their own reforms.

One result is that there is no proper market for land: businesses that want to set up shop are best off wooing state governments to provide some. Chief ministers with a presidential approach (a model Mr Modi espoused in his previous job running Gujarat) scurry around scouting for plots on behalf of the private sector in a manner that would have seemed familiar to the central planners of yore.

That India is pro-business but not necessarily pro-market is a frequent refrain. "The government wants to create jobs, not the environment in which job-creation flourishes," says one investor. Special economic zones are set up as sops, sometimes to entice single companies. Even big foreign investors are essentially told what to

do: Walmart can only open cash-and-carry stores closed to the general public, Amazon must sell mostly other merchants' goods rather than its own, and so on.

If businesses cannot get things done themselves, even the most energetic politician will struggle to set up enough factories to generate jobs for the 1.1m Indians joining the labour market every month. Most will end up in the informal sector, where nearly nine in ten Indians now work. The problems snowball from there: informal wages are just a tenth of those in the formal sector, and tax-dodging is rampant. India has just 49m income-tax payers out of a

population of 1.2 billion.

Evidence of the mistrust of markets is abundant. Indian farmers need more fertiliser, but imports are taboo and price controls discourage investment in new factories. No matter: the government has leaned on Coal India and a power utility, of all companies, to try their hand at it. If venture capitalists are wary of funding Indian startups, the state will do it in their stead, badly. A government fund launched five months ago for this purpose has so far made just one investment (each requires the approval of several ministers).

Hopes that privatisation might return

the commanding heights of India's economy, nationalised in the 1960s, to private hands have dimmed. Aside from dominating banking and insurance the government also owns an airline, hotels, utilities, a maker of photographic film and, until last month, several watch-making factories. Ministers run industries rather than regulate them. This month your correspondent witnessed an audience-member at a public event ask the telecoms minister why his (state-supplied) broadband connection was so slow. The minister promised to look into it. It would have been better, surely, to pass the buck to the private sector. ■

Buttonwood | The next leap

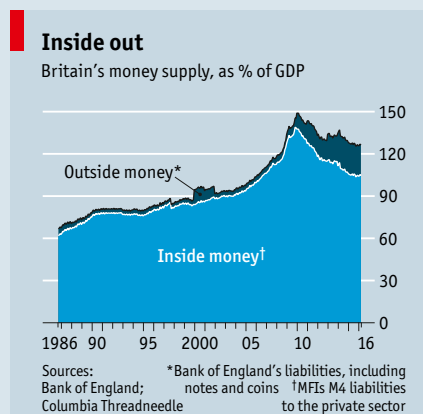
Helicopter money sounds radical. It may not be that much of a departure

WOULD “helicopter money” (the use of newly created money to finance government spending or tax cuts) be a revolutionary break from existing monetary policy? Its advocates argue that the tactic would give the global economy a much-needed boost; its detractors see it as a further step on the path towards fiscal irresponsibility and hyperinflation.

A paper from Toby Nangle of Columbia Threadneedle, a fund-management group, argues that helicopter money is not as radical a leap as you might think. Money is created in two ways. By far the largest proportion is generated by the banking sector when it lends to consumers or businesses. The bank creates a deposit in the name of the borrower which can then be spent. Mr Nangle refers to this as “inside money”. The other type, which he calls “outside money”, is that created by the government and central bank, including the notes and coins that everyone carries around.

Mr Nangle's insight involves looking at outside money in a different way. In the conventional view, the government collects taxes from the private sector and uses the proceeds to finance its spending, covering any shortfall by borrowing in the bond markets. Instead, he suggests, look at the process through a monetary lens. The government creates money to pay its bills—public-sector wages, defence equipment and so on. Doing this without limit would quickly undermine confidence in its currency. So governments offset this monetary expansion by “sterilisation”—taking money out of the system through taxes or debt issuance.

Now think about quantitative easing (QE), the creation of new money to buy government bonds. In effect, this is undoing, or reversing, the sterilisation process. The aim was to prevent excessive mone-



etary tightening. In Britain, the chart shows that bank credit (inside money) was shrinking after the financial crisis but, thanks to QE, the Bank of England partially offset this by creating outside money.

In addition, QE in effect reduces government debt held by the private sector, at least for as long as central banks hold on to their respective governments' bonds and remit the interest payments back to the treasury in question. In accounting terms, one bit of the government owes money to another bit. On a net basis, the ratio of government debt to GDP in Japan has been falling, not rising.

The only difference between the current situation and the use of helicopter money is that, in theory, central banks plan to unwind their bond purchases in the long term. Government bonds will eventually end up back in the private sector. (Either the central bank will sell the bonds in the market, or it will fail to reinvest when the bonds mature.)

However, it is almost eight years since the failure of Lehman Brothers and no central bank has started to unwind QE. In the circumstances, would the use of helicopter

money be that much of a policy shift?

Mr Nangle's argument is ingenious but raises questions. If helicopter money is so similar to QE, then would it really be effective? After all, despite several rounds of QE, developed economies have not reattained their pre-crisis growth rates. The essential difference, enthusiasts argue, is that the expansion of the money supply would be avowedly permanent, and thus would have a more stimulatory effect.

That difference might well cause helicopter money to be seen in a different light by the markets. The idea of financing government spending by printing money is regarded with horror by many bond investors because it is a drug to which governments would quickly become addicted. Why bother with the unpopularity of raising taxes or the need to placate bond markets when a friendly central bank can fund all your spending promises? The first government to try it might see considerable downward pressure on its currency. Mild depreciation would be welcome; a rapid plunge would not.

In the end, Mr Nangle comes out against helicopter money because it would be harder to reverse than QE. Instead of selling government bonds to the market, the central bank would have to push up short-term interest rates, perhaps by a lot, since this would probably be its main tool. The impact on small firms and mortgage-holders might be crippling.

But the debate isn't going to go away. With short- and long-term rates close to historic lows, there isn't a lot central banks can do on the rates front if more monetary stimulus is needed. Expect to see lots of sophisticated arguments in favour of helicopter money in order to quell the doubts of the markets.

Mexico's special economic zones

How the bottom half lives

MEXICO CITY

Free-trade areas aim to boost growth in the impoverished south

THERE is not just one Mexico, a common line runs, but two of them. The northern half of the country—the states bordering America and the Bajío region to the south of them—is the “North American” Mexico, an area of higher productivity, faster growth and greater levels of foreign investment. To the south is the country’s “Central American” heartland—a greener region more geared towards agriculture than to manufacturing, where nine of the ten states with the highest incidence of extreme poverty are located. For decades successive governments have debated how to encourage more investment in the south and thus bring the two Mexicos closer together. The current one thinks it has an answer: special economic zones.

Special economic zones are geographically defined areas that enjoy lower taxes or less exacting regulation than the rest of a country. The intention is to promote investment in deprived areas with incentives that might be unaffordable, unpopular or unnecessary if applied nationally. First used in Ireland in 1959, they now number over 4,300 globally. Roughly half, according to Abraham Zamora of Banobras, a state development bank, have been successful. Which half Mexico’s will fall in is not yet clear.

The law creating the zones was signed at the end of May; they should be up and running in 2018. “They will undoubtedly constitute a milestone in public policies for alleviating poverty and inequality,” Enrique Peña Nieto, Mexico’s president, has said, a mite prematurely.

The first three zones are intended to bring benefits to five different states. One is a corridor of land stretching between Coat-

IEX, unleashed

Speed bumps in the night

NEW YORK

American regulators approve a controversial new stock exchange

IT IS a ruse familiar to officials the world over: if you have embarrassing or controversial news, release it on a Friday, the later the better. The decision on June 17th, a Friday, by the Securities and Exchange Commission (SEC), Wall Street’s main regulator, to approve a new stock exchange sounds mundane. But the fact that the briefing explaining the agency’s reasoning was scheduled for 8pm gives a sense of the awkwardness of the topic.

IEX, the newly approved exchange, has one distinctive feature. Whereas most share-trading venues pride themselves on the speed with which trades can be executed, IEX promises to slow down transactions deliberately, with a “speed bump” of 350 millionths of a second. This idea has been controversial for two reasons. First, it is hard to reconcile with rules that oblige an exchange to execute a trade immediately, at the best available price, even if that means sending it to a rival market. Second, by attempting to slow things down, IEX is taking aim at a system it believes is rigged to favour ultra-fast high-frequency traders (HFTs) at the expense of the investors and companies that stockmarkets are supposed to nurture.

At the moment share-trading orders bounce between 13 exchanges (at which bids and offers are made public), more than 40 dark pools (where they are not) and an indeterminate number of brokers. Big asset managers suspect this sprawling, fragmented system allows HFTs to nip in ahead of them and take advantage of their orders—an idea that was given credence in a 2014 book by Michael Lewis called “Flash Boys”, which cast IEX in the role of hero.

By slowing down HFTs along with everyone else, IEX’s speed bump is supposed to protect less nimble investors. Its application received lots of support from big asset managers, at any rate. But the SEC was hesitant, asking IEX to modify its application five times and deferring a decision on it twice. In the end, at the same time as it approved IEX’s application, the SEC issued an “updated” interpretation of its best-price rule, allowing for delays in execution of up to a thousandth of a second. Critics fear even more fragmentation; backers hope for a fairer system. The SEC has promised to study the effects of the speed bump, and revise its rules again if necessary. Keep your Friday evenings free.

zacoalcos in Veracruz and Salina Cruz in Oaxaca, across the isthmus of Tehuantepec (the narrowest part of Mexico). It may yield a new route for firms looking to move goods between the Gulf of Mexico and the Pacific Ocean. The others are both linked to existing Pacific ports: Puerto Chiapas in the state of Chiapas next to the Guatemalan border, and Lázaro Cárdenas on the border between the south-western states of Michoacán and Guerrero (see map). Private administrators will run the zones on 40-

year contracts, managing the infrastructure inside them and recruiting the tenants. One of their priorities will be to find “anchor” tenants able to attract other occupants to the zone, perhaps as suppliers.

Successful economic zones tend to capitalise on the strengths of the local economy. For example, the agricultural bent of the region around Puerto Chiapas, it is hoped, may spur investments in agribusiness. In general, though, zones must offer three enticements to would-be investors: alluring tax breaks, good infrastructure and a decent workforce. By putting two of the zones in (or possibly next to—the details are not yet known) existing ports, the Mexican government is at least trying to ensure that infrastructure will be less of an issue. Those zones should not be held back by the isolation that has bedevilled similar schemes elsewhere.

The tax breaks may be more of a problem. Special economic zones have to be special, after all, quips Gerardo Corrochano of the World Bank. Mexico’s will benefit from a broad exemption from VAT, which is levied at 16% elsewhere in the country. That should encourage not only companies operating in the zones, but also those wanting to sell services to them. But ▶▶



▶ the income-tax and customs regimes are still hazy. Another concern is that some incentives could be removed after just eight years. Without more clarity on tax, says Emilio Arteaga, a trade lawyer, it is hard to be optimistic about the zones.

Mexico has long made shrewd use of tax breaks to spur development. Its *maquila* regime, established in the 1960s, allows firms to import materials for manufacture or repair duty-free, as long as they re-export the finished product. These factories have been able to tap the country's unemployed farmers for labour; the location of the vast majority of them, near the American border, helps to minimise transport costs. Between 1980 and 2000 they boosted the share of international trade in Mexico's GDP from 11% to 32%.

The new zones offer a less convincing business case, however. The government wants to use them to reduce poverty in the region; investors will be more concerned about returns. Whether they can do both depends on how alluring a regime the finance ministry can come up with. ■

Regulating banks

Capital hill

WASHINGTON, DC

Republicans offer an alternative to America's convoluted bank regulations

THE Republican nominee for president may be all blather and bombast, but the party's leadership in the House of Representatives is trying to make up for that by producing lots of weighty policy proposals. The latest, which Jeb Hensarling, chairman of the Financial Services Committee, plans to unveil this week, concerns financial regulation. Mr Hensarling wants to replace the Dodd-Frank act, the sprawling overhaul of America's financial system instituted in the wake of the crisis of 2007-08, with something much simpler. His bill will not become law as long as Barack Obama wields a presidential veto, but it does add heft to the growing calls for reform.

Mr Hensarling says he is not targeting all of Dodd-Frank, "just 89.7%". The alphabet soup of financial regulators would be vigorously stirred. For instance, the Consumer Finance Protection Bureau, an agency spawned by Dodd-Frank, would survive but with diminished independence and authority. Its funding would come from Congress rather than the Federal Reserve (and could therefore be cut if it strays); it would not be allowed to prohibit arbitration clauses in financial contracts; and it would no longer have a single boss but a bipartisan panel of supervisors. The bit of the Fed that regulates financial insti-

The DAO

Theft is property

A cyber-attacker outsmarts a "smart contract"

IS IT theft if no rules are broken? That is what users of the DAO, a futuristic investment fund, were left pondering after June 17th, when an unknown attacker made off with around 3.6m "ether", an online currency similar to bitcoin. As cyber-heists go, it was a big one: the ether were worth about \$55m at the time of the attack, about a third of the DAO's assets. But the DAO, which stands for Decentralised Anonymous Organisation, does not have rules as such, or staff to enforce them: instead, it has computer code, which is supposed to embody its purpose and to operate automatically. If the attacker found a flaw in the code, whose fault is that? Indeed, some cyber-libertarians are arguing that whereas the heist was not a crime, altering digital ledgers to retrieve the lost ether would be an affront to the whole project.

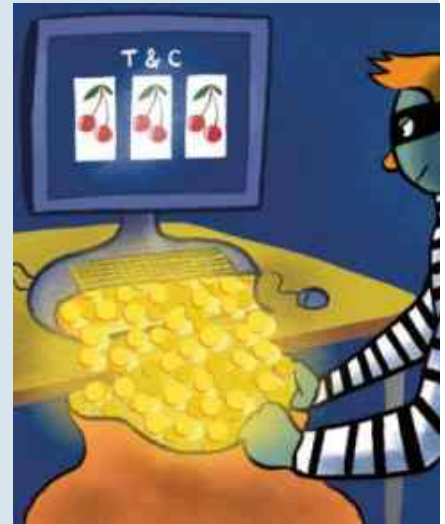
Like bitcoin, ether relies on a "blockchain"—a public ledger, distributed among lots of the system's users, which records all transactions. Bitcoin's blockchain handles mainly financial transactions, but ether's can run computer code, including self-executing "smart contracts", like those underpinning the DAO.

The DAO is controlled by the votes of its members (anyone who has transferred ether to it) and by "the steadfast iron will of immutable code", with transactions occurring automatically once enough members have voted for them. Those seeking investment set up a similar contract that pays out under fixed conditions. The DAO carries a disclaimer on its website explaining that its description of all this is only a summary of the underlying code, which is the real rulebook.

And that is where the problem lies.

The attacker was able to siphon the money by exploiting a glitch in the code that caused it to process the same transaction many times. Writing bug-free code is hard, and such an outcome is presumably not what its authors intended. But by the DAO's philosophy, that is irrelevant: all that matters is what the code allows. In effect, says Emin Gun Sirer of Cornell University, the attacker simply read the terms and conditions more closely than anyone else. Others soon followed suit, hitting the DAO with a blizzard of attacks and counter-attacks.

The blockchain could be modified to retrieve the missing funds. But doing so would require the assent of a majority of users, and not everyone is convinced. After all, if partial humans can alter smart contracts, how would they be any different from the boring old paper sort?



tutions, as opposed to setting interest rates, would also be subjected to Congress's budgetary oversight. All regulators would be required to conduct cost-benefit analyses on any proposed new rule.

Bank supervision would get an even bigger shake-up. Mr Hensarling's plan is based on three principles: that hefty capital requirements, rather than intrusive regulation, are the best way to make banks safe; that failing banks should not be bailed out; and that banks will always find a way to game complicated rules, so simple ones are preferable. So confident is Mr Hensarling in the appeal of his ideas that he would give banks a choice of operating under the current regulatory regime or opting out. The opt-outs, however, would

have to fund themselves with equity worth 10% of assets, without any adjustment for their perceived risk. That is far more equity than the biggest banks have at the moment, especially ones with investment-banking operations, but not such a leap for more straightforward retail banks. At the same time, the Volcker rule, which aims to stop banks from trading on their own account, would be repealed.

No bank with 10% capital, Mr Hensarling says, failed during the financial crisis. The new requirement would approach the 13-16% levels of equity funding banks used before the creation of the Federal Reserve and government-backed deposit insurance in order to convince customers of their solidity. Big banks would probably be ▶▶

unenthusiastic, since they would have to shrink or raise lots of capital, curbing profits either way. But Mr Hensarling believes that small banks would be thrilled: “Speak to any community banker and they will tell you they are withering on the vine and the number one culprit is Dodd-Frank,” he says. “The sheer weight, volume, complexity and cost uncertainty of a regulatory burden cannot be amortised over a small earnings base.”

Elizabeth Warren, a Democratic senator and acerbic critic of big financial institutions, was quick to label the proposal a “wet kiss for the Wall Street banks”. She and her party have been slower, however, to admit Dodd-Frank’s flaws, let alone suggest any improvements. Mr Hensarling concedes that Dodd-Frank is unassailable for the moment. But he says he wants to show his fellow members of Congress, and voters, that there is a simpler, fairer, less interventionist way to keep wayward financial institutions in check. ■

German banks

Turn of the screw

FRANKFURT

Ultra-low interest rates are slowly squeezing Germany’s banks

BANKS the world over are groaning under the burden of low, even negative, interest rates. The gripes from Germany are among the loudest. In March, when the European Central Bank cut its main lending rate to zero and its deposit rate to -0.4%, the head of the savings banks’ association called the policy “dangerous”. At the co-operative banks’ annual conference this month, a Bundesbank official earned loud applause just for not being from the ECB.

Germany’s banking system comprises three “pillars”. In the private-sector column, Deutsche Bank, the country’s biggest, expects no profit this year. That is mainly because of its investment-banking woes, but low interest rates have also weighed it down: it wants to sell Postbank, a retail operation it took over in 2010. Commerzbank, ranked second, specialises in serving the *Mittelstand*, Germany’s battalion of family-owned firms. It has felt the interest-rate squeeze even more. Analysts at Morgan Stanley place it among the worst-hit of Europe’s listed lenders.

Most Germans, however, entrust their savings to the other two pillars. One includes 409 savings banks (*Sparkassen*), mostly municipally owned; the other, 1,021 co-operatives. These conservative, mainly small, local banks are the most vocal complainers—even though at first blush they have little to moan about. Savings banks’

combined earnings declined only slightly last year, to €4.6 billion (\$5.1 billion) from €4.8 billion in 2014. Deposits and loans grew; mortgages soared by 23.3%. Capital cushions are reassuringly plump: their tier-1 ratio rose from 14.5% in 2014 to 14.8%. Co-ops had a similar story to tell. But trouble is brewing.

The ECB has flattened long-term rates as well as short ones, by buying public-sector bonds and, starting this month, corporate debt. Ten-year German government-bond yields are near zero—and recently dipped below, thanks in part to markets’ fears about this week’s Brexit referendum. For banks, this means ever thinner margins from taking in short-term deposits and making longer-term loans—from which, says McKinsey, a consulting firm, German banks earn 70% of their revenue.

Lenders have been well insulated so far, because most loans on their books were made when interest rates were higher: 80% of loans last longer than five years. Rising bond prices (the corollary of falling rates) have provided further padding as banks’ portfolios gain in value: that effect alone has brought the savings banks €19.4 billion over the past five years. But as old loans mature, they are being replaced by new ones at today’s ultra-low rates. The mortgage boom is thus a mixed blessing: rates are typically fixed for ten years or more.

With no increase in ECB rates in sight, the screw is tightening. Half of the 1,500 banks surveyed by the Bundesbank last year—before the latest rate cuts—expected net interest income to fall by at least 20% by 2019. Although banks would prefer higher rates, too sudden an increase would also be awkward, pressuring them to pay more for deposits while locked into loans at rock-bottom rates.

Banks are seeking ways to alleviate the pain. Commerzbank is charging big companies for deposits, above thresholds negotiated case by case. (It is also reported to be pondering stashing cash in vaults rather than be charged by the ECB.) Bankers warn of an end to free personal current accounts. But with so many banks to choose from, scope for raising fees is limited.

Selling investment products and advice seems more promising; and commission

income has risen, as some savers seek out higher returns. Yet low rates have made many Germans, already a cautious lot, even less adventurous. They are stuffing more, not less, into the bank—but into instant-access accounts: with rates so low they may as well keep cash on hand.

Low rates are not banks’ only worry. Both bankers and politicians vehemently oppose a proposed deposit-insurance scheme for the euro zone: the savings banks and co-ops have always looked out for each other, and don’t see why they should insure Greeks and Italians, too. Smaller institutions complain about an increase in regulation since the financial crisis—even though they weathered the storm far better than many larger ones. The savings banks’ association claims that red tape costs its members 10% of earnings—and some as much as 20%.

Another concern is the march of technology. Germans have been slow to take up digital banking, but their banks—reliant on simple deposits and loans, and still carrying the costs of dense branch networks—are vulnerable to digital competition nonetheless. Number26, a Berlin startup, has signed up over 200,000 customers across Europe for its smartphone-based current account within months. The savings banks plan to hit back this year with Yomo, a smartphone app aimed at young adults.

McKinsey reckons that low rates, regulation and digitisation together could cut German banks’ return on equity from an already wretched 4% in 2013 to -2% within a few years if they do nothing in response. The pressure is starting to tell. This month the Sparkasse Köln-Bonn, one of the biggest savings banks, said it would close 22 of its 106 branches. Some rural banks have replaced branches with buses.

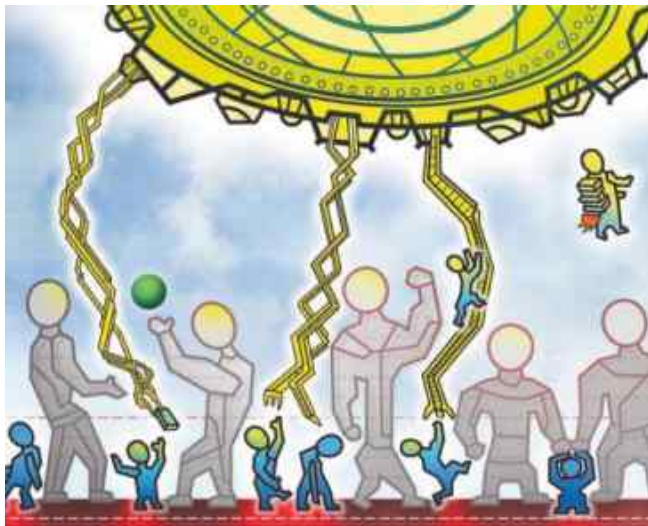
All this is likely to thin the crowded ranks of Germany’s lenders. Consolidation has been under way for decades: since 1999 the number of co-ops has fallen by half; on August 1st their two remaining “central” banks, DZ Bank and WGZ Bank, which provide co-ops with wholesale and investment-banking services, are to join forces. The pace of mergers has steadied in recent years. Negative rates may speed it up again. ■



If only rates were as buoyant

Free exchange | A running start

Poor children fall behind early in life. Better pre-school education could help



IN 1965 Lyndon Johnson introduced “Head Start” as part of his “War on Poverty”. Conceived as an intensive summer school for poor three- and four-year-olds, the programme now serves almost 1m children a year, all year round. That still leaves roughly half of American children of that age receiving no formal schooling at all, compared with just 10% or less in much of industrialised Europe and Asia—an imbalance politicians on the left, including Hillary Clinton, are eager to address. Not before time: research on early-childhood education suggests it is a smart investment.

By the time pupils begin primary school, there is a huge gap in achievement between rich and poor. In a 2011 paper Sean Reardon of Stanford University examined the difference in test scores in maths and reading between children from families in the 90th percentile of the income distribution and those in the 10th. He found that at age six it was already greater than one standard deviation and had barely diminished by the age of 18, leaving it equivalent to several extra years of secondary schooling. The gap was twice that between black and white students, and growing.

Research by Meredith Phillips of the University of California, Los Angeles, suggests that is because wealthier families are, in effect, home schooling their children. By the age of six, she estimates, children of wealthy parents have spent as much as 1,300 more hours in enriching activities than those of poorer families. Poorer parents are strapped for money and time; roughly 35% of children in America live in single-parent homes.

Proponents argue that good public pre-schooling would therefore be a social and economic boon. It would boost social mobility, they say, while also saving public money in the long run by reducing the need for remedial education, poverty assistance, state-funded health care and the like. The effectiveness of public pre-school education has long been a subject of debate, however. Head Start, for instance, has not prevented the divergence in fortunes between rich children and poor. Studies of preschools for the disadvantaged have often established only a passing improvement in test scores.

The value of pre-school has become clearer in recent years as participants in several long-run studies have grown into adulthood. The Perry Pre-school Project, for instance, divided 123 children in Michigan in the early 1960s into treatment and control

groups, and then tracked their performance as they aged. A similar programme initiated in North Carolina in the 1970s tested the impact of pre-schooling on 111 children, again divided into a test and a control group. Although pupils’ early advantage on measures of cognitive ability eventually erodes, participants nonetheless fare much better than peers over the long run. The high-school graduation rate among girls in the Perry Project who had attended pre-school, for instance, was 52 percentage points higher than that of the control group. Preschoolers from both studies were more likely to be employed as adults and to earn higher wages. They were also healthier, less likely to smoke and less likely to be arrested.

By the same token, a paper published in 2014 by Pedro Carneiro, of University College London, and Rita Ginja, of Uppsala University in Sweden, uses local-level shifts in the eligibility criteria for Head Start to tease out the links between participation in the programme and local socioeconomic trends. Head Start was associated with lower rates of obesity and smoking, reduced incidence of depression and less time spent in prison.

Such studies imply that pre-schooling is providing more than a good grounding in finger-painting, or even an early exposure to letters and numbers. Proponents argue that intensive, hands-on programmes help children develop important habits, such as conscientiousness, which do not show up on tests but are clearly useful later in life. The successful cultivation of such skills makes early-childhood education a particularly good investment, because it enables those who receive it to capitalise on subsequent instruction in education or work training, for example. Indeed, one study estimates that spending on pre-schooling for poor children yields a return of 7-10% a year in terms of longer life expectancy, higher earnings, lower crime and reduced public spending.

One for all

Whether governments should provide pre-schooling for all is a trickier question. An expansion of free nursery places in Britain led to an enormous rise in the share of three-year-olds enrolled, from 37% to 88%. Yet only one in four of those enrolled would not otherwise have gone to pre-school. Although scores on assessment tests for this group rose substantially, they represented a small enough share of total participants that the average scores among all British children barely budged. Evaluations of universal pre-schooling in Quebec, where the government introduced highly subsidised early-childhood education for all in 1997, find that shifting children from private nurseries or lavish care at home into public facilities actually reduced children’s scores on measures of social development.

Those in favour of universality argue that it broadens political support for public pre-schooling. The benefits of early-childhood education take decades to materialise, after all, during which time backing for means-tested programmes might wane whereas support for universal pre-schooling would not. Supporters also reckon that mixing students of different backgrounds improves the experience of poorer children. Yet as with universal primary and secondary schools, richer parents will often opt out of the public system, or segregate themselves from poorer children by moving to expensive neighbourhoods. In strict economic terms, money focused on the disadvantaged is money better spent—provided society remains committed to the investment. ■



Passenger drones

Those incredible flying machines

Personal robotic aircraft are hovering over the horizon

FLYING a helicopter is tricky, especially when hovering. You use your left hand to raise and lower the collective-pitch lever (to climb or descend), your right hand to move the cyclic-pitch joystick (to go forwards, backwards and sideways) and both feet to work the anti-torque pedals (to point the nose). At first it all seems like an impossible dance, but with plenty of practice and careful co-ordination it can be mastered. Flying a drone, by comparison, is easy-peasy. Some can be operated with little or no experience using only a smartphone app. So, it was a matter of time before resourceful folk started to think about building simple-to-operate drones that are large enough for people to fly in.

One passenger drone undergoing flight tests is the Volocopter VC200 (pictured above). With 18 separate rotors it might seem to be an ungainly contraption, but its makers, e-voLo, a company based in Karlsruhe, Germany, claim it is more stable than a conventional helicopter. It is certainly more straightforward to fly and can be operated with just one hand. Twisting the joystick makes the Volocopter turn left or right and pushing an “up” or “down” button makes it climb or descend. To land, the pilot needs only to keep his finger pressing the down button until the aircraft is safely on the ground.

The idea behind the Volocopter and similar craft under development is that, like a drone, they are packed with sensors,

including gyroscopes, accelerometers and magnetometers which, combined with an on-board computer system, means the aircraft flies largely autonomously. The pilot—or operator as they might more accurately be called—provides only basic commands, leaving the aircraft itself to take care of any necessary manoeuvres, balancing itself during a hover, automatically holding its position and compensating for changing conditions, such as a sudden cross wind.

The technology is sufficiently advanced that there is nothing to stop passenger drones taking to the air, provided they can meet the same safety standards as other light aircraft and are flown by trained pilots. At a price for a small machine likely to be similar to that of an upmarket car—and a fraction of the cost of a new helicopter—they could prove extremely popular in recreational and sport aviation.

The next step is to persuade aviation authorities that, because the craft are so heavily automated, they can be safely and reliably flown by people with only a little training. Convincing officials of that could take a few years, but it is possible. Aviation authorities have in the past worked with companies and flying enthusiasts to develop special training programmes for other new types of aircraft, such as powered hang-gliders and microlights.

Some envisage going further still, allowing passenger drones to provide auton-

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omous air-taxi services. A bit like using an Uber app to call a cab, a pilotless drone would be summoned to whisk you away to your destination. That raises so many tricky questions, around insurance, infrastructure and public liability, that such services are many years away. But the journey to that destination may well have begun.

Unmanned drones can already be flown under existing guidelines. This week America's Federal Aviation Administration (FAA) finalised its rules for civil drones weighing less than 55lbs (25kg). They must be kept in line of sight, below 400 feet (122 metres) and away from people. To use a drone for commercial purposes the operator must undertake an approved training course. Exemptions to the line-of-sight rule will be allowed for some flights, such as those making deliveries. But heavier drones need to be registered like conventional aircraft and face tougher regulation.

Let's twist again

The attraction of drones is their ease of operation. Unlike most helicopters, hovering drones use multiple rotors. Many drones are based on a design called a quadcopter, which employs four rotors on arms set 90 degrees to each other. Each rotor is directly driven by an electric motor. By turning two of the rotors clockwise and two anticlockwise it counters the twisting effects of torque produced by a single-rotor helicopter (without a tailrotor to push against the torque, a helicopter would spin hopelessly round and round). Moreover, whereas a helicopter needs to vary the pitch of its blades (the angle at which they attack the air) in order to manoeuvre, the multiple rotors on a drone have a fixed pitch. The drone instead manoeuvres by independently changing the speed of one or more of its rotors under computer control. As this set-up requires fewer and less complex ▶▶

▶ moving parts than a helicopter, it makes drones simpler, cheaper to build and maintain, and potentially more reliable.

Ehang, a dronemaker based in Guangzhou, China, is using the quadcopter design for a single-seat drone it is developing, but with an added twist. The Ehang 184 has a total of eight rotors, two on each corner but with one rotor facing up and the other facing down, each powered by its own motor. This builds in an extra margin of safety so that should a motor or rotor fail, the aircraft would still fly. Huazhi Hu, the company's founder, aims to begin flight tests of the 184 in Nevada later this year to obtain an airworthiness certificate from the FAA.

Ehang's eventual intention is that passengers need only enter their destination on the 184's control screen, strap in and let the drone fly them the entire journey autonomously. The craft is designed to nip along at up to 100kph and fly for 23 minutes before its batteries need recharging. With existing battery technology, passenger drones are still a long way from beating conventional helicopters in both endurance and load-carrying abilities. But batteries are getting better. And even big aerospace companies, such as Airbus, believe that electric and hybrid power systems will be used in future passenger aircraft.

Flying chips

The 18 rotors lifting the Volocopter take the concept further. Ascending Technologies, a German dronemaker bought earlier this year by Intel, a giant chipmaker, gave e-voLo a hand with the electronic systems that control them (the craft contains more than 100 microcontrollers). The greater number of rotors provides both more efficiency in lift and higher levels of redundancy in the event of a failure. And, just in case of a big emergency, there is also a parachute—one that will gently carry to the ground the entire drone with its passengers remaining in their seats.

The VC200 gained permission to fly from German authorities earlier this year. It has an all-in weight of 450kg and, in its present form, a flight duration of 30 minutes. After completing a series of flight tests the VC200 should be fully certified by 2017 in a category of aircraft known as an “ultra-light”. The company have taken this route because it will get the VC200 into the air sooner and allow valuable flight experience to be built up while discussions continue about creating a possible new class of aircraft for passenger drones.

Apart from recreational flyers, other users might include the emergency services with, say, a paramedic flying directly to an incident without having to rely upon a helicopter and a professional pilot, says Florian Reuter, an e-volo director. A four-seater version, the VC400, is also planned along with hybrid versions that will be fitted with petrol-powered range-extenders. The ultimate aim, adds Mr Reuter, is for Volocopters to provide air-shuttle services in congested places, such as cities. With more experience of operating such flights regulators would be in a position to consider whether passenger services could enjoy complete autonomy.

A rather different approach is being taken by Malloy Aeronautics, a British company. It is developing a drone you can sit on like a motorbike. The Hoverbike is now in its third incarnation, having begun with two rotors, one at the front and another at the rear, but progressing to four. However, it does not look like a typical quadcopter. Instead, it has a pair of rotors at the front and another pair at the back. Each is slightly offset and partially overlapping. So far, the company is carrying out test flights of the craft as an unmanned drone in order to develop its software and systems fully before fitting a seat and handlebars to produce a passenger version. Malloy has, though, flown a one-third scale remote-controlled prototype with a dummy pilot

(see picture below).

The idea behind the Hoverbike is to produce a rugged and simple air vehicle which, because it is oblong rather than square, would be more easily transportable in vehicles or other aircraft, and would be able to operate and land in difficult surroundings, such as on the side of a mountain, says Grant Stapleton, a Malloy director. The company is also working with America's Army Research Laboratory on the Hoverbike concept. It would have basic controls, such as a throttle grip for the right hand—as on a motorbike—with the handlebars used to provide other commands.

The market for passenger drones in their various forms could be huge. Beside military and commercial operations, they would have a large number of leisure uses. They also open up new possibilities for a combination of manned and unmanned flight. Mr Stapleton already knows what he wants to do with his: fly up a mountain, land and snowboard down, with the Hoverbike programmed to meet him at the bottom ready for another go. ■

Surveillance

Halting the hate

A new technique for removing radical propaganda

AMERICAN officials referred to Anwar Al-Awlaki as a senior recruiter for al-Qaeda. After being connected to numerous terrorist attacks, in 2011 he became one of the first United States citizens to be killed by an American drone. Yet Awlaki's online lectures continue to inspire Islamic extremists nearly five years after his death. His videos are thought to have helped radicalise those responsible for the attack this month on a gay nightclub in Orlando, for the shootings in 2015 at the Inland Regional Centre in San Bernardino and for the Boston Marathon bombings in 2013.

Once such extremist videos appear online they never disappear. YouTube removed hundreds of Awlaki's videos in 2010. But a search of the platform reveals thousands of copies remain in circulation. Now a new technology promises to help prevent extremist videos from spreading on the internet.

The technique, known as “robust hashing”, was developed by Hany Farid at Dartmouth College in Hanover, New Hampshire, working in partnership with Microsoft. In essence, it boils down a photograph, video or audio file into a unique numeric code.

To generate a code for a photo, for example, the image is first converted to black ▶▶



Watch out! There's a biker above

▶ and white, changed to a standard size and then broken up into squares. Dr Farid's algorithm then calculates the variation in intensity (the brightness of the pixels) across each of the cells in this grid. Finally, the intensity distribution of each cell is combined to create a 144-digit signature (or "hash") for each photo. The technique can identify photographs even if they have been altered in minor ways (if a photograph's colour is changed, for example, or if marks are made on it). Dr Farid estimates that his software can check up to 50m images a day. Importantly, there is no way to reconstruct a photograph from its hash.

An earlier version of the technology, called "PhotoDNA", has already been successfully deployed to remove child pornography from social-media sites but is able to create hashes only for photographs. Working with the Counter Extremism Project (CEP), a non-profit organisation, Dr Farid has been able to extend robust hashing to video and audio files.

Dr Farid has not published his work. The reason for that is he fears it would help people to try to circumvent the technology or allow repressive regimes to use it to suppress dissent. Instead, he and the CEP hope to set up the National Office for Reporting

Extremism (NOREX). This body would help maintain a database of extremist imagery and assign robust hashes to the most brutal or dangerous. Social-media companies have yet to sign up but if past experience is a guide, they soon will.

In 2009 Microsoft donated PhotoDNA to the National Centre for Missing & Exploited Children, an American organisation which has built a registry of hashes from its database of abusive images. The technology, which removes hundreds of thousands of photographs each year, is used by nearly all social-media companies, including Facebook and Twitter. ■



Social media and sport

What the deuce, Watson?

Finding out the hot topics at Wimbledon

WHEN the 2016 Wimbledon Championships start on June 27th millions of tennis fans will begin posting on social networks such as Twitter, Facebook and Instagram about everything from the matches to the attire, hairdos and headbands of their favourite players. The contest's organiser, the All England Lawn Tennis Club (AELTC), would quite like to know what the hottest topics are. So it is using a powerful computer to find out.

That computer is Watson, an IBM machine which in 2011 famously won the American TV quiz "Jeopardy!" and nowadays resides as a cloud-computing service. The idea, says Alexandra Willis, the AELTC's digital supremo, is to use its machine learning and natural language-processing techniques to discover the most pressing topics of conversation among the vast output from fans. Knowing that, the club's editorial team—which provides content for Wimbledon's mobile app, its website and its video feeds—can respond quickly with relevant articles, posts, tweets, statistics and images.

The computer system is capable of

analysing vast amounts of unstructured text and inferring meaning from it. It has also been trained on all the results of every Wimbledon match since 1877. So if, for instance, fans start tweeting: "Has a Chinese player ever got to the third round before?", Watson would soon come up with an answer. Similarly, by comparing a player's performance on any of the 19 courts to past games, it can notify the editorial team and commentators of any records about to be broken or new milestones reached.

The system was discreetly tested at last year's Wimbledon, by seeing if it could answer questions posed by the 3,500 journalists covering the event. It also did a stint at the US Masters golf competition in Augusta, Georgia, earlier this year, where Facebook and Twitter feeds were plugged in to train the system up. IBM will face stiff competition in the field of social-media analysis from a number of specialist firms, reckons Peter Bentley, a computer scientist at University College London. But for the tennis, at least, it is seeded first.

Climate research

Monsooner or later

Forecasting India's monsoon is tricky. Robots may help

FARMERS throughout the ages have gleaned clues about the weather from the natural environment. Animal movements and the colour of the sky have been considered augurs. For one of the world's most important weather events, India's monsoon, forecasting methods are becoming rather more refined. About half of the country's population—600m people—depend upon the rain it brings. Scientists want a better understanding of the processes by which the Indian Ocean interacts with the atmosphere, and underwater robots can help in their quest.

Monsoon climates typically have two distinct seasons: wet and dry. In India the rainy onslaught begins when moist air is carried northwards from the Indian Ocean during the summer. The winds transporting it come from an area of high atmospheric pressure in the southern Indian Ocean, and cross the equator before raging over the land. As the air gathers moisture during the journey, atmospheric convection forms storm clouds which arrive first in southern India around early June (as they did this year). The monsoon creeps north and west, showering Pakistan about a month later. By September it is in retreat and it is normally gone by December.

Information about when and where the monsoon will arrive is important for farmers, especially as almost two-thirds of India's fields lack irrigation systems. The expected arrival of rains dictates when seed-sowing should start: crops such as rice, soyabean and cotton are normally grown during the wet season between June and September. The event is critical even for Indians who do not farm. A sense of the monsoon's duration ahead of time allows utilities to plan hydropower gener- ▶▶

ation, as the rains fill dams and reservoirs.

The complexity of climate systems makes forecasting the monsoon tough. It is erratic anyway: four years in every ten, it is abnormal. Furthermore, humans are changing the environment. Clearing forest and vegetation means less water is stored in the land, for example. Air pollution is a huge problem, too, much of it caused by cooking at home. The polluting aerosols, such as black carbon, released by this and other activities interact with sunlight. Some of these tiny particles—many less than one tenth of the width of a human hair—scatter it, while others absorb it. Both effects alter the heating of the atmospheric column, and thus the heating of the land relative to the ocean—a phenomenon which helps drive the monsoon.

The heat trapped by greenhouse gases is likely to lead to even greater variability in the monsoon. Rainfall extremes are expected to increase, thanks partly to the fact that a warmer atmosphere can hold more moisture (about 7% more for every 1°C of warming). And the world is sweltering. This year is almost certain to be the hottest ever recorded; 370 months in a row have now been either warm or warmer-than-average, according to the World Meteorological Organisation, a UN agency.

Bobbing along

Climate models attempt to simulate many of the processes which are driving the monsoon, says Hugh Coe of the South West Asian Aerosol Monsoon Interactions project, a research initiative, but how such processes really work has yet to be examined thoroughly. That is why scientists from the University of East Anglia in Britain, working alongside researchers from the Indian Institute of Science and other bodies, are releasing seven underwater robots into the Bay of Bengal as part of an £8m (\$11.8m) project. They will glide underwater for a month—having set sail on June 24th—across a 400km sweep of international water.

Oceanographers have been using sea gliders for a number of years and they have steadily been getting better. Their use in the Bay of Bengal is novel. The torpedo-shaped gliders do not have an engine and instead manoeuvre vertically by changing their buoyancy. They use electrical power to pump oil back and forth between a bladder inside a pressurised part of their hull and another bladder in a usually flooded region of the hull. To dive, oil is transferred from the external bladder to the internal one. This does not change the craft's mass but decreases its volume, which lowers its buoyancy and makes it slowly sink. To surface, the oil is pumped back again. To move forward, the pitch of the craft is changed by pumping fluid towards the bow, which makes it dive, or sent towards the stern to ascend. A pair of short stubby wings on the

craft provide a lifting force that translates vertical motion into forward motion.

The sea gliders will measure ocean temperatures, salinity and currents to discover how exactly salty, warm water from the Arabian Sea churns with surface water from the Ganges river. This mixing dictates how heat is delivered to the atmosphere according to Ben Webber from the University of East Anglia. Findings will be communicated via satellite when the sea gliders periodically surface. As the data should help improve rainfall prediction for future monsoons, that is good news for scientists, farmers and robot fans. ■

Zoology

Flight compass

Deer use magnetic alignment to know which way to run

WHETHER it is a herd of gazelle, a court of kangaroos or a crash of rhinos, the sight of a group of animals turning from a predator and bolting in unison in the same direction is one of the most majestic in nature. It is also one of the least understood. Now a group of researchers think they have come up with the reason why such animals seem instantly to know which way to run and not crash chaotically into one another: they use a sort of compass.

To investigate this, Petr Obleser, a PhD student at the Czech University of Life Sciences in Prague, and his supervisor, Hynek Burda, studied roe deer commonly found on hunting grounds in South Bohemia and West Moravia in the Czech Republic. That some animals have an innate awareness of Earth's magnetic field is well known: many use it to guide their migration. Herdsmen and hunters have also long observed that grazing animals often tend to align themselves facing either north or south, which the researchers suspected was in readiness to escape in either of those directions should a threat emerge.

And that is largely what the roe deer did, Mr Obleser, Dr Burda and their colleagues report in *Behavioral Ecology and Sociobiology*. For their experiment, Mr Obleser began the arduous task of slowly walking through the wilderness areas at set times and in set locations for 46 days between April and August 2014.

Whenever he saw a roe deer, he immediately stopped and assessed whether the deer had seen him first by studying where its ears and eyes were directed. If the deer had not yet noticed him, he began recording information on the weather, position of the sun, visibility, light levels, surrounding habitat and if the deer was on its own

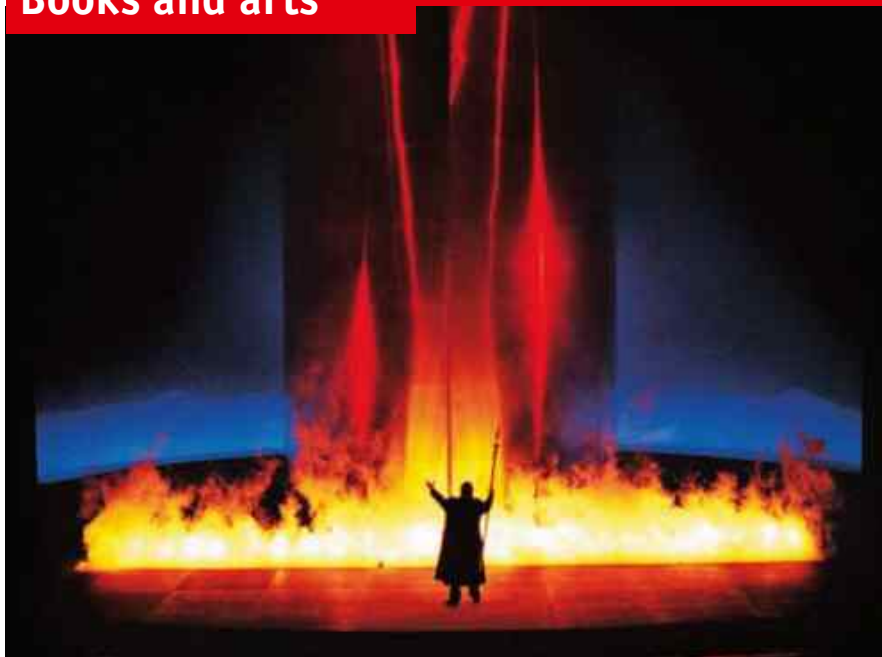
or in a group. He also used a laser range-finder to measure the distance between the animal and its nearest source of cover, as well as a compass to determine its geomagnetic orientation. Then he crept closer and closer. When the deer ultimately fled, he measured the direction of its flight. If the monitored deer was with others, which was often the case, the rest of the deer were ignored, so that accurate measurements of just an individual were obtained. In this way he accumulated data on 188 deer.

Mr Obleser found the deer were more likely to orient themselves in a northern or southern direction while standing and that they have a strong tendency to bolt in those directions as well. More specifically, it was found that when the deer were approached from the south, 52% of those studies ran north, 17% to the south and 31% either east or west. The results from northern approaches were not much different, with 67% racing to the south, 12% north and 21% east or west. Yet what proved fascinating were the results from eastern and western approaches. The researchers speculated that coming from the west ought to drive the majority of the deer eastward, but only 42% went that way while 50% headed north or south. An eastern approach caused 40% to go to the west and 43% north or south.

Intriguingly, the tendency to run north or south did not appear to be related to weather, the position of the sun or any other environmental conditions. Even when the nearest cover was to the east or the west, the deer still preferred to initially bolt north or south before curving around and heading for the safe haven. Moreover, when deer were in a group, their tendency to move along the north-south axis grew stronger. Deer, the researchers argue, are not only sensitive to Earth's magnetic field but also make use of it when it is time to run away. ■



About to head north



Wagner's "Ring" cycle

Getting into Valhalla

How to understand the most daunting opera ever written

IT IS gargantuan in every way. The "Ring of the Nibelung", known as the "Ring" cycle, lasts about 15 hours and is performed over four evenings. A new instrument, the "Wagner tuba", was invented for it; a concert hall, the Bayreuth Festspielhaus, constructed for its premiere. Its composer, Richard Wagner (1813-83), began writing the opera in 1848, a year when Europe was torn by nationalist and democratic revolutions, but did not finish it until 26 years later. The finished product is considered the finest piece of musical theatre ever written, a sweeping artistic expression of a period in which the world was swiftly moving towards modernity. Sir Roger Scruton, a newly knighted English philosopher, tries to make sense of it in his latest book, "The Ring of Truth".

Based on a knitting together of German and Icelandic tales, the opera revolves around a ring, fashioned in gold from the Rhine by Alberich, a dwarf, that grants the power to rule the world. The struggles over the ring lead to love, betrayal and death, as well as the end of the rule of the gods. (Many of these themes are also found in J.R.R. Tolkien's "Lord of the Rings"; Tolkien unconvincingly denied that he had been influenced by Wagner.)

The "Ring" cycle is notable for its 150 or so leitmotifs, musical phrases associated with an idea or character. They do not simply accompany the libretto but also reveal

The Ring of Truth: The Wisdom of Wagner's Ring of the Nibelung. By Roger Scruton. Allen Lane; 400 pages; £25

the subconscious feelings of the characters or what will happen later in the story. For instance, the "nature" leitmotif, a rising major arpeggio, opens the opera and is associated with the majesty and life of the rushing river Rhine. But later Wagner flips it on its head—with the notes now moving downwards—to signify its opposite: the inevitable decay and death of the gods.

Rising out of the foment of the mid-19th century, the "Ring" is often seen as a work with strong Marxist overtones. George Bernard Shaw, an Irish playwright and critic, argued that the Tarnhelm, a magic helmet central to the drama, is really the top hat of the capitalist class. Siegfried, a mortal who "knows no fear" and who undermines the system, is said to represent Mikhail Bakunin, a Russian anarchist. Wagner was no fan of industrialisation: his depiction, to the sound of 18 anvils, of Alberich's enslaved dwarves mining more gold, is terrifying. But it is unclear whether he read Marx. In any case Sir Roger has no time for sweeping theoretical interpretations. "[I]t is a vast diminution of Wagner's drama to pin such a thin Marxist allegory to its extraordinary and believable characters," he sniffs.

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He is keener on a rich, historical account. Wagner lived at a time of philosophical changes that have had a lasting impact on how we see ourselves. The Enlightenment, a movement which gripped Europe from the 18th century, loosened the hold of the Church in favour of rational thought. The works of Hegel were particularly important ingredients in the "Ring". "Like the Hegelians, Wagner saw the contest over religion as the decisive episode in the emergence of the modern world," Sir Roger writes.

On one level, the story is about Siegfried realising his freedom as an individual, in which he breaks from the stifling rule of the gods—an optimistic account associated with the ideas of Ludwig Feuerbach, one of Hegel's disciples, who heavily influenced Marx. Yet Siegfried struggles in his condition of freedom. "Götterdämmerung" (or "Twilight of the Gods"), the final, five-hour opera, explores the disconcerting idea that without the gods we are left alone. We know that we cannot live up to the perfect standards set by our old masters; and yet all we have to enforce good behaviour is ourselves. To revolutionaries watching the "Ring", this was a wake-up call: the opera showed that socialist dreams were every bit as illusory as the religion they had set out to replace.

Sir Roger is not always so attuned to historical and philosophical context. Take his discussion of anti-Semitism, which looms large in the popular understanding of Wagner. Scholars enjoy mining the operas for evidence of how anti-Jewish Wagner "really" was (Alberich, the money-grabbing dwarf, is a particularly controversial character). But in Sir Roger's view, these critics' single-minded focus on Wagner's anti-Semitism means that they fail to understand the many other ideas explored in the ►►

operas. While this has some truth, in his own analysis he overcompensates, choosing to ignore the anti-Semitism theme almost entirely. It is a bizarre choice, which leaves the discussion incomplete.

The “Ring” cycle may be a European work nearing its 140th birthday, but Sir Roger is surely right to argue that it still has “relevance to the world in which we live”. The existential consequences of throwing off the yoke of religion is debated in many countries. Europe is swept by movements seeking to break free from certain structures of society towards some nebulous alternative. Moreover, Sir Roger successfully shows just how important the “Ring” was to the history of music and philosophy. After reading this book, only the most unadventurous reader would turn down the chance to see Wagner’s masterpiece. ■

Transgender memoir

Daddy dearest

In the Darkroom. By Susan Faludi. Metropolitan Books; 417 pages; \$32. William Collins; £16.99

SUSAN FALUDI had been estranged from her father for 25 years when she received an e-mail announcing “interesting news”. “I’ve had enough of impersonating a macho aggressive man that I have never been inside,” her father wrote. Several pictures were attached. One featured her father in a platinum wig and ruffled blouse. Another showed her parent with fellow “post-op girls” in a Thai hospital. Ms Faludi’s father, who had been Istvan Friedman as a persecuted Jew in Budapest, then Steven Faludi as an “imperious patriarch” in America, was now Stefánie, a coquettish septuagenarian with a taste for frilly aprons, glittery heels and male attention.

“Write my story,” Ms Faludi’s father asked (“or rather, dared”) when they reconnected in 2004. Stefánie’s choice of biographer was inspired. As the bestselling author of several books about gender, sex and power, Ms Faludi was well placed to meditate on the meaning of her father’s transformation. “In the Darkroom” is a fascinating chronicle of a decade spent trying to understand a parent who had always been inscrutable.

Having hoped her father’s transition would offer a glimpse of “the real Steven”, Ms Faludi is disappointed to find Stefánie no less hot-tempered, long-winded, enigmatic and uninterested in the past as Steven had been. “It’s not my life anymore,” Stefánie says dismissively about her childhood. Although Steven had returned to live in Budapest after his marriage col-

lapsed, Stefánie never wishes to revisit her youth and rarely leaves the house. Instead of disclosures, Stefánie prefers superficial exposures, proudly parading before her daughter in negligees and barely tied robes. With frustration, Ms Faludi finds that the sex-change “had only added a barricade, another false front to hide behind”.

But as a Pulitzer-prize-winning journalist, Ms Faludi has made a career of stripping away artifice. She pores over old letters and documents and patiently tracks down family members and schoolmates. The person who emerges is often just as overbearing and oppressive as the father she grew up with, even after the transition. “Stefánie had this very dominating style, like a hammer coming down,” recalls a transgender woman who runs an inn for post-operative trans women in Thailand. Yet Ms Faludi also learns that her father was a hero, having masqueraded as a Nazi sympathiser in order to save his parents during the war.

As a feminist, Ms Faludi is startled to find Stefánie embracing a “florid femininity” that she herself had rejected. The author is discomfited by the stereotypically girlish memoirs of trans women, who thrill to become “the exact sort of girl I’d always thought of as false”. And she pointedly wonders why trans people claim to be flouting the binary system of sexes even as they confess “a desire to be one sex only, the one that they had an operation to become, which was always the binary opposite of the one they’d been.”

Budapest is an odd place for a Jewish trans woman. Although Hungary passed anti-discrimination laws in order to join the European Union, legal tolerance is undercut by prejudice and intensifying anti-Semitism. Intriguingly, Ms Faludi compares her father’s “rebirth” in old age to Hungary’s own revisionism. She finds the country keen to scrub away any evidence



of the “shrapnel scars on seemingly every building and on my father’s character”. Two-thirds of the country’s 825,000 Jews were sent to their deaths during the war, but there is little mention of this in its history books or museums. Hungarians, including her father, prefer to lament their fate at the hand of the Soviets. Ms Faludi questions whether her father’s sex-change had anything to do with the emasculations of Hungarian Jews during the war. But an old schoolmate of her father’s cautions against pat conclusions. “In the end, the mind is a black box”.

Ultimately this book is an act of love, a way to get close to a parent who had always been remote. Months before dying in 2015, the elder Faludi read a draft. “I’m glad,” Stefánie said. “You know more about my life than I do.” ■

A memoir of Australia

Ancestral voices

Thicker Than Water: History, Secrets and Guilt. By Cal Flyn. William Collins; 366 pages; £16.99

CAL FLYN never caught the family-history bug until she stumbled across her three-times great-uncle, Angus McMillan. A Skye man, he had been dispossessed in the Highland Clearances, and in 1837 had spent his savings on a passage to Australia. There he became something of a hero, responsible for “discovering” Gippsland, an area of 14,000 square miles (36,260 square km) of fertile plain tucked into Australia’s south-east corner. His memory was honoured with plaques and cairns. Ms Flyn basked in reflected glory. She felt a real sense of kinship with McMillan: like him, she is a Highlander, like him a restless soul.

Then she discovered something horrifying. In July 1843 a group of men called the Highland Brigade, under McMillan’s leadership, surrounded a Gunai encampment at Warrigal Creek and proceeded to slaughter the people. They then fished a wounded child from the creek and ordered him at gunpoint to guide them to other settlements. Further massacres are commemorated in chilling place names: Butchers Creek, Skull Creek, Slaughterhouse Gully. As many as 200 Gunai died that day.

Ms Flyn might have stopped her researches there and then, but she felt conflicted. She had “intergenerational guilt”, a sense that she was somehow implicated in the “Gippsland massacres”, and a desire to understand what inspired them. She had read the diary McMillan kept on his journey to Australia, in which he resolved to “work for the good and advantage of man- ▶▶



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▶ kind...[to be] sweet and benevolent, quiet, peaceably contented...charitable even of aliens". What had happened between his arrival and the massacres that earned him the title "the butcher of Gippsland"? At 27, the age at which McMillan left Scotland, Ms Flyn flew to Australia to find out.

Tracing McMillan's footsteps, she conjures up the landscape of Gippsland, plaiting together travelogue, history, diaries and reflections. She also risks censure as she struggles to comprehend McMillan's atrocities. He was a "mass murderer", she is clear about that. But he saw himself as part of an armed conflict, however lopsided, and launched the massacre at Warrigal Creek in response to the gruesome murder of a white youth by the Gunai. And if McMillan considered them hardly human, he was not alone. In 1838 another group of white settlers led the Myall Creek massacre. When prosecuted, they argued that they had not realised that killing an Aboriginal man was a crime. The *Sydney Herald* supported them: indigenous Australians were "black animals" then.

McMillan has come to symbolise some of the very worst excesses of Australia's violent colonial past. So it is a tribute to Ms Flyn's empathy for his "moral ambivalence" that when she comes to write of his death—possibly suicide—aged 54, the reader feels pity as well as relief. In the end, he remains an enigma. "They were unknown then, now they are unknowable," Ms Flyn writes of those who died. The same is true of the "butcher" who ended so many of their lives. ■

Cricket in Pakistan

Balls of fury

White on Green: Celebrating the Drama of Pakistan Cricket. By Richard Heller and Peter Osborne. *Simon & Schuster*; 354 pages; £20

SPORT does not just provide a window into countries; it helps shape them. In Pakistan, cricket and politics have always been intertwined. In the nation's first Test, in 1952, they were led by Abdul Kardar, who had previously played for India—a small legacy of partition.

Ever since, cricket has been "a bridge to understanding the collective subconscious of Pakistan". So argue Richard Heller and Peter Osborne in "White on Green". The book is really an anthology of the best moments in Pakistani cricket. Often these resonate way beyond the pitch. During partition in 1947, Abdul Aziz Durani, a cricket coach, fled to Karachi, leaving his 12-year-old son with relatives in India. The boy would go on to play 29 Tests for India, but



The A team

would barely see his father, who became one of Pakistan's best-regarded coaches.

Very different is the tale of Dr A.Q. Khan, who gave Pakistan its first nuclear bomb, sold nuclear secrets to North Korea and is a patron of domestic cricket. Misbah-ul-Haq, the current captain, played 19 first-class matches for Khan Research Laboratories, the side Mr Khan helped found.

The tensions between the competing visions for Pakistan as a secular nation and a Muslim one have also played out through cricket. The three founding fathers of Pakistan cricket were a Christian, a Parsi and a Muslim, in keeping with Muhammad Ali Jinnah's vision of Pakistan as a secular state. Three Christians played for Pakistan in the 1950s. But at times—particularly under the captaincy of Inzamam-ul-Haq in the mid-2000s, who led team prayers as the influence of the revivalist Islamic movement Tableeghi-Jamaat spread within the side—Pakistani cricket has seemed anything but secular.

At every turn, the authors' warmth for Pakistan and its cricket shines through. They recount stories about many of the sport's biggest figures (even General Pervez Musharraf is interviewed about his involvement), but the book is best when finding unlikely heroes. Foremost among these are the Khan sisters of Karachi, "Pakistan's cricketing suffragettes", who ignored death threats to form Pakistan's first international women's cricket team. The squad took part in the 1997 Women's World Cup only after the side managed to defy the Pakistan Cricket Board's ban on them leaving the country. Such opposition would be unimaginable today: the women's squad receive contracts from the Board, enjoy mainstream support in the country and, for all their continued challenges, have become a symbol of female empowerment in Pakistan. ■

Reading poetry

War of words

The Hatred of Poetry. By Ben Lerner. *Farrar, Straus & Giroux*; 86 pages; \$12. *Fitzcarraldo*; £9.99

POETRY has always occupied an ambivalent space in society. In the ancient world Plato banned poets from his ideal republic; today they have to navigate the "embarrassment or suspicion or anger" that follows when they admit to their profession in public. Ben Lerner understands this hatred: as a poet he has been on the receiving end of it, but also, more interestingly, he has felt it himself.

Long before he published his two acclaimed novels, "Leaving the Atocha Station" and "10:04", Mr Lerner was known as a poet. Yet the biographical details that are woven into this short and spirited discussion suggest an uneasy relationship with the form. As a boy, charged with learning a poem, Mr Lerner tried to game the system by asking his librarian which was the shortest; later in life he confesses that he has never heard what Sir Philip Sidney described as "the planet-like music of poetry", nor experienced the "trance-like state" widely said by critics to be induced by John Keats ("I've never seen any critic in a trance-like state," he adds, not unfairly).

Yet Mr Lerner does not see all this as a problem; indeed, he believes it to be central to the art form. Poets and non-poets alike hate poetry, he argues, because poetry will always fail to deliver on the transcendental demands people have invested in it. As a result they enjoy pronouncing upon the abstract powers and possibilities of poetry more than they actually like to sit down and read it. As Keats wrote in "Ode on a Grecian Urn", "Heard melodies are sweet, but those unheard/Are sweeter." Mr Lerner takes his cue from Keats, but is a little more frank when he describes "the fatal problem with poetry: poems".

This inevitable sense of falling short is expressed in some of the best poetry ever written, he says, and he elaborates his point with energised discussions of Keats, Walt Whitman and Emily Dickinson. But it is also inadvertently present in some of the worst poetry ever written. "Alas! I am very sorry to say/That 90 lives have been taken away", wrote William Topaz McGonagall, a Scottish poet, in a notoriously underwhelming response to the Tay Bridge disaster of 1879. "When called upon to memorialise a faulty bridge, McGonagall constructs another," writes Mr Lerner, as he dissects McGonagall's swirling metrical confusion with poetically informed glee across a number of pages. ▶▶

▶ But McGonagall's literary ineptitude is well known, and Mr Lerner's essay becomes most interesting when he ventures into more contemporary territory, attacking with polemic zeal what he sees as confused critical assaults on modern poetry: the belief in a "vague past the nostalgists can never quite pinpoint" when poetry could still unite everyone, or in a "capacity to transcend history" that often seems to rely on its poetic purveyors being "white men of a certain class". The hatred of poetry, Mr Lerner shows, can suddenly and revealingly become a vehicle for bitter politics. Yet he also sees communal redemption in the strange bond people have with this ancient art form: if we constantly think poetry is an embarrassing failure, then that means that we still, somewhere, have faith that it can succeed. ■

Sculpture parks in Britain

Training the eye

Outdoor sculpture is all the rage

THIRTY years ago, outdoor sculpture in Britain was chiefly classical statuary or naming a private landscaped garden (complete with ha-ha) or the odd Henry Moore. Now people are driving hundreds of miles out of their way in search of it. From the exquisite New Art Centre at Roche Court near Salisbury to the biennial selling exhibition at Asthall Manor outside Oxford, sculpture parks are the hot new British summer destination, combining culture with bracing fresh air. The three most important are the Yorkshire Sculpture Park (YSP) near Wakefield, Jupiter Artland near Edinburgh and the Cass Sculpture Foundation in West Sussex. In contrast to YSP, which is publicly funded, Jupiter Artland and Cass are private ventures—but based on very different models.

At YSP a massive stainless-steel sculpture of a camel's pelvis gleams in the sunshine. Clever siting of the piece—part of a solo show of work by Not Vital, a Swiss artist—ensures that the visitor's eye is drawn not only to the sculpture itself, but also through it to the landscape beyond, an essential element if you are thinking of creating a sculpture park. Founded in 1977, YSP's 500 acres (202 hectares) of rolling green park and woodland last year attracted over 500,000 visitors. From the beginning the focus has been on exhibitions, complemented by a collection that includes pieces by Anthony Caro, Joan Miró and Barbara Hepworth, mostly on long-term loan. A 20-year survey of Andy Goldsworthy's work in 2007 proved popular. More often than

not, though, YSP is introducing visitors to artists, such as Not Vital, that they have probably never heard of—and it has managed to take its audience with it.

On a smaller scale, Jupiter Artland is also attracting big numbers. On July 6th it will hear whether it has won the Art Fund Museum of the Year award, for which four other entities have also been shortlisted. Created by Nicky Wilson, an artist, and her husband Robert, who is chairman of Nelsons, a homeopathic health-care company, it attracted 8,000 visitors when it opened for the summer in 2009. Twelve thousand would probably be the limit, Mr Wilson told an interviewer the following year. Yet the numbers continue to rise: 70,000 visited last summer. And no wonder.

The magic begins when the wooded driveway rounds a bend and Charles Jencks's "Life Mounds" (pictured), a series of majestic green earthworks, rise up on either side. It continues as, armed with the state-of-the-art Jupiter Artland app, you go in search of Anya Gallaccio's underground amethyst folly; Anish Kapoor's disturbing "Suck"; or "Separation in the Evening" by a rising Glasgow-based star, Sara Barker.

The completion of the Jencks project—a multi-year undertaking that Mrs Wilson helped map out—signalled the start of the park. Once they had "Life Mounds", the Wilsons felt they should open to the public. And they continue to commission. Next month Christian Boltanski will install "Animitas", a mass of small Japanese bells on long stalks that will chime "the music of the souls" as they sway in the breeze on an island in Jupiter's duck pond.

Cass commissions work too, but not in order to collect it. The foundation came

into being in 1992, when Wilfred Cass (now 91, and still much involved) and his wife Jeannette embarked on a retirement project that would promote monumental outdoor sculpture. Mr Cass, who had fled Nazi Germany as a child and later found his calling as a rescuer of failing companies, wanted a way to speculate on behalf of artists. So began a process whereby the foundation commissions sculpture with a view to selling it, supporting the artist through the fabrication process and displaying the results in its elegant parkland. When works sell, half the proceeds go to the artist and half back into the kitty to fund the next round of commissions.

Having initially focused on Britain, Cass has this year gone international in a big way. Next month an exhibition entitled "A Beautiful Disorder" will showcase the work of 18 contemporary artists from greater China. Whereas most pieces had still to arrive, a visit in mid-May revealed at least one treat in store in the form of Jennifer Wen Ma's "Molar", an immersive "landscape" in which dramatic clusters of black "leaves" and glass "fruit" overhang dark pools of Chinese ink.

Though their models differ considerably, Cass, Jupiter and YSP are united in their pursuit of the new. Mr Cass's response to Storm King, a sculpture park in upstate New York, was that it had great art, but most of it was 40 years old: his park would not be full of outdated works. And the pursuit of the new includes nurturing the next generation. When Mr Wilson says, "One of our roles is to encourage younger artists—to give them that rite of passage of moving into the outdoors," he speaks essentially for all three organisations. ■



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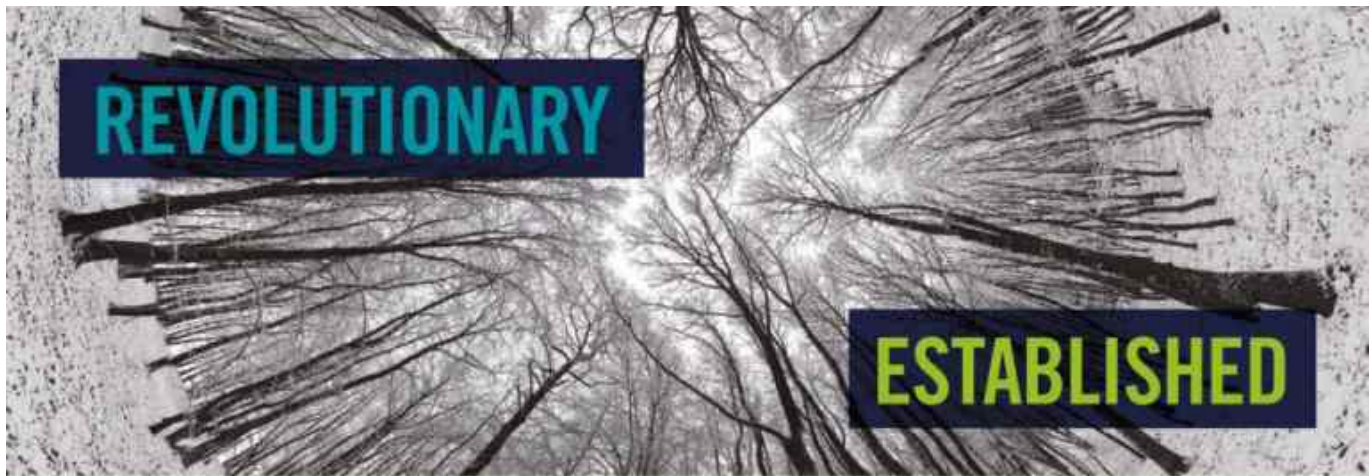
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	Gross domestic product			Industrial production latest	Consumer prices		Unemployment rate, %	Current-account balance		Budget balance % of GDP 2016 ^f	Interest rates, % 10-year gov't bonds, latest	Currency units, per \$	
	latest	qtr* 2016 ⁱ	2016 ⁱ		latest	2016 ⁱ		latest 12 months, \$bn	% of GDP 2016 ^f			Jun 22nd	year ago
United States	+2.0 Q1	+0.8	+1.8	-1.4 May	+1.0 May	+1.4	4.7 May	-473.1 Q1	-2.5	-2.5	1.69	-	-
China	+6.7 Q1	+4.5	+6.6	+6.0 May	+2.0 May	+1.9	4.0 Q1 [§]	+293.5 Q1	+2.7	-3.1	2.78 ^{§§}	6.58	6.21
Japan	+0.1 Q1	+1.9	+0.6	-3.3 Apr	-0.3 Apr	nil	3.2 Apr	+157.2 Apr	+3.4	-6.1	-0.15	105	123
Britain	+2.0 Q1	+1.4	+1.8	+1.6 Apr	+0.3 May	+0.7	5.0 Mar ^{††}	-146.9 Q4	-4.8	-3.6	1.37	0.68	0.63
Canada	+1.1 Q1	+2.4	+1.5	-0.2 Mar	+1.5 May	+1.6	6.9 May	-47.6 Q1	-2.7	-1.6	1.23	1.28	1.23
Euro area	+1.7 Q1	+2.2	+1.5	+2.0 Apr	-0.1 May	+0.3	10.2 Apr	+367.5 Apr	+3.0	-1.9	0.05	0.89	0.88
Austria	+1.6 Q1	-0.7	+1.3	+2.5 Mar	+0.6 May	+1.1	5.8 Apr	+9.6 Q4	+2.2	-1.9	0.38	0.89	0.88
Belgium	+1.5 Q1	+0.9	+1.3	+1.2 Mar	+2.2 May	+1.5	8.7 Apr	-0.1 Dec	+1.2	-2.4	0.45	0.89	0.88
France	+1.4 Q1	+2.6	+1.4	+1.9 Apr	nil May	+0.2	9.9 Apr	-21.9 Apr [‡]	-0.5	-3.5	0.42	0.89	0.88
Germany	+1.6 Q1	+2.7	+1.6	+1.2 Apr	+0.1 May	+0.4	6.1 May	+301.0 Apr	+8.0	+0.4	0.05	0.89	0.88
Greece	-1.3 Q1	-1.9	+1.2	+2.9 Apr	-0.9 May	+0.4	24.1 Mar	+1.3 Apr	+2.1	-3.9	8.09	0.89	0.88
Italy	+1.0 Q1	+1.0	+1.0	+1.8 Apr	-0.3 May	+0.2	11.7 Apr	+43.3 Apr	+1.9	-2.5	1.36	0.89	0.88
Netherlands	+1.4 Q1	+1.9	+1.7	+2.8 Apr	nil May	+0.5	7.6 May	+68.8 Q4	+9.7	-1.6	0.29	0.89	0.88
Spain	+3.4 Q1	+3.1	+2.8	+8.9 Apr	-1.0 May	-0.4	20.1 Apr	+17.1 Mar	+1.2	-3.5	1.51	0.89	0.88
Czech Republic	+2.6 Q1	+1.4	+2.7	+4.2 Apr	+0.1 May	+1.3	5.4 May [§]	+2.7 Q1	-0.1	-1.5	0.51	24.0	23.9
Denmark	+0.1 Q1	+2.2	+1.2	+2.0 Apr	+0.1 May	+0.7	4.3 Apr	+18.5 Apr	+6.0	-2.8	0.27	6.60	6.55
Norway	+0.7 Q1	+4.0	+1.5	+6.0 Apr	+3.4 May	+2.5	4.6 Apr ^{††}	+29.3 Q1	+11.2	+6.8	1.15	8.31	7.72
Poland	+2.5 Q1	-0.4	+3.5	+3.5 May	-0.9 May	+1.2	9.2 May [§]	-2.3 Apr	-1.9	-2.1	3.04	3.91	3.66
Russia	-1.2 Q1	na	-0.9	+0.7 May	+7.3 May	+7.5	5.6 May [§]	+51.3 Q1	+3.3	-2.5	8.54	64.1	53.9
Sweden	+4.2 Q1	+2.0	+3.5	+3.5 Apr	+0.6 May	+1.0	7.6 May [§]	+28.2 Q1	+5.6	-0.5	0.59	8.25	8.11
Switzerland	+0.7 Q1	+0.4	+1.2	+1.0 Q1	-0.4 May	-0.6	3.5 May	+71.9 Q1	+9.6	+0.3	-0.41	0.96	0.92
Turkey	+4.8 Q1	na	+3.3	+0.6 Apr	+6.6 May	+7.7	10.1 Mar [§]	-28.6 Apr	-4.6	-1.8	9.63	2.90	2.66
Australia	+3.1 Q1	+4.3	+2.6	+4.8 Q1	+1.3 Q1	+1.6	5.7 May	-62.3 Q1	-4.0	-2.0	2.22	1.34	1.29
Hong Kong	+0.8 Q1	-1.8	+2.0	-0.3 Q1	+2.6 May	+2.6	3.4 May ^{††}	+9.6 Q4	+2.7	-0.4	1.20	7.76	7.75
India	+7.9 Q1	+9.6	+7.5	-0.8 Apr	+5.8 May	+5.1	4.9 2013	-22.1 Q1	-1.1	-3.7	7.48	67.5	63.5
Indonesia	+4.9 Q1	na	+5.1	+1.6 Apr	+3.3 May	+4.3	5.5 Q1 [§]	-18.2 Q1	-2.4	-1.9	7.59	13,263	13,310
Malaysia	+4.2 Q1	na	+5.5	+3.0 Apr	+2.0 May	+2.8	3.5 Mar [§]	+7.0 Q1	+2.6	-3.7	3.88	4.03	3.73
Pakistan	+5.7 2016**	na	+4.8	+6.7 Mar	+3.2 May	+5.1	5.9 2015	-2.5 Q1	-0.9	-4.6	8.03 ^{†††}	105	102
Philippines	+6.9 Q1	+4.5	+6.2	+10.5 Apr	+1.6 May	+2.6	6.1 Q2 [§]	+6.7 Mar	+3.5	-1.9	4.44	46.4	45.0
Singapore	+1.8 Q1	+0.2	+2.3	+2.9 Apr	-0.5 Apr	+1.0	1.9 Q1	+54.8 Q1	+20.6	+0.9	2.03	1.34	1.34
South Korea	+2.8 Q1	+2.1	+2.6	-2.8 Apr	+0.8 May	+1.3	3.7 May [§]	+103.1 Apr	+7.0	+0.4	1.64	1,157	1,099
Taiwan	-0.7 Q1	+3.1	+2.1	-3.6 Apr	+1.2 May	+1.0	4.0 May	+74.8 Q1	+12.4	-0.9	0.81	32.3	30.7
Thailand	+3.2 Q1	+3.8	+3.5	+1.5 Apr	+0.5 May	+2.4	1.0 Apr [§]	+39.6 Q1	+3.0	-2.2	2.15	35.2	33.6
Argentina	+2.3 Q2	+2.0	-0.7	-2.5 Oct	— ***	—	5.9 Q3 [§]	-15.9 Q4	-2.6	-2.8	na	13.9	9.09
Brazil	-5.4 Q1	-1.1	-3.7	-7.2 Apr	+9.3 May	+8.3	11.2 Apr [§]	-34.1 Apr	-1.4	-5.7	12.63	3.40	3.07
Chile	+2.0 Q1	+5.3	+3.1	-3.4 Apr	+4.2 May	+3.6	6.4 Apr ^{§††}	-4.7 Q1	-1.4	-1.8	4.57	676	630
Colombia	+2.5 Q1	+0.6	+3.3	+8.4 Apr	+8.2 May	+4.4	9.0 Apr [§]	-16.9 Q1	-5.2	-1.9	8.14	2,980	2,537
Mexico	+2.6 Q1	+3.3	+2.3	+1.9 Apr	+2.6 May	+3.0	3.9 Apr	-30.5 Q1	-2.9	-3.0	6.07	18.6	15.3
Venezuela	-8.8 Q4~	+8.4	-7.7	na	na	+220	7.3 Apr [§]	-17.8 Q3~	-1.7	-15.5	10.53	9.99	6.30
Egypt	+4.0 Q4	na	+3.8	-12.7 Apr	+12.3 May	+9.8	12.7 Q1 [§]	-16.8 Q4	-2.7	-9.8	na	8.88	7.63
Israel	+1.9 Q1	+1.3	+3.5	+1.2 Apr	-0.8 May	+1.2	4.9 Apr	+14.7 Q1	+4.2	-2.5	1.76	3.86	3.78
Saudi Arabia	+3.5 2015	na	+2.8	na	+4.1 May	+3.8	5.6 2015	-53.5 Q4	-1.8	-9.3	na	3.75	3.75
South Africa	-0.2 Q1	-1.2	+0.7	+1.8 Apr	+6.1 May	+6.4	26.7 Q1 [§]	-13.4 Q1	-4.2	-3.3	8.88	14.7	12.1

Source: Haver Analytics. **% change on previous quarter, annual rate. [†]The Economist poll or Economist Intelligence Unit estimate/forecast. [§]Not seasonally adjusted. ^{††}New series. ~2014 **Year ending June. ^{†††}Latest 3 months. ^{††††}3-month moving average. ^{§§§}5-year yield. ^{***}Official number not yet proved to be reliable; The State Street PriceStats Inflation Index, May 37.09%; year ago 26.74% ^{†††††}Dollar-denominated bonds.

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Markets

	Index Jun 22nd	% change on		
		one week	Dec 31st 2015	
			in local currency	in \$ terms
United States (DJIA)	17,780.8	+0.8	+2.0	+2.0
China (SSEA)	3,041.4	+0.6	-17.9	-19.0
Japan (Nikkei 225)	16,065.7	+0.9	-15.6	-3.0
Britain (FTSE 100)	6,261.2	+4.9	+0.3	-0.1
Canada (S&P/TSX)	14,003.8	+0.6	+7.6	+16.6
Euro area (FTSE Euro 100)	1,007.3	+4.9	-8.0	-4.4
Euro area (EURO STOXX 50)	2,978.3	+5.2	-8.9	-5.3
Austria (ATX)	2,213.8	+4.2	-7.6	-4.1
Belgium (Bel 20)	3,452.8	+3.9	-6.7	-3.1
France (CAC 40)	4,380.0	+5.0	-5.5	-1.9
Germany (DAX)*	10,071.1	+4.8	-6.3	-2.6
Greece (Athex Comp)	611.6	+6.3	-3.1	+0.6
Italy (FTSE/MIB)	17,323.3	+4.9	-19.1	-16.0
Netherlands (AEX)	441.3	+5.2	-0.1	+3.7
Spain (Madrid SE)	875.4	+5.4	-9.3	-5.8
Czech Republic (PX)	852.1	+4.2	-10.9	-7.6
Denmark (OMXCXB)	847.4	+2.2	-6.5	-2.7
Hungary (BUX)	26,789.4	+1.8	+12.0	+16.8
Norway (OSEAX)	665.9	+2.9	+2.6	+9.4
Poland (WIG)	46,196.7	+2.9	-0.6	+0.9
Russia (RTS, \$ terms)	927.3	+1.9	+8.0	+22.5
Sweden (OMXS30)	1,354.6	+3.9	-6.4	-4.8
Switzerland (SMI)	7,972.1	+3.8	-9.6	-5.7
Turkey (BIST)	77,267.4	+1.4	+7.7	+8.3
Australia (All Ord.)	5,349.5	+2.3	+0.1	+3.1
Hong Kong (Hang Seng)	20,795.1	+1.6	-5.1	-5.2
India (BSE)	26,765.7	+0.1	+2.5	+0.5
Indonesia (JSX)	4,896.8	+1.7	+6.6	+10.6
Malaysia (KLSE)	1,637.7	+0.6	-3.2	+3.0
Pakistan (KSE)	38,149.3	-1.1	+16.3	+16.3
Singapore (STI)	2,786.1	+0.4	-3.4	+2.3
South Korea (KOSPI)	1,992.6	+1.2	+1.6	+3.2
Taiwan (TWI)	8,716.3	+1.3	+4.5	+6.6
Thailand (SET)	1,424.7	-0.7	+10.6	+13.0
Argentina (MERV)	13,742.3	+4.8	+17.7	+8.4
Brazil (BVSP)	50,156.3	+2.5	+15.7	+34.9
Chile (IGPA)	19,730.6	+0.7	+8.7	+14.7
Colombia (IGBC)	9,884.8	+1.7	+15.6	+24.3
Mexico (IPC)	45,806.2	+1.8	+6.6	-0.8
Venezuela (IBC)	13,957.5	-3.7	-4.3	na
Egypt (Case 30)	7,156.5	-3.5	+2.1	-9.9
Israel (TA-100)	1,240.5	+0.4	-5.7	-4.7
Saudi Arabia (Tadawul)	6,532.4	-0.5	-5.5	-5.4
South Africa (JSE AS)	53,557.2	+2.9	+5.6	+11.6

Foreign direct investment

Global inflows of foreign direct investment (FDI) were \$1.8 trillion in 2015, up by 38% on the year before. After three years of contraction, FDI flows to developed economies almost doubled, to \$962 billion, the highest level since 2007. M&A deals involving companies in the United States and Ireland helped boost flows into these two countries; in Europe as a whole, deal-making was up by 36%. Canadian inflows were adversely affected by low commodity prices; a slump in Britain can be explained by a fall in intra-company loans. The global outlook for 2016 is not cheery, however: weak aggregate demand and policy measures to curb tax evasion suggest that flows could decline by 10-15% this year.



Source: UNCTAD

Other markets

	Index Jun 22nd	% change on		
		one week	Dec 31st 2015	
			in local currency	in \$ terms
United States (S&P 500)	2,085.5	+0.7	+2.0	+2.0
United States (NAScomp)	4,833.3	nil	-3.5	-3.5
China (SSEB, \$ terms)	342.6	-0.7	-18.6	-19.7
Japan (Topix)	1,284.6	+0.6	-17.0	-4.6
Europe (FTSEurofirst 300)	1,342.4	+5.6	-6.6	-3.0
World, dev'd (MSCI)	1,667.9	+2.1	+0.3	+0.3
Emerging markets (MSCI)	829.3	+2.6	+4.4	+4.4
World, all (MSCI)	402.2	+2.1	+0.7	+0.7
World bonds (Citigroup)	954.8	+0.2	+9.7	+9.7
EMBI+ (JPMorgan)	774.6	+1.1	+10.0	+10.0
Hedge funds (HFRX)	1,162.7 [§]	nil	-1.0	-1.0
Volatility, US (VIX)	21.2	+20.1	+18.2 (levels)	
CDSs, Eur (iTRAXX) [†]	77.5	-10.4	+0.5	+4.3
CDSs, N Am (CDX) [†]	78.9	-6.2	-10.7	-10.7
Carbon trading (EU ETS) €	5.7	-0.2	-31.2	-28.6

Sources: Markit; Thomson Reuters. [§]Total return index.[†]Credit-default-swap spreads, basis points. [§]June 21st.Indicators for more countries and additional series, go to: Economist.com/indicators

The Economist commodity-price index

2005=100

	Jun 14th	Jun 21st*	% change on	
			one month	one year
Dollar Index				
All Items	141.8	140.3	+3.6	-1.3
Food	172.7	168.3	+3.7	+4.6
Industrials				
All	109.6	111.1	+3.3	-9.4
Nfa [†]	118.1	120.1	+3.8	-4.3
Metals	106.0	107.3	+3.1	-11.6
Sterling Index				
All items	184.1	173.9	+3.1	+5.8
Euro Index				
All items	157.3	154.8	+2.5	-2.1
Gold				
\$ per oz	1,285.9	1,270.6	+2.9	+7.8
West Texas Intermediate				
\$ per barrel	48.6	49.0	+1.4	-19.6

Sources: Bloomberg; CME Group; Cotlook; Darmann & Curt; FT; ICCO; ICO; ISO; Live Rice Index; LME; NZ Wool Services; Thompson Lloyd & Ewart; Thomson Reuters; Urner Barry; WSJ. *Provisional

[†]Non-food agriculturals.

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Star turn

Jo Cox, the first British MP to be murdered since 1990, died on June 16th, aged 41

OUT-OF-TOUCH and self-centred at best; deceitful and crooked at worst: Britons have developed smoulderingly low opinions of their rulers. Jo Cox—idealistic, diligent, likeable and rooted in her Yorkshire constituency—was a living rebuttal of that cynicism.

Britain's political class is easily caricatured as an inbred elite. But she was the first member of her family to go to university. True, she found Cambridge daunting: it mattered so much how you talked and whom you knew. Other undergraduates had posh professional parents and had taken sunny gap years. Her only foreign travel had been package holidays in Spain, with summers spent packing toothpaste in the factory where her father worked; indeed she had assumed, until school pointed its head girl farther afield, that she would spend her life working there.

For all her brains and charm, Cambridge jolted her confidence—setting her back five years, she said. But when in 2015 she reached the House of Commons, mastering the ways of that self-satisfied, mysterious and privileged institution was easy.

Also unlike a stereotypical politician, she had a real life. She had been an aid worker for ten years. She had met rape victims in Darfur in Sudan, and talked to child soldiers about how they had been forced

to kill their family members. She commuted to the House of Commons by bicycle, from the houseboat she shared with her husband and two young children, its view of Tower Bridge the only luxury she allowed herself to enjoy. (She wasn't a TV star and wouldn't dress like one, she firmly told a constituent who wondered if she might like to vary her trademark, unfussy blue blazers and red dresses.)

Principles mattered; tribalism did not. She was Labour "to the core", but one of the most moving of many tributes after her murder was by Andrew Mitchell, her Conservative co-chair of the all-party Friends of Syria group. He called her a "five-foot bundle of Yorkshire grit", and recalled her ferocious scolding of the Russian ambassador for his country's role in Syria's civil war. She and her Tory counterpart would text each other across the floor of the House of Commons, oblivious to the baying partisanship that raged about them. Other such friendships abounded.

Like many Labour moderates, she nominated the left wing no-hoper, Jeremy Corbyn, for the party leadership, with the aim of making the contest livelier and more representative of the movement's grass roots. Also like many, she regretted it later: the party needed a forward-looking election-winner, not a throwback bound

by the comforting nostrums of the past.

But unlike many self-styled Labour modernisers, she did not plot against the hapless party leader. Back-stabbing was not her style: there was work to do. A lot of that involved championing unpopular causes. Working-class Labour voters, like the ones who put her in Parliament, tend increasingly to be pro-Brexit and nativist. Mrs Cox was a fervent pro-European. Her Batley and Spennings constituency, she said fondly in her maiden speech, was not just a great maker of traditional biscuits but also "deeply enhanced" by immigration.

Fired up

She bemoaned British foreign policy's missing moral compass. Whereas many Labourites droned or ranted at the prime minister's weekly question-and-answer session, she asked him, calmly and devastatingly, whether he had "led public opinion on the refugee crisis or followed it". That unsettled Mr Cameron, and (aides now say) helped change British policy. Her plainly spoken ambition to be foreign secretary one day looked more than plausible.

Helping her constituents was her most rewarding job, yet also prompted the tragic circumstances of her death. Though Westminster and Whitehall are tightly guarded, British politicians have scant protection when they venture outside. Only a handful of senior ministers have police bodyguards. Constituents wanting to meet their representatives simply make appointments for their regular surgeries (advice sessions)—or, as in the case of Mrs Cox's assailant, wait outside in the street.


Trust and openness come at a cost. Five politicians were assassinated during the Troubles in Northern Ireland, the last of them Ian Gow, blown up by a car bomb outside his home in 1990. In 2000 a regular visitor to the Cheltenham constituency office of Nigel Jones, then a Liberal Democrat MP, entered in a frenzy, wielding a sword, wounding the lawmaker and killing his assistant, Andrew Pennington. In 2010 an Islamist extremist walked into a constituency surgery to stab and nearly kill the Labour MP Stephen Timms. A recent survey showed four out of five MPs saying that they had experienced intrusive or aggressive behaviour. Mrs Cox herself had complained to the police about abuse—although not involving the 52-year-old gardener with, seemingly, far-right views and psychiatric problems who is now charged with her shooting and stabbing.

The toxic echo-chamber of social media, plus untreated mental illness, help turn stalkers and oddballs into murderous maniacs. One of Mrs Cox's political precepts was that ignoring problems makes them worse—something to ponder as Britain thinks about its lawmakers, belatedly and sombrely, in a perhaps kinder light. ■



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