

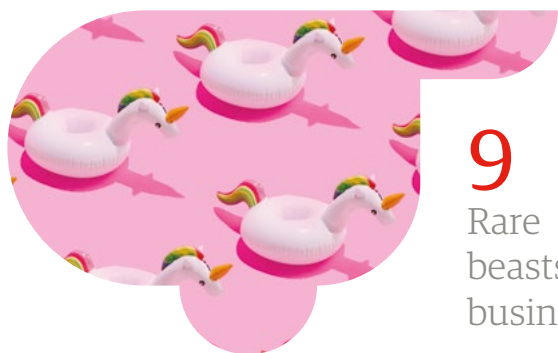
Vision Review

Edition 19

Who is President Xi?

From cave-dwelling outcast
to all-powerful leader





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A cry for help



Welcome to the Winter edition of *Vision Review*



“When France sneezes,” Austrian diplomat Klemens von Metternich remarked in the wake of the French Revolution, “Europe catches a cold.” Reflecting shifts in global power, this maxim has metamorphosed over time and is now most often framed in terms of US hegemony. “When America sneezes,” we usually say today, “the world catches a cold.”

But what about when China sneezes? The machinations of the second-largest economy on Earth are becoming ever more significant, with the actions of one man in particular perhaps most important of all. Our lead article examines the extraordinary rise of President Xi Jinping and considers how his journey from exiled cave-dweller to “paramount leader” has shaped his worldview.

One of Xi’s declared aims is to propel China to the frontier of innovation. We touch on these efforts in discussing the phenomenon of unicorns – young, privately owned companies with billion-dollar valuations – and the UK’s own attempts to develop them.

Cutting-edge technology is also to the fore in several other pieces in this edition. We investigate the recent shortage of computer chips, tracing the history of an invention that has come to impact on almost every aspect of our lives; we explain the challenges of eco-flying; and we ask whether radical advances could at last help realise the long-promised dream of a four-day working week. Delving into the mysteries of ancient cures, we also look at how the past is informing both the present and the future.

Other topics featured in this issue are typically diverse. They include diversity itself, the growth of the seaweed business, the boom in retirement villages, the science behind sniffer dogs and – yum – the search for the world’s most delicious marmalade. We also hear from a member of the Vision network, Simon Field, of Valere Wealth Management, who discusses the challenges and pleasures of delivering superior financial advice during the past two years.

As ever, we hope you enjoy all the articles. We would be delighted to hear from you if you have any feedback or if you have any suggestions for subjects we might cover in forthcoming editions of *Vision Review*.



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If you have any comments on this publication or suggestions for topics that you would like to see discussed in the future, please let me know.

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A poster of Chinese President Xi Jinping stares down at passers-by in Beijing.

Image: Aly Song/Reuters

Xi Jinping – journey to power

Xi Jinping is arguably the most powerful man in the world. But what do we really know about the President of China? And should we be concerned about the direction in which he is taking his country?

Jane Sydenham

In the once-desolate village of Liangjiahe, North-West China, hundreds of tourists a day queue to visit a series of caves where, back in 1969, a naïve and privileged young 15-year-old from Beijing was banished.

The teenager spent seven years in the village, labouring alongside the local peasants who ground a living from the soft hillside dirt.

“He slept here. He didn’t know how to cook. He didn’t know how to adapt to life in the countryside,” says an elderly villager, Gong Zhengfu. He shows visitors the bed of brick and clay on which the boy fell exhausted each night. “At first we had to arrange for people to cook for him,” he says.

“We taught him how to plough the land and carry manure,” adds another villager, Shi Yuxin. “When he left the village, he cried.”

That boy was Xi Jinping. This experience shaped his life, and it is shaping the lives of millions more today.

A life of privilege

Xi Jinping (pronounced “shee jin ping”) was born in Beijing in 1953, the son of Xi Zhongxun, a Chinese communist revolutionary who had helped Mao Zedong rise to power and held a senior role in government as Head of Propaganda.

As the son of a revolutionary hero, Xi Jinping enjoyed a privileged upbringing among the families of the party elite. But it was not to last.

Mao’s megalomaniac tendencies began to emerge in the 1960s. The failure of the Great Leap Forward brought famine to the country and the deaths of as many as 55 million people. As the senior party leadership became fractured and in-fighting broke out, Xi’s father was purged and demoted – sent to work in a remote tractor factory.

Worse followed. With the start of the Cultural Revolution in 1966, his case was once more examined and the historic accusations against him expanded. He was jailed and forced to undertake “thought reform” through hard labour.

The Cultural Revolution lasted 10 years. It was a period of political and social chaos designed to mobilise China's masses behind Mao, helping to reimpose his control over the Communist Party.

Mao's enemies were crushed, schools and universities were closed, and gangs of teenagers wearing red armbands – Red Guard groups – roamed the streets, destroying property, tearing down signs and persecuting those wearing “bourgeois clothes”.

They ransacked the Xi family home. His older sister, Xi Heping, committed suicide in the wake of the trauma.

Though Mao's intentions to root out opposition and strengthen his waning leadership were partially successful, the levels of violence and disorder soon became too extreme even for him. He declared it “very necessary for the educated youth to go to the countryside and undergo re-education by the poor peasants”. In the years that followed as many as 17 million youths were sent to live like farmers.

Without his disgraced father's protection, Xi was one of them. It was a difficult time. After a few months, torn from his parents and siblings, he fled back to Beijing. He was arrested and sent to work on a camp to dig ditches before returning to the village.

Death of Mao

Mao died in 1976. His successors sought to restore order and rebuild the economy. From 1978 Deng Xiaoping quietly began opening up the country and encouraging enterprise – he designated special economic zones (SEZs) in strategically placed areas to re-open to international trade and exploit China's abundance of cheap labour.

In 1989 troops fired at pro-democracy protesters in Tiananmen Square, leaving thousands dead and wounded. The massacre demonstrated the limits of Deng's willingness to shift too far from the model of centralised control. He has,



Left: Five-year-old Xi Jinping (left) with his father Xi Zhongxun and his younger brother. Right: Tourists visit the cave in Liangjiahe where Xi lived as a teenager.

“We taught him how to plough the land and carry manure.”

however, been credited with igniting China's rise to economic power in the 21st century.

Under Deng's more liberal regime, Xi flourished and began his own skyward trajectory. After a spell in the People's Liberation Army and a failed first marriage, he began working in local government.

Meteoritic rise

In 1985 Xi moved to the vast coastal area of Fujian Province, directly opposite the island of Taiwan, and took up a township-level governmental role in one of Deng's SEZs, Xiamen. Here he experienced first-hand the benefits of reform – and the problematic side-effect of corruption.

It was here, too, that he met and married his second wife, Peng Liyuan, one of the most famous singers of traditional Chinese songs.

Anyone predicting at this point that Xi would one day become China's President might have had their sanity questioned.

He was elevated to provincial-level leadership as a Deputy Governor in 1996, enabling him to stand for one of the alternate 150 posts of the national Central Committee of the Party the following year. This is where serious power really begins to lie in China. Famously, Xi missed out by one position. He secured a slot only when a 151st position was made available for him by political allies, including old friends of his father.

In 2000 Xi became Governor of Fujian province. Two years later he was moved to Zhejiang, a coastal province to the north, as Party Secretary – a much more powerful position. There he supported local enterprises, including the internet start-up Alibaba, created by former English teacher Jack Ma, a native of the province.

In 2007 Xi briefly served as Party Secretary of Shanghai, and in October 2007 he was appointed to the nine-man Politburo Standing Committee. He took charge of the 2008 Summer Olympics and was elected Vice President.

When his nearest rival for the ultimate crown of “paramount leader”, Bo Xilai, fell from grace – convicted of bribery and embezzlement charges – Xi's position as

successor was secured. On 15 November 2012 he was elected to the post of General Secretary of the Communist Party, making him informally the paramount leader. He was elected President in March 2013.

Xi today

For much of the past decade Xi has seemed to encourage free enterprise, enabling the rise of giant companies like Tencent, Alibaba and JD.com and the success of billionaire Chinese business owners, who are every bit as charismatic – and almost as rich – as American counterparts such as Jeff Bezos and Elon Musk.

This has led many in the West to see Xi's reforms as a shift towards Western values and beliefs.

We assume his experience makes him a natural successor to Deng, in the liberal tradition. We assume, too, that he must resent the man responsible for the suffering visited on his family in the '60s and '70s. It is a mistake people have only recently begun to realise.

In China, Xi has always spoken positively of Mao and his experience in Liangjiahe. Mao's various reforms may have accounted for millions of deaths, but Xi describes these as years of learning. He paints the picture of the Party that has emerged as an effective governing force that is helping restore China to its central role in the world. Rather than regarding them as divided, he sees himself as reconciling the pre- and post-1978 eras.

He has said: "There are people who think that reform and opening up are the same as adopting Western universalist values, Western political systems, and if these things don't happen then it's not reform. This is mistaken and distorts what we are doing. Of course, we want to raise the banner of reform, but our reform is one that will continuously have Chinese characteristics."

And communist ones. A Chinese phrase says: "There can only be one tiger on the

mountain." Since coming to power Xi has ruthlessly built his power base, ensuring he is that tiger. A rigorous anti-corruption campaign won him the support of China's poor while helping concentrate power to himself. He has taken up many of the most important positions within the Party himself or has filled the seats with close followers. He has also removed the constitutional restriction on him serving more than two terms, which would have seen him step down in 2023. His power is now as great as Mao's once was. He may rule till he dies – or is overthrown.

Defender of the faith

Professor Steve Tsang, a political scientist and historian at the School of Oriental and African Studies in London, says: "Xi is a Leninist and Marxist able to rely completely on the Communist Party to exercise control in practically every area of Chinese life. So, he is not just a dictator but a dictator using the world's most

"Under Deng's more liberal regime, Xi flourished and began his own skyward trajectory."

Screen showing President Xi during a show commemorating the 100th anniversary of the founding of the Communist Party of China in 2021.



efficient instrument of control to exercise power and make changes as he sees fit."

He is also a visionary. Tsang says Xi is on a mission to rejuvenate China and restore the country to a mythical status he believes it had in the 18th century, when people would pay homage to the Chinese Emperor, the Son of Heaven, before its humiliation at the hands of the British Empire. He sees himself as one of China's greatest leaders.

T. E. Lawrence warned: "All men dream; but not equally. Those who dream by night in the dusty recesses of their minds wake up in the day to find that it was vanity, but the dreamers of the day are dangerous men, for they may act their dreams with open eyes to make it possible." Does that make Xi dangerous?

Incursions into Taiwan's air defence zone in the South China Sea, along with recent proclamations by Xi that he will "reunify" Taiwan with China, certainly make people concerned. In a speech in September last year, Xi described Taiwan's independence as "the most serious hidden danger to national rejuvenation", adding: "The historic task of the complete reunification of the motherland must be fulfilled – and definitely will be fulfilled."

Tsang says: "Xi Jinping believes that his Leninist party system is the best system in the world. And he wants to make sure

that system is always protected and safe. A world that promotes democracy and seeks to make other countries more democratic is a world that is not safe for Leninist China.”

Tsang believes this makes conflict between China and the US almost inevitable – eventually. One mountain; one tiger.

Economic instability

A more immediate concern may be China’s current economic stability. In recent months Xi appears to have launched his own Mao-style reforms, with a crackdown on businesses that fail to toe the Communist Party line.

In November 2020, he unexpectedly intervened to prevent the public offering of Ma’s payments and lending business, Ant Group. Attacks on other tech groups and other industries have followed. Targets include private tutoring – an industry that is worth \$100 billion but which Beijing has decreed can now operate only without profit – and the video-games industry. Children are now limited to just one hour online on only Fridays, Saturdays and Sundays.

What seems to have happened is that certain big internet companies grew too quickly in a lax regulatory environment. This meant data privacy and other consumer rights were not protected and fair market competition was not practised. With Jack Ma in particular known for publicly criticising government policies, these firms were seen by Xi as gaining too much political influence – and tougher regulations were brought in.

Xi’s determination to put domestic capital markets in order is also thought to have been a factor in moves such as cancelling the IPO of Ant Group, a microloans company. At a widely speculated 60 times leverage, Ant’s IPO could have further escalated concerns over China’s financial stability.



Children in China are now limited to just one hour online – and only on Fridays, Saturdays and Sundays.

“We want to raise the banner of reform, but our reform is one that will continuously have Chinese characteristics.”

These moves saw trillions of dollars wiped off the value of Chinese tech and education shares last year, as well as hundreds of property developers facing bankruptcy.

Russell Napier is curator of the Library of Mistakes in Edinburgh, which is dedicated to recording the financial folly of humankind. He is also the author of a history of the Asian Financial Crisis – he was a young analyst in Asia when it broke in the late ’90s. He has serious concerns about the way Xi has allowed debt levels to rise, and he worries that the President’s tactics for reducing them are driven by an ulterior motive.

Napier says: “Since his ascent to power Xi has taken steps to increase the control that he and the Chinese Communist Party have over many facets of life in China. Exploding debt bombs across the

Chinese private sector would let the Chinese state intervene to take control of distressed companies. Xi’s decision to permit much more debt distress than investors believed possible may be another mechanism by which he seeks to return China to something less akin to a market economy and more akin to a command economy.”

It is a dangerous game. Many worry that, with all these measures coming at once, Beijing could trigger a rapid cooling of the Chinese economy. This is not helped by a zero-tolerance policy to COVID-19 that has created a stop-start recovery in consumer confidence – or by local officials aiming for centrally imposed targets on CO₂ emissions simply turning the power off.

Beijing should perhaps be given the benefit of the doubt with regard to its belief that it can improve people’s lives in a way that is aligned with the Party’s interests and which will avoid systemic risk to China’s economy. It may prove capable of managing this process and creating a soft landing, as it has in the past. But the risks involved are high.

In the aftermath of the Tiananmen Square Massacre, Deng made a pragmatic retreat from his liberal path for some years. It had gone too far for the Communist Party. Is that what Xi is doing now – readjusting the levers of economic power to bring things back into line? Or is it possible that his actions last year presage the start of something more enduring and serious, like one of Mao’s disastrous ideological campaigns? Xi says the Party has learnt the lessons of the past. Let’s hope he has.

The Chinese premier has come a long way since his exile to a cave in Liangjiahe. No-one could have predicted that a teary-eyed teenager would one day become the world’s most powerful man. Few can predict today what he will do next with that power.

How do we grow unicorns?

The government wants Britain to be seen as an entrepreneurial nation capable of building successful giant businesses in the way America does. Where do we start?

David Kness

It was once rare for a company to reach a billion-dollar valuation – so rare that in 2013 Aileen Lee, founder of Cowboy Ventures, a venture capital firm in Palo Alto, California, gave such businesses a name: unicorns.

Unicorns are less rare today, but they are still newsworthy. Successful new companies with high growth are seen as the lifeblood of the global economy, and the UK government is keen to create them.

Speaking at London Tech Week in September last year, Nadine Dorries, the Digital, Culture, Media and Sport Secretary, boasted: “We’ve just smashed all previous records for unicorns... and for venture capital investment. It took us 24 years to create our first 20 unicorns. We’ve already matched that in the first six months of this year... We’ve cracked start-ups. Now it’s time to go big and to begin paving the way for a new generation of British tech titans.”

Where to look for unicorns

You may not have heard of the world's largest unicorn, China's ByteDance, but you probably have heard of one of its products. The \$140 billion company, founded only in 2017, developed and runs TikTok.

The second-largest unicorn, Stripe, based in San Francisco, is less mainstream: it sells payment-processing services for

e-commerce companies. Third on the list is Elon Musk's space exploration company, SpaceX, which is worth \$74 billion.

These three companies provide good clues for a unicorn hunter. The trick seems to be to focus on technology-driven businesses in the US and China.

Relative to its size, the UK does well at producing unicorns. A country that accounts for only 0.87% of the global population, it is responsible for 4% of the world's unicorns. China and India may beat us, but their citizens make up 17.8% and 17.7% of the world's population respectively. The US is another animal: it has 50% of the world's unicorns and just 4.25% of its population.

Fintech (technologies supporting the financial services industry) is the largest class of unicorns, and this helps explain why the UK has been so successful in creating them. London has long been acknowledged as the financial capital of Europe and now dominates the fintech space, with all 14 of the UK's fintech unicorns based there. Companies include Monzo and Revolut (both banking services) and Rapyd (another payments company). In fact, three out of four UK unicorns are based in London.

Non-London-based unicorns are concentrated in a few locations across the UK. Examples include OVO (renewable

“London dominates the fintech space, with all 14 of the UK's fintech unicorns based there.”



“In the long term, the success of a business should be defined by the jobs it creates and the value it adds to the economy.”

energy) and Graphcore (chips and processors) in Bristol; three unicorns in the healthcare sector in Oxford and Cambridge; Gymshark in Solihull; and two in Scotland – Skyscanner in Edinburgh and BrewDog in Ellon.

How to grow a unicorn

Would-be unicorns need to be fed – they require investment. The sort of money consumed tends to change as a company grows.

The initial stage of funding is often ‘bootstrapping’, where the business survives on funds from the founder’s savings or those of family and friends. This is usually not sustainable, and the serious entrepreneur must soon seek angel or seed funding.

Seed investors know there is a serious risk that the business will fail and so are often rewarded with part ownership (equity).

At this stage come business angels – private individuals who invest their own money directly or through a crowdfunding scheme and venture capitalists (VCs). Professional VC investors may offer specialist funds for individuals to invest through, to help mitigate the risks for them and widen the capital pool.

Most start-up businesses fail, which is why more than 25 years ago the UK government created schemes to encourage investors to risk putting capital into them. They are the Seed Enterprise Investment Scheme (SEIS), the Enterprise Investment Scheme (EIS) and Venture Capital Trusts (VCTs).

Investors are incentivised with up-front income tax relief – 50% for

SEIS (aimed at very early-stage, small companies), 30% for EIS and VCT. Dividends are tax-free within VCTs, and investors within all three schemes – usually run by VC specialist firms – enjoy exemption from capital gains tax on profits (though only after three years in the case of SEIS and EIS investors).

If the business survives it will try to raise more cash in a funding stage called Series A. It is often necessary to build a syndicate of investors, with an initial ‘anchor’ investor to help secure funding from others. The level of investment at this stage ranges from £2 million to £15 million.

Later investment rounds progress alphabetically. Series B funding is raised by companies that have developed substantial user bases and can show they are capable of significant further growth. By Series C the business is well established and has a successful track record. It can be looking to raise between £30 million and £50 million – or even more – to grow as quickly as possible, sometimes via international expansion. By now the investment is seen as less risky, and investors such as private equity and hedge funds begin to participate. Eventually, possibly via further funding rounds, the valuation may rise to \$1 billion – the threshold that signifies unicorn status.

What must the UK do to grow more unicorns?

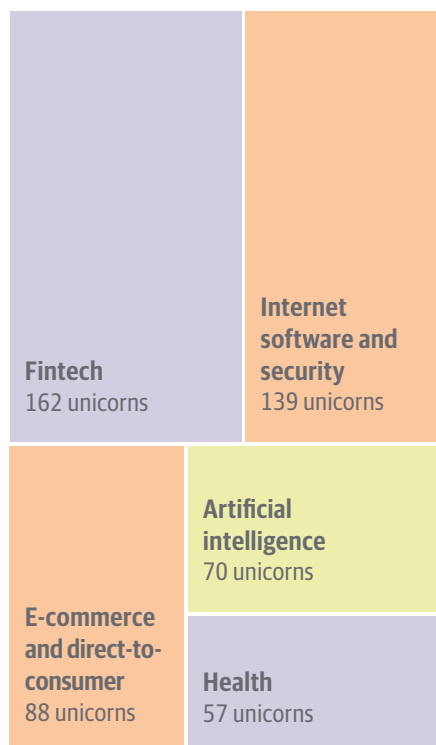
As we have established, the US is best at producing unicorns. A key reason is market size. The total market across Europe is roughly equivalent to that in the US, but it is much less homogeneous.

The US also has much higher levels of spending on basic research and R&D. Silicon Valley grew up because it was at the nexus of public and private R&D from the US military, Stanford University and private companies such as Bell Labs and Hewlett-Packard. The UK government has committed to addressing Britain’s relatively low spend on R&D as a proportion of GDP.

Silicon Valley also illustrates how the power of networking and specialisation across a specific business sector can accelerate growth. In the UK these are limited to two key sectors: finance (financial services and fintech) and pharmaceuticals.

Large funding rounds are challenging in the UK, too, since there is less late-stage capital available. In 2019 Europe as a whole invested \$35 billion in venture capital, while the US invested \$116.7 billion. This has tempted some UK businesses to relocate to the US.

Top five of the world’s unicorns by sector



Source: CB Insights; data as of 23/9/21; categories are not mutually exclusive, and unicorns are sorted according to their primary industry category

The UK government was so concerned about the difficulty of getting investment into start-ups that in 2017 it commissioned the Patient Capital Review. Experts said the amount of money available for investment needed to be at least double, from £3 billion to £6 billion a year.

The ingredients we need to build successful new businesses are in place across the UK. Excellent universities produce new ideas and highly skilled workers. Business incubators, based in universities and elsewhere, provide structured support and mentoring. We have a strong network of VCs to help with funding. But one question remains: do we really need unicorns?

UK and European businesses that do not grow to be unicorns are not failures – in fact, they go bankrupt no more frequently than businesses in the US. Many are increasing sales and profits and creating jobs. Some are being acquired, especially by American companies.

An obsession with the \$1 billion target is not healthy, says Paul Atkinson, a Partner at Edinburgh-based Par Equity. His venture capital company has an outstanding record of successful investing. In 2020 it was given £15 million by the government to invest, alongside money from angels and its EIS fund, in high-growth technology businesses in Scotland and the north of England.

“In the long term,” says Atkinson, “the success of a business should be defined by the jobs it creates and the value it adds to the economy. The UK will be much better served if we support the growth of lots more successful companies worth £50 million to £500 million rather than searching for unicorns.

“These high-quality workhorses spread across the country will do more for economic regeneration and levelling up. There’s nothing mythical about the benefits that would bring.”



BrewDog – an unconventional unicorn story

BrewDog was founded in 2007 by two Scotsmen who were bored with what they condemned as “industrially brewed lagers”. Aged 24, they obtained a £20,000 bank loan, leased a small unit from the local council and started brewing.

By 2009 BrewDog was the largest independent brewer in Scotland. A crowdfunding scheme called Equity for Punks (EFP) bankrolled further expansion. Over 1,300 people invested. Through a series of subsequent funding rounds, 180,000 “Equity Punks” – usually customers – put more than £80 million into the company.

Over the coming years, often courting controversy in its advertising, the business grew rapidly.

James Watt, one of the founders, described how a conventional business growth strategy did not always work for BrewDog. “I very mistakenly believed the only way to take BrewDog to the next level was to hire an experienced and expensive senior management team,” he wrote in a LinkedIn article. “I assembled an all-star cast with impressive resumés and hearty paychecks, but within 12 months we had parted company with all seven of them.” Watt blamed the episode for a brief loss of the company’s

“insurgent” culture, saying professional management could “destroy all of that magic”.

The company had net revenues of nearly £250 million and 2,000 employees by the time the COVID-19 crisis hit. It posted losses of £7.4 million for 2020. Meanwhile, the ‘insurgent’ culture – branded a “cult of personality” by some employees – led to the workplace being described as toxic.

This accusation – from which Watt has vowed to learn – upset the Equity Punks, who had also grown restless after another tactic BrewDog took from the ‘conventional’ growth playbook.

In 2017 an American private equity firm, TSG, invested £213 million for 22% of BrewDog. This guarantees it an 18% compounding annual return on its holding in the event of an IPO or sale. It also means potential returns for all existing investors will be lower and, if a future IPO does not raise more than £1.89 billion, investors in the latest crowdfunding round – staged in 2019 – could be left with no gains and even a loss.

BrewDog shows how even the most successful start-ups can still trip up on the journey to unicorn status.

Eco-flying – is it possible?

Many of us are trying to find ways of reducing our impact on the planet. Cutting down on flying is a key part of that. Will science ever create ways of enabling us to fly to far-off lands with a clean conscience?

Tomas Owen-Jones

The Airlander 10 may represent the future of air travel. Expected to go into production in 2025, it should be capable of flying 4,000 nautical miles, over five days, with a 10-tonne payload – or a hundred passengers.

There is a reason why this combination of figures may sound unusual. The Airlander 10 is a 21st-century airship, manufactured by a British company, Hybrid Air Vehicles, in Bedford.

More specifically, it is what is known as a non-rigid airship – similar to the familiar

“Zeppelin airships could carry more than 43 tonnes.”

but much smaller Goodyear blimps we have seen for years. The helium that fills it is an inert gas, meaning it is not explosive. The ship’s distinctive shape has earned it the nickname ‘the flying bum’, although ‘the flying pillow’ might be a pleasanter epithet.

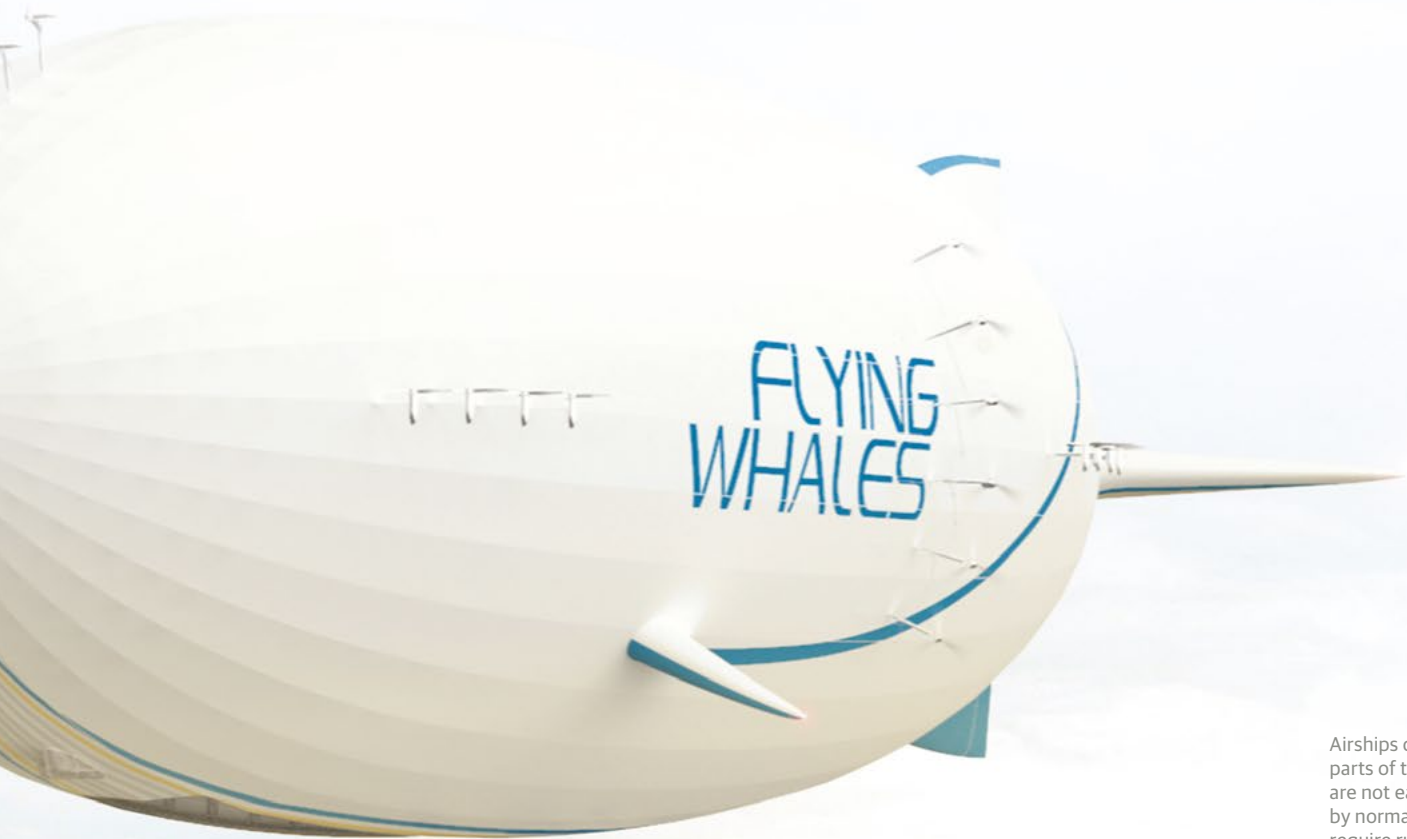
Despite being powered by four V8 diesel engines, the Airlander 10 should deliver a 75% reduction in CO₂ emissions over a comparable aircraft. New hybrid electric engines in the pipeline will bring this figure to 90%, and the target is to have zero-emission,

all-electric engines by 2030. Whichever engines it uses, it will be a lot quieter than conventional aircraft – inside and out.

This is not going to replace traditional air travel for some time, if ever. But the Airlander 10’s cabin can be configured to offer 90 passengers superb luxury sightseeing opportunities; 40 passengers a seat for dinner in the sky; or 16 passengers in eight double en-suite bedrooms a gentle overnight journey. You might not travel as often with this method, but when you do it can be in style.

You may go to different places, too. With no need for a runway – the Airlander 10 can even touch down on water – airships open a new way to explore the world and reach more remote destinations.

They can also carry freight. This is the focus of most manufacturers – and there are dozens of them, including Lockheed in the US and the state-owned China Aviation Industry General Aircraft Company.



Airships can reach parts of the world that are not easily accessed by normal planes that require runways.

Image: Flying Whales

Of course, many people's perceptions of airships owe much to the fate of the *Hindenburg*, the German Graf Zeppelin that burst into flames while mooring at a New Jersey airport in May 1937 after completing its first transatlantic voyage. The disaster – caused by the use of explosive hydrogen – claimed the lives of 13 passengers and 22 crew and shattered public confidence in passenger airships for generations.

Yet it is often forgotten that Graf Zeppelins flew more than a million miles between 1928 and the *Hindenburg* tragedy. They circumnavigated the globe and were capable of carrying more than 43 tonnes. It took fixed-wing aircraft 30 years to catch up – and only then with thirsty engines that spewed CO₂ gases into the atmosphere.

Flying Whales, a French company, hopes to have 150 of its ships – each 154 metres long and as high as a 12-storey building – floating gracefully around the world, picking up and delivering heavy cargoes, within the next decade. Earning the support of wealthy philanthropists such as Google co-founder Sergey Brin, other modern-day airship manufacturers are concentrating on the ability to deliver aid quickly to otherwise impenetrable places.

Electric planes

A similar initial mission is driving electric plane manufacturers. British company Nuncats is developing an electric light aircraft that can be fuelled with electricity generated by an existing microgrid of solar panels in rural Kenya. It will enable medics and vital equipment to be flown to these remote communities. The plane is known as 'the electric sky jeep'.

But could electric engines ever power commercial passenger flight? In 2020, to applause from onlookers, a modified Cessna light aircraft capable of carrying nine passengers took off from an airfield in Washington State. On the positive side, the fuel costs were less than £5 – it would have cost around £300 if conventional

“Those who still want to fly can shop around to find the airlines with the lowest carbon footprint.”

fuel had been used – but it was in the air for just 30 minutes and had only the pilot on board. Long-haul electric flight with large aircraft is decades away.

The issue is energy density. A lithium-ion battery's engine density might reach 250 watt-hours per kilogram (Wh/kg); jet fuel manages nearer 12,000 Wh/kg. This means electrical propulsion can be more efficient, but fossil-fuel systems 'hold' 14 times more energy than a battery of the same weight meaning their range is greatly increased.

In addition, batteries are heavier – so heavy that for a conventional large passenger plane to maintain its current range it would need batteries weighing 30 times more than its present fuel intake. In other words, it would not manage to take off.

Engineers are not disheartened. US firm Wright Electric has partnered with NASA, Britain's BAE Systems and easyJet to try to develop a 186-seat plane capable of short-haul flights of around an hour. That is enough to get you from Paris to London – as long as you are not put in a holding pattern over Heathrow for too long.

The engineering required will be groundbreaking. Power, weight, propulsion – all will need to be addressed. Advances in battery technology will be needed, too. Wright Electric's mission is to eliminate carbon emissions from all flights under 800 miles by 2040.

Hydrogen

Others are researching the potential of hydrogen, the gas that filled the Graf Zeppelin. Today engineers have developed tanks in which to compress the gas safely. Toyota has a hydrogen-powered car, the Mirai, and hydrogen is being explored as an eco-friendly fuel source for trains and lorries.

Airbus is working on three concept planes that it says will be the world's first zero-emission commercial aircraft. It is targeting 2035, but there are many challenges to overcome. "Hydrogen can be combusted directly through modified gas-turbine engines," says Grazia Vittadini, formerly the company's Chief Technology Officer. "It can be converted into electric energy, thanks to fuel cells, and it can be combined with CO₂ and used to produce synthetic kerosene."

The catch, adds Vittadini, lies in volume. "Hydrogen has four times the volume of kerosene," she says, "so it will be fundamental to get tank design right and integration on to an aircraft. Typically, the tanks are embedded in the fuselage.

How bad is flying?



A return flight from London to New York

Emissions per person = 1.66 tonnes of CO₂

The equivalent of:

Doing 2,366 laundry washes

Taking 812 10-minute showers

Watching TV for 863 days



Source: Fly Green

This brings us to longer-stretch fuselages and wider diameters, which impacts on aerodynamic performance.”

Another issue is that hydrogen is a gas that turns into liquid at -253°C . So it will be key to be able to bring hydrogen to this temperature and keep it there throughout all phases of flight.

A global transition to hydrogen will also require a rethink of several elements of the aviation ecosystem. “Battery technology isn’t moving at the pace we want,” says Glenn Llewellyn, Airbus’s Vice President, Zero-Emission Aircraft. “This is where hydrogen comes in. It’s got several thousand times the energy per kilogram of today’s batteries. Hydrogen is an energy source required by many industries for us to all meet the Paris Agreement targets. This scaling and the scaling we’ll see in the coming years are going to significantly bring the cost down, and this makes it very interesting for aviation. We’ve already started working with airlines, energy companies and airports, because this kind of change really requires a teaming across the aviation industry to make it happen.”

Two of the three Airbus concept planes – all just computer-generated models at the moment – look conventional. One is a turbo-prop plane. That means each wing carries a turbine engine that drives a propeller. It should travel a thousand nautical miles and carry a hundred passengers.

The second concept, a turbofan plane, is intended to carry up to 200 passengers 2,000 nautical miles. Here, as with the turbo-prop, the hydrogen would be stored in the fuselage at the back of the plane, taking up what would normally be passenger space.

More intriguing is the blended-wing plane. This has a triangular shape. It looks like something you would see in a futuristic space movie. The architecture allows more volume to store hydrogen and more space for passengers, but how the cabin would be configured is yet to be decided.



The Airlander 10 cabin with space for 72 passengers.

“You might not travel as often with this method, but when you do it can be in style.”

This would not be the first time hydrogen has been tested in a passenger plane. In April 1988, in the Soviet Union, a Tupolev commercial plane fuelled by hydrogen flew for 30 minutes – albeit without any passengers. The tank took up about a third of the passenger area. Today, more than 30 years later, maybe this technology is about to take off.

What about now?

In the meantime, those who still want to fly can shop around to find the airlines with the lowest carbon footprint.

Ryanair, for example, claims to be Europe’s greenest major airline and the best for carbon efficiency. This is largely down to having the youngest fleet and managing to fill more seats on each flight. It claims its average rate of CO_2 emission per passenger is half that of flag-carrier European airlines.

Ryanair produces a monthly CO_2 per passenger/kilometre figure on its website. In August 2021 this was 77g. Ryanair also offers passengers the opportunity to offset the carbon cost of their flight.

EasyJet offsets the carbon from each flight itself, investing in projects that include renewable energy schemes, planting trees and protecting against deforestation. It has cut emissions by a third since 2000. Where possible, it uses just one engine when taxiing and special climb, descent and landing techniques that improve efficiency. It has introduced lighter-weight seats, too.

Many airlines are testing more sustainable aviation fuel (SAF). For instance, BP produces an SAF from cooking oil and animal waste fat. Compared to traditional jet fuels, it says, SAF reduces carbon emissions by 80% over the lifecycle of the fuel. SAF can be blended at up to 50% with traditional jet fuel, though last year Rolls-Royce completed the first tests of 100% SAF in a business jet engine.

Others have created SAF by using forestry and municipal waste. British Airways’ parent, IAG, has committed \$400 million to more investment in SAF over the next 20 years.

Fasten your seatbelts

We began by asking whether we might ever be able to fly again with a clean conscience. The answer is encouraging, but you might have to wait 20 years. In the meantime, as you buckle up, it might help salve any guilt to know just how much the air industry is doing today to make improvements.

Chips with everything

Are you in the market for a new car or a games console? You might have to be patient. A global shortage of computer chips – or semiconductors, to use the technical term – is causing huge delays to all sorts of products. But what is a semiconductor? And what exactly is the problem?

Nik Mir

What is a semiconductor?

The clue is in the name. A semiconductor is a material through which electrical current can pass, at least to some extent. Semiconductors are typically crystals made of certain materials, most commonly silicon. These crystals are better conductors of electricity than insulator materials, such as ceramics, through which current cannot pass; but they are not as good as full-on conductors, such as metals, through which electricity flows freely.

If you have ever wondered how California's Silicon Valley – regarded as the technology capital of the world – got its name, semiconductors are the answer. Pretty much any electronic device requires semiconductors, with anything that is computerised or uses radio waves depending on them.

What has this got to do with computer chips?

The properties of semiconductors – their unique electron structures – mean that by arranging them in certain ways you can create particular effects. For

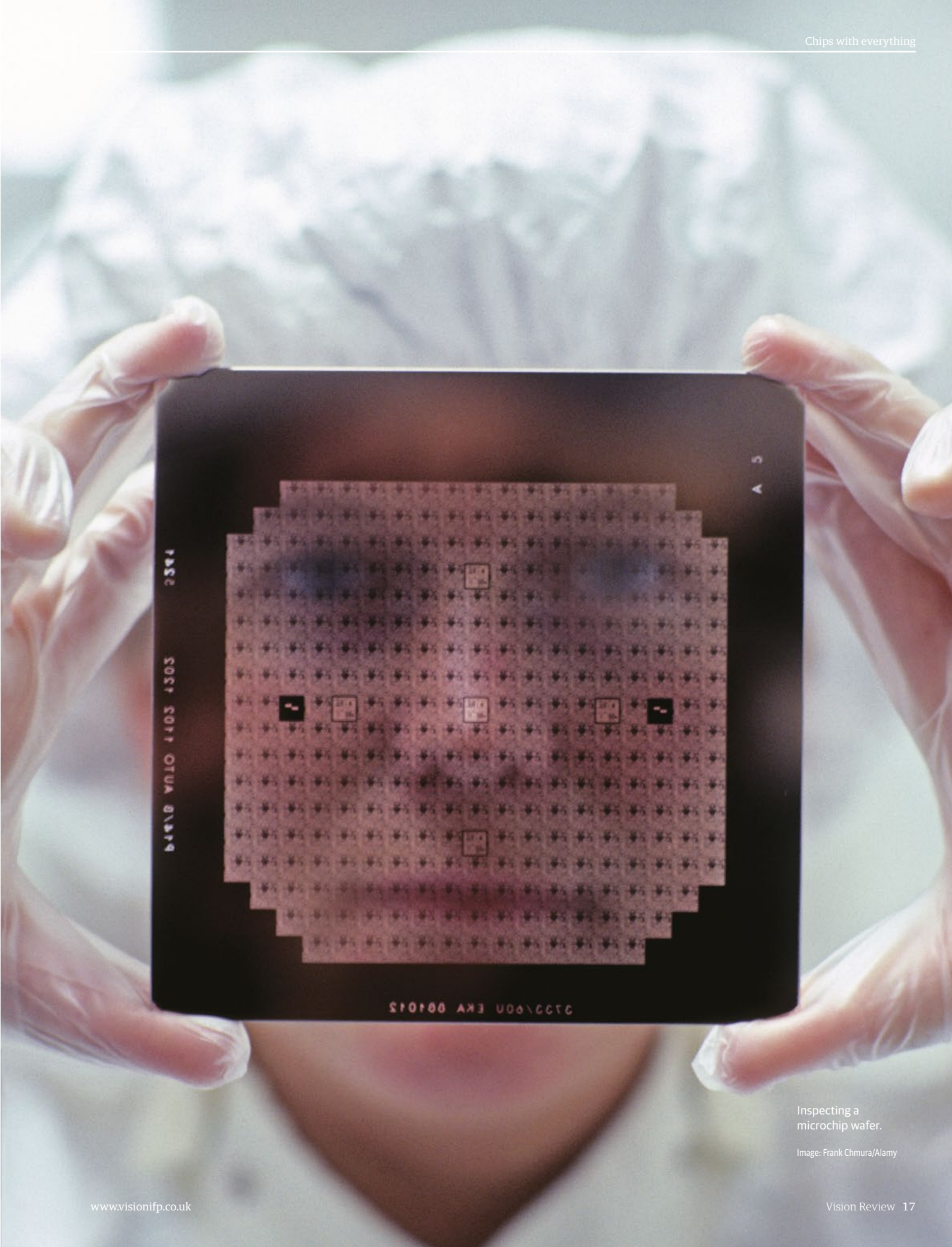
example, if you put two slightly different forms of silicon together you can create a diode, a device that allows electrical current to flow in one direction but not the other. Add in a third layer of silicon and you can create a transistor, which has more functionality; it is effectively a switch through which you turn current on and off.

A computer chip is a piece of silicon that can hold very large numbers of transistors – it is sometimes described as a silicon chip. With all these switches, you can create 'Boolean gates', named after mathematician George Boole. These are the building blocks of digital circuits. A Boolean gate takes two incoming electric currents, compares them and, depending on what it finds, sends on a current or doesn't. The gates can be set up in different ways, with different tests of the inputs determining whether the current is sent on – if both match, say.

What does this mean in practice?

Think of a private club doorman who has to enforce a dress code. The doorman might be instructed to admit you and a

“IBM can ... cram 50 billion transistors on to a chip the size of a fingernail.”



Inspecting a microchip wafer.

Image: Frank Chmura/Alamy



Cars parked on a lot at a General Motors plant after the company temporarily shut operations last year because of chip shortages.

friend only if you are both wearing ties; or he might let you in if only one of you has a tie on. Alternatively, either one of you wearing a tie might prohibit your entry. There are lots of variations on the theme – all the club is doing is creating a system for deciding when you can and cannot come in.

Boolean gates work in much the same way, and what you have actually created here is a microprocessor – the chip that sits at the heart of your PC, your mobile phone or any other device. All those switches and gates are arranged in such a way as to enable you to give the device highly complicated instructions about what you want it to do.

How have these chips developed?

If you want your computer chip to do more difficult work – and to do it more quickly – you need to make it more powerful. What this really means is adding more transistors to your chip, so that you can issue it with more complicated instructions and get back a result at speed.

One option would be to keep making computer chips larger and larger, but this is not practical for the way in which we want to use them. Developers have instead focused on how to get more transistors into a given space – to build ever-smaller structures with silicon

Do superchip manufacturers make a good investment?

Any business in a market where demand outstrips supply and looks set to continue to do so has obvious attractions for investors, and it is notable that leading semiconductor stocks have recently outperformed the rest of the market – including other technology stocks.

This performance has reflected strong sales and expected revenues. Towards the end of 2021, despite ongoing supply shortages, market analyst IDC predicted that worldwide semiconductor revenues would total \$522 billion for the year – up almost 11% on 2020 – while World Semiconductor Trade Statistics forecasts had to be repeatedly upgraded.

However, investors considering this sector need to focus on two caveats, the first of which is that these stocks have often been prone to volatility. Even last year, amid the clamour for chips, stocks failed to rise in a straight line.

The second issue is the sector's sensitivity to the economic cycle – particularly as 70% of the industry's output ends up in consumer products, where discretionary spending is closely linked to growth rates. As the global economy ebbs and flows, so does demand for chips. Capacity is difficult to turn on and off quickly, leaving chip manufacturers exposed.

In addition, this cycle tends to be exacerbated by buyers' behaviour, with stockpiling during stronger periods of consumer demand common. Semiconductor sales patterns may therefore be more exaggerated than other areas of the economy.

Given these dynamics, investors need to tread carefully. The long-term structural drivers of the semiconductor market look attractive, but short-term valuations might overstate or understate this outlook.

molecules arranged perfectly to move electric current through the chip more quickly.

This is where Moore's Law comes in. In 1965 Gordon Moore, a co-founder of computer giant Intel, predicted that the number of transistors that could be packed into the same amount of space would double every two years – in other words, that the power of a computer chip would double every two years – and that the cost would halve. So far his theory has held true. Transistors have got smaller, and computing devices have become more powerful while also getting cheaper.

How small and how powerful?

Unbelievably tiny and remarkably powerful. In 2021 IBM unveiled new semiconductor chips with the smallest transistors ever made – they are two nanometres wide, enabling the company to cram 50 billion transistors on to a chip the size of a fingernail.

As for power, in the 1970s, as computing took off, a chip might have been able to process as many as 40,000 instructions per second. Today your home computer manages something closer to a million, while modern super-computers deliver a thousand trillion – also known as a quadrillion.

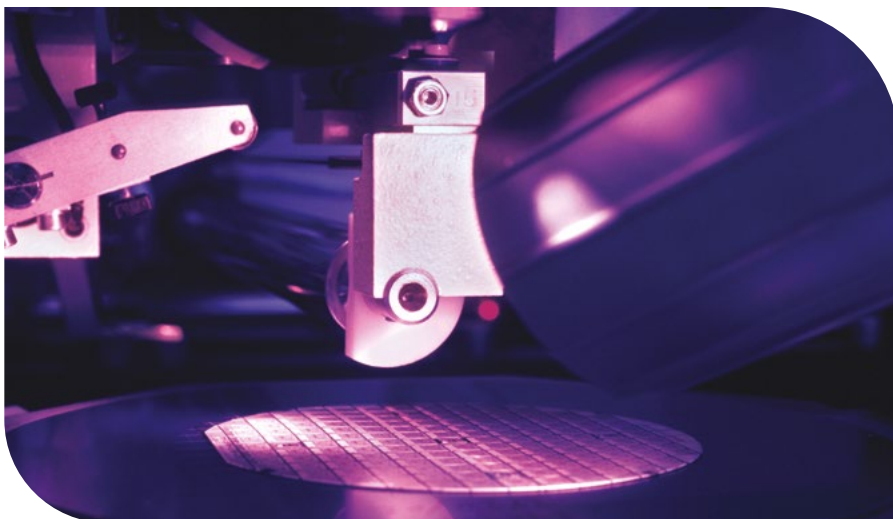
Where do we go from here?

Computing specialists disagree on how long Moore's Law can be sustained, but they accept it is finite. We are getting to a stage where it simply will not be possible to shrink transistors any further.

However, this doesn't mean computers will stop becoming more powerful. Scientists are working on a range of different types of technology to keep advancing.

Given all this progress, why have we suddenly run into shortages of chips?

There has been something of a perfect



Manufacturing a silicon wafer

storm. Chip manufacturers were struggling to keep up with demand before the COVID-19 pandemic and had started investing in new plants that can deliver over double the number of chips per silicon wafer for the same cost.

The new factories are configured to produce specialised components, such as core processors. But new technologies also need older chips, such as RF devices for wi-fi, and these are manufactured only at the old-style plants.

For example, 5G networks are more powerful than their predecessors, and their infrastructure involves many more chips of all types. Similarly, the Internet of Things, in which any object with a chip can be connected online, is driving an exponential growth in chip demand.

Think of the wearable device you use when running, the fridge you can turn up or down through your phone or the way your car now communicates through navigation systems (and will eventually be autonomous). Then add in millions of industrial and commercial devices that businesses want to manage remotely. The latest estimate is that there will be 75 billion Internet of Things devices installed worldwide by 2025.

“East Asia manufactures three-quarters of the world's chips, but many plants were forced to shut down at the height of the pandemic.”

COVID-19 has only exacerbated the situation. Remote working, for example, has meant surging demand for telecoms and home-computing equipment, while at-home leisure activities during lockdowns saw demand for almost every entertainment device soar as well.

Why don't semiconductor manufacturers just make more chips?

The short answer is that they have. According to the World Semiconductor Trade Statistics, semiconductor sales were increasing by around 30% to 40% year-on-year before the pandemic.

However, COVID-19 has caused significant disruption. East Asia manufactures three-quarters of the world's supply of chips, but many of its plants were forced to shut down completely at the height of the pandemic. They got up and running in the end, but now global supply chain disruption is causing further difficulties.

There have been other problems, too. The trade row between the US and China saw the US Department of Commerce announce that China's SMIC, one of the largest semiconductor manufacturers, would no longer be able to buy parts from the US. More recently, winter storms in Texas closed US semiconductor factories, while a fire led to the shutdown of a Japanese plant.

Chip makers have been modifying the tooling at some of their new plants to make the additional older chips needed today. But this is a slow and expensive process, and manufacturers are also aware that the excess demand will soon fade.

Do we need even more factories?

Yes, but they will not solve the current problem. It takes two to three years to get a new factory up to mass production.

Securing the supply of chips for the future is a global endeavour. Manufacturers in Taiwan, China and South Korea are investing in new and modified facilities, while President Biden has unveiled plans for more investment in American producers.

So when will normal service be resumed?

It is clear it will take some time. Intel and IBM have warned they expect the chip shortage to last as long as two years.

Moreover, chip shortages cause knock-on effects. If you still want that new car, bear in mind that Toyota, Ford and Volvo have all slowed or halted production for periods because they have been unable to get the chips they need. Apple has warned it will make fewer iPhones for the same reason.

Some in the industry are more optimistic, predicting an easing in conditions towards the end of this year, but everyone agrees this is not a problem that can be solved overnight.



Finding ancient cures for modern ailments

Modern science has delivered a solution to COVID-19 and highlighted the benefits of gene therapies. However, while the future of medicine looks exciting to most of us, scientists are making equally thrilling discoveries by looking for clues in the past.

Cherie Hamoudi

Jungle combat during the Vietnam War brought many dangers to soldiers on both sides. Among the most common was malaria, which reduced the strength of some military units by half – thus proving itself more devastating than enemy bullets.

In the late 1960s, while the US developed the drug mefloquine, North Vietnam's President Ho Chi Minh asked China's Chairman Mao for help. It was the height of the Cultural Revolution, and Mao was convinced there would be an answer in ancient Chinese medical texts.

The Communist Party sent Professor Tu Youyou to a malaria-infested island to search for remedies. She and her team looked at two thousand traditional cures, eventually narrowing the list to 10, which they tested on mice. In particular, they focused on sweet wormwood (*Artemisia annua*), which a 1,600-year-old recipe entitled *Emergency Prescriptions Kept Up One's Sleeve* suggested as a treatment for intermittent fevers – a hallmark of malaria.

They boiled the plant in water to extract the active ingredient with only modest success. Then they found a text from AD 400 that recommended soaking the wood in cold water. It worked. All the infected blood cells in the mice were killed.

The concentrated extract was administered to the North Vietnamese Army and used across China. It was later developed into the drug artemisinin, which treats many types of malaria.

Since then it has saved millions of lives in South China, Southeast Asia, Africa and South America. In 1999 the World Health Organisation (WHO) listed it as “essential”, and in 2015 Youyou became the first mainland-Chinese scientist to win a Nobel Prize for medicine.

Today, researchers around the world are examining ancient remedies. Some

“Nature is very smart, since it has a remedy for every pain.”

may hold the key to one of the most intractable problems of modern medicine: antibiotic-resistant superbugs.

Double, double toil and... blessed relief

Dr Christina Lee, a scientist at the University of Nottingham, is a part of the AncientBiotics consortium that is trying to recreate old cures in an attempt to find antibiotics that can kill bacterium such as MRSA. It is international and multidisciplinary, including parasitologists, medievalists, microbiologists, medicinal chemists, data scientists and mathematicians.

In 2015 the team recreated Bald's eyesalve, a medieval cure for a sty – an infection of the eyelash follicle. MRSA is a common cause of styes and is also responsible for sepsis and pneumonia. The recipe contains wine, ox gall (from a cow's stomach) and garlic or onion. Once mixed, the ingredients must stand in a brass vessel for nine days before the salve is used. The team found the mixture was a potent antibiotic that killed established infections.

The salve works best if made exactly as directed, which suggests the recipe was improved over generations of healers. The challenge for modern science, where the search is usually for an active ingredient to isolate, is to understand how the interaction of an eclectic mix of ingredients increases the potency of the brew.

Wisdom captured on parchment

Another member of the AncientBiotics team, Dr Erin Connelly, a scientist at the University of Warwick, has been studying a medieval text entitled *Lyllye*

(pronounced 'lily') of *Medicynes* – a 15th-century Middle English translation of a Latin book first completed in 1305. The last known printing was as late as 1697, which shows the importance of the text across the medieval and Renaissance periods. There are 360 recipes and thousands of ingredient names.

Dr Connelly compared the recipes across the four different versions of the book, standardised the text and translated it into 600 pages for the modern reader. She then loaded the recipes into a database and analysed them. Taking the exotic mixture that created Bald's eye salve as an inspiration, she tried to find in the recipes patterns that could be worth exploring in the laboratory.

Exact amounts of ingredients are rarely specified in these texts, with the writer assuming the reader would know. By searching for patterns across multiple recipes that use the same ingredients to cure the same ailments, modern data science is able to suggest the combinations most likely to work.

Folk remedies with more than a grain of truth

Not all naturally occurring antibiotics were dispensed via ointments and potions. The soil in the churchyard in Boho, County Fermanagh, Northern Ireland, was believed to cure infections. Microbiologist Dr Gerry Quinn, of Ulster University, took samples to investigate if there was any scientific basis to the assertion – and was amazed to find there was.

He discovered a unique and powerful strain of *Streptomyces*, a microorganism that is used to produce antibiotics. It killed the top three pathogens – organisms that cause disease – identified by the WHO as a major threat to human health.

Traditionally, the cure was used to treat a variety of conditions, from toothache

to infections. Patients placed a small portion of the soil wrapped in cloth next to the infection or underneath their pillow for nine days. Quinn was amazed to see it killing microbes in Petri dishes in a modern laboratory.

The church stands on a site that has been used for Christian worship for more than 1,500 years. In a nearby field are 4,000-year-old Neolithic stone carvings, which researchers take as confirmation of the spiritual – and maybe healing – significance of the site for millennia.

Dr Quinn's analysis identified several naturally occurring antibiotics in the soil. He hopes his work may reveal a compound that a pharmaceutical company could develop into a commercial antibiotic that is effective against drug-resistant bacteria.

Anti-beer-otics?

Sometimes the ancients reveal their secrets by other means. In 2018 Gillian Belk, a master's student at the University of California, was studying the 'Beerology' exhibit at the San Diego Museum of Man when, using UV light, she found a 2,000-year-old bone containing tetracycline, an antibiotic discovered in 1948.



Streptomyces bacterial spores

“God has not given us a better recipe than this one.”

After her initial shock, she realised that either the bone was contaminated with the modern-day compound or its owner had ingested tetracycline as part of their diet. Further investigation found researchers had first noticed this phenomenon in the 1980s but had dismissed it as contamination. Tests following Belk's discovery convinced experts that the antibiotic must have been present in a living body. The theory now is that the 'medicine' came from a specially brewed beer.

It is well documented that certain beverages were administered for medicinal purposes. It is thought a strain of *Streptomyces*, which can produce tetracycline, was introduced to the beer from soil left on the grain. It would have been visible as golden lumps in the beer, which would have cured small, infected wounds or urinary tract infections. The brewers would have continued to make the same beer, using a previous batch to 'seed' the next one.

Following in a fine tradition

This focus on ancient remedies is not new. Several modern drugs were developed from folk remedies, making it less surprising that there could still be some hidden treasures to find. Examples include willow bark, which was used to treat inflammation and was found to contain salicylic acid, now the basis of aspirin; and garlic, which was used to treat problems ranging from snake bites to ulcers and now features in blood-clotting inhibitors.

In the 18th century William Withering, an Edinburgh doctor, provided the template that modern scientists follow. When he sought a second opinion from a local gypsy healer on a patient with 'dropsy', a swelling due to heart disease, she suggested a potion containing

about 20 plant ingredients – and the patient was cured.

Having found out what the ingredients were, Withering tried different formulations and strengths on numerous patients – much like a present-day clinical trial – and deduced that the active ingredient was the purple foxglove (*Digitalis purpurea*). This eventually led to modern-day heart drugs digoxin and digitoxin.

Old meets new

Armenia, which sits on the border of Asia and Europe, was once an important trading point on the former Silk Road, which ran from China to Europe. It created a line of communities that shared a reservoir of knowledge from generation to generation.

In antiquity the herbs of the Armenian highland were especially well-reputed among writers such as Greek physician Galen and Islamic philosopher Ibn Sina. In the 15th century Armenian physician Amirdovlat Amasiatsi wrote *Useless for the Ignorant*, an encyclopaedia of 3,500 Armenian plants and herbs. The text advises on the uses of native Armenian plants in such depth that Amasiatsi's writings continue to influence modern pharmacists.

Since 1993 Armenian pharmacologist Armen Sahakyan has collected ingredients for the recipes from the old manuscripts and recreated them for modern use. He has recently developed a new treatment for psoriasis.

There is a saying in rural Armenia: "Nature is very smart, since it has a remedy for every pain." As harmful microbes become ever more difficult to kill with conventional medicine, it is reassuring to know that alternative solutions may be out there, waiting to be discovered – or rediscovered. And an unusual array of academics are looking for them.

Q&A

Simon Field IFA and Director, Valere Wealth Management Limited

Simon Field

Born: Newbury Park, Essex

Lives: Woodford Green, Essex

Professional qualifications: BSc Geography,
Diploma in Financial Planning

First job after school: fishmonger at Tesco – I still have bad memories of when whole salmon was on special offer and it seemed everyone in the area came in on a Saturday to buy it at a bargain price and ask me to fillet it or cut it into steaks; luckily, I've kept the skills I learnt, which are very useful on annual fishing trips in Cornwall

Hobbies: watching most sports; long-suffering QPR fan; playing golf; trying to keep fit

Married to Lauren for 11 years; two daughters – Thea, five, and Hope, one

“My biggest career highlight has been joining the Vision network. It has provided my clients with access to a far superior service and given me the time and flexibility to be able to focus on what's important to them.”



How long have you been an adviser?

Since 2011. I've been working in the industry since 2002.

What have been your career highlights so far?

The biggest highlight has been joining the Vision network. This involved taking the huge step from the comfortable environment of being a top-performing financial adviser at a large bank, offering only restricted advice, to setting up as an Independent Financial Adviser and being able to work with anyone across the entire market.

It was something I was apprehensive about, but it has turned out to be the best career decision I've ever made. It has provided my clients with access to a far superior service and given me the time and flexibility to be able to focus on what's important to them, offering a level of service they deserve on an ongoing basis.

Other highlights have included attending two global top-performer events while in my previous job. One was in Beijing and the other in Kuala Lumpur. They were memorable occasions.

What service do you feel you offer clients?

I feel I offer a great service that's based on trust and which aims to help build each client's unique plan for the future.

"I feel I offer a great service that's based on trust and which aims to help build each client's unique plan for the future."

Much of the work is on retirement planning and working out what clients need and what they'll spend their money on. We commit a lot of time at the outset to get this right, with each plan brought to life by using cashflow forecasting software.

I then work with the best service providers and asset managers across the market to help fulfil a specific plan. I'm incredibly proud of the reputation for trust, integrity and great service that I've built over the years in working with partners of professional services firms.

What is your typical day like?

I wake up at around 6.30-7am, and the first hour of the morning is spent chasing Thea around the house to make sure she's ready for school. I usually drop her off at school and then get home to start work.

Post-COVID, I spend two days a week in the City or visiting clients at their homes. Before COVID this would be four or five days a week.

I generally finish work or try to be back from my meetings for the day at around 5.30pm. That's when I usually start the 'dinner, bath, bottle and bed' routine for the girls.

Once they're in bed, by around 8pm, Lauren and I might watch a box set. Sometimes I might go to the gym. Depending on how busy I am, I may work for another couple of hours if I need to.

What would you like to see change in the financial services arena?

I would like to see the limits on what you can contribute into a pension relaxed or lifted and perhaps partly offset by means-



testing the state pension. This would give more control and flexibility over how an individual saves for retirement.

It's often difficult to see how clients just embarking on their careers can build a pension pot up to a reasonable amount when they're capped at £4,000 in contributions per year. Typically, they also need more money earlier in retirement – and a state pension starting in their late 60s is unlikely to make much of a difference to their spending plans.

I would also like to see more female advisers come into the industry. I would fully support my daughters if they wanted to follow in my footsteps and have an opportunity to train as a financial adviser.

You recently celebrated your second anniversary with the Vision network. How would you sum up your first two years?

I founded Valere Wealth Management and joined the Vision network towards the end of 2019. It has been an eventful couple of years since then, to say the least.



Kynance Cove, Cornwall, where Simon and his family enjoy holidaying. Their annual trips to the coast tend to involve some fishing, allowing Simon to call on skills he learnt in his first job – as a fishmonger at Tesco.

Image: Elizabeth Richardson

The sudden advent of the Omicron variant underlined that we still live in uncertain times. Now we have inflation to contend with as well. What are the most important messages an adviser can try to impart amid near-constant disruption and ongoing challenges?

I think the past two years have shown the importance of having flexibility in your plans. There have been clear winners and losers in the markets since the pandemic began. Having a flexible, active approach helps you avoid the losers – which can be just as important as picking the winners.

With inflation rising and looking like it may be around for a while, the value of cash is under the most pressure it has faced since the early '90s. I believe investing in great companies is a good way of keeping pace with inflation. Cash isn't the place to be when inflation is running at 5% or more, as its value will be eroded very quickly.

Finally, I think the pandemic has highlighted the importance of living a great life. It has shown the value of working with an adviser who helps clients work out how much money they'll need for the rest of their lives and who also encourages them to spend and enjoy themselves when the projections show they'll have enough.

“There have been clear winners and losers in the markets since the pandemic began. Having a flexible, active approach helps you avoid the losers – which can be just as important as picking the winners.”

Although the first lockdown seems like a distant memory now, it soon became clear that COVID would be around for a while and we would need to adapt to new ways of working. So it has been a bit of a whirlwind.

Despite all the challenges, though, things have gone extremely well. I'm now working with more than 30 families, helping them plan and build for the future, and I feel very grateful to have such great clients, whom I regard as friends.

On a personal level, the past two years have been fantastic. I've been able to spend more time with my family, which was one of the main reasons why I decided to join the Vision network. Watching Hope grow up has made me realise how much I missed during Thea's first year, and things like having dinner and going out for walks as a family have shown how the pandemic has actually brought us closer together in some ways.

The pandemic has rapidly reshaped the use of technology across the financial services industry as a whole. Which of the more traditional approaches have you reintroduced as

soon as circumstances have allowed and how have your clients responded to the 'hybrid' model of old and new?

I reintroduced face-to-face meetings as soon as I could. I think one of the most enjoyable parts of my job is meeting people, getting to know them and looking into how I can help them – and for me this works a lot better in person. I know clients I've met when restrictions have been lifted have really appreciated the effort to see them face to face rather than online.

But video technology has also worked well. I generally speak to clients on a quarterly basis, and the ability to hold these meetings via video call instead of a simple phone call has been a vast improvement.

While I believe face-to-face engagement is still the bedrock of a good adviser-client relationship, video can provide a great blend between personal interaction and the effectiveness of the technology we have at our fingertips today. It has also given me the ability to organise three-way calls with clients and fund managers, which clients have received very well.

Bringing in the seaweed harvest

The seaweed business has long been well-established in many parts of Asia. It remains in its relative infancy elsewhere in the world, but its growth is already capturing the attention of health-conscious eaters and leading conservationists – not to mention investors.

Emma Watson

Image: San Francisco Chronicle/
Hearst Newspapers via Getty
Images/Contributor



Mara Seaweed's website is full of celebrity endorsements, from a picture of *The Great British Bake Off*'s Paul Hollywood enjoying his first taste of kelp to MasterChef's Gregg Wallace waxing lyrical about a healthier alternative to salt.

"We are at a tipping point," says Arnie Sathiy, director of sales and business development at the Edinburgh-based company. "Seaweed is a staple food in many Asian countries, but the Western market has been a little way behind. Now we are beginning to see the huge opportunity materialise."

It is not just that big names from the food world – including Jamie Oliver, Heston Blumenthal and James Martin – are lining up to extol the virtues of seaweed: there is also a feeling in the sector that the stars are aligning. Seaweed has a long and growing list of uses for home cooks, in the catering industry and in related fields, and it also provides invaluable climate-change solutions.

The biggest market in the UK, in recent times at least, has been the vitamins and supplements sector. Seaweed products are a natural source of vitamins A, B1, B2, C, D and E, as well as minerals including zinc, iodine, magnesium, iron, potassium, copper and calcium.

Britons' increasing focus on health and wellbeing has provided a boost in this regard. The growth in vegan and vegetarian diets is delivering an additional fillip, as seaweed is a source of some of the nutrients non-meat-eaters miss out on.

Increasingly, however, seaweed products can be found beyond the healthcare aisle. Seaweed snacks are a popular option, while seaweed flakes are gaining traction as a healthy replacement for salt – offering the same flavour-enhancing attributes but with 85% less sodium chloride.

Consumers are getting the message. Waitrose named seaweed as its must-have ingredient of 2021, with sales up 23% compared with the previous year. "Seaweed is an incredibly versatile ingredient," says Jenna Doran-Twyford, an ingredients buyer at the supermarket group. "We've noticed our customers wanting to understand the true nutritional value of what they're eating, as well as becoming more adventurous in the kitchen."

Mara Seaweed's Sathiy hopes to see tastes broaden even further, with consumers eating seaweed in more natural form – from soups to salads. "In Scotland," he says, "seaweed was a huge part of the economy and the food sector 150 years ago. We just forgot about it as food production industrialised."

The value of persuading people to eat more seaweed in all its forms is not lost on the World Wide Fund for Nature (WWF), which has made a series of investments in the seaweed industry for climate-change-related reasons. In 2020, for example, it put \$850,000 into Ocean Rainforest, which is attempting to scale up seaweed farming in the Faroe Islands. The WWF says seaweed aquaculture can help achieve its conservation goals.

There are other potential ecological benefits. Cattle that eat seaweed-based feed generate much smaller amounts of the methane gas that is so damaging from a global warming perspective. Seaweed spread on the soil can neutralise toxic ammonia. It soaks up CO₂. It can even be used as an ingredient in packaging, replacing plastics.

Another seaweed business to have received WWF funding is Oban-based Oceanium, a specialist in processing the seaweed produced by a growing number of farmers in Scotland. In May 2021 it raised £2 million in a financing round led jointly by the conservation group and the Green Angel Syndicate.

Building out this processing capacity is important for the fledgling British seaweed sector. Farming seaweed isn't the difficult element of production: turning a crop into a saleable product is the challenge that requires specialist knowledge, skills and equipment.

Briana Warner, CEO of Atlantic Sea Farms, based in Maine in the US, describes seaweed as a genuine "miracle crop". She points out that it grows quickly, requires no fresh water, land or fertiliser and provides multiple benefits. It is no coincidence, she adds, that life expectancy rates in Asian countries where seaweed consumption is highest are well above those in much of the West.

As in the UK, the American seaweed industry is growing fast. Part of the attraction in Maine – currently one of two production centres, alongside Alaska – is that it is possible to farm kelp with exactly the same equipment used for the state's most famous product, lobster.



This means seaweed already offers fishermen an opportunity to diversify – and if climate change continues, as is likely, it will eventually offer a lifeline. “The Gulf of Maine is one of the fastest-warming bodies of water in the world,” says Warner. “That helps kelp grow more quickly, but if the water temperature rises by even a couple more degrees it will prove fatal to the lobster industry.”

Along with its counterparts in the UK and Europe, Atlantic Sea Farms expects significant increases in production in

“Seaweed has a long and growing list of uses for home cooks, in the catering industry and in related fields, and it also provides invaluable climate-change solutions.”

the next few years. At present, though, such progress remains comparatively small-scale in the context of the global market for seaweed. Research by Brand Essence says this is growing at 8.7% a year and will be worth \$23.95 billion by 2025, up from \$13.36 billion in 2018.

The vast majority of the market sits in Asia, which dominates both consumption and production. Yet Warner thinks Western producers can make inroads over time, even if Asian producers benefit from huge scale and lower labour costs.

“Today our job is to create a fresh product that is easier to use – to market our seaweed not as a better product but as a different one,” she says. “Eventually, however, we want to get to a point where consumers are educated enough to look for a local product grown in clean water with complete traceability.”

In other words, this is just the beginning of the West’s seaweed revolution.

Six types of edible seaweed

Seaweed comes in hundreds of varieties, most of which are edible. But commercial production tends to focus on a small number of crops.

Kelp

The most common seaweed crop, kelp is brownish-green and large in size, with leathery fronds that grow several metres long. It contains high levels of iodine.

Wakame

Also known as sea mustard, wakame is a dark-green seaweed found in miso soup. It has a sweet taste and is an excellent source of omega-3 fatty acids.

Nori

Nori, sometimes called purple laver, turns dark green when dried. It is roasted and pressed into dried nori sheets, which can be used to wrap sushi rolls and rice balls.

Dulse

First harvested in Scotland and Iceland, dulse is a reddish seaweed that has a soft, leathery texture and tastes a little like bacon. It can be fried into a bar snack that is popular in Canada.

Irish moss

Native to the shorelines of the US and Europe, Irish moss – or carrageen – resembles tiny trees. Abundant in sugar molecules, it is often found in desserts such as tapioca and ice-cream.

Sea lettuce

Sea lettuce is pale green, with fresh-looking broad leaves. It looks remarkably like a garden-grown lettuce but has a stronger taste.



2

1. Based in Maine in the US, Atlantic Sea Farms regards seaweed as a genuine “miracle crop”.
2. A seafood plant worker processing seaweed.
3. Edinburgh’s Mara Seaweed is at the forefront of the superfood’s rising popularity in the UK. Its products include dulse, kombu and Shony – the last of these named after an ancient Hebridean sea god.



3

The lure of the retirement village

They are touted as a perfect solution for those who want to downsize and live for as long as possible in their own home. Retirement villages are becoming increasingly popular. We look at the pros and cons.

Richard Dawson

With billboards touting their features and encouraging a visit, retirement villages are a growing feature of the landscape. This should not come as a surprise, given that the number of Britons aged over 65 is already around 12 million – and growing.

Advances in healthcare mean we are living longer and managing health conditions better. In turn, this means we are capable of living independently for longer – with a little help.

These villages aim to provide that help – and much more. Alongside specialist care, they often offer a range of facilities and amenities, including swimming pools, cinemas, private dining rooms, libraries, spas, gyms, art studios, cafés and restaurants.

Industry body ARCO (Associated Retirement Community Operators) represents 27 private and not-for-profit operators – half the sector. It envisages 250,000 people living in retirement villages by the end of the decade – three times the number today yet still a long way behind America, where these

villages have been popular for many years. In the UK 0.8% of people aged over 65 live in designated 'housing with care' properties, compared with 6% in North America and 5% in Australia.

The surprise, perhaps, is that it has taken so long for the concept to take root in Britain. ARCO's research shows residents in retirement communities stay healthier for longer, are more active and less lonely; they feel more secure, enjoy life more and have more privacy compared with those who have not yet moved. ARCO claims that if the number of people living in these facilities were to triple it would give the sector a turnover of around £70 billion and save the NHS £5.6 billion.

Retirement villages are also seen as a solution to the problem of downsizing. Think tank Demos says there is a chronic undersupply of appropriate housing for older people, who are consequently left trapped in homes that are too big and unmanageable and that are desperately needed by younger families. ARCO estimates over three million properties would be released if all those interested in moving into a 'retirement property' were able to do so.

Some may see moving to a new home in a retirement village as a way to downsize and release capital to give to loved ones. It can be part of a sensible inheritance tax management plan. But the ongoing costs of moving into a retirement village need to be seriously assessed with your adviser before you commit to any move. Retirement villages are not necessarily a low-cost solution.

Audley Villages is a good example of a well-run business that is catering to people at the luxury end of the market. A member of ARCO, it runs 19 sites across the country. Most of its properties are built around a historic centrepiece building that becomes the Audley Club, offering the kinds of facilities you would expect to find in a country house hotel.

An example is Binswood Hall in Leamington – an imposing Victorian Gothic Grade II* listed red-brick school and chapel that looks like a cross between an Oxford college and Hampton Court. The site, which had been left empty and unused, was acquired by Audley in 2011 and opened as a luxury retirement village three years later. Today there are 114 retirement properties there.





The lounge at Audley's Binswood Hall retirement village in Leamington.

Image: Audley Village

“There is a chronic undersupply of appropriate housing for older people, who are consequently left trapped in homes that are too big and unmanageable.”

Audley homes across the business range from one-bedroom to three-bedroom properties and currently sell for between £250,000 and £2.6 million – the latter for a penthouse apartment with views over Clapham Common. The minimum age for buying an Audley home is 55.

Each Audley-built property is sold with a lease of up to 250 years, with the length varying from village to village. In most a monthly service fee covers external maintenance of the home itself, alarms, the grounds and facilities. It also covers membership of the club, which includes access to the onsite fitness studio and classes, sauna and relaxation areas, as well as a lounge and a library.

Treatments can be bought at hairdressing and beauty salons

available on most sites, and each site has a restaurant offering discounted breakfasts, lunches and dinners. A home delivery service is also available.

Emergency support is covered by the monthly management fee, but each village has a team of carers whose services can be called upon for an additional charge to help with things like cleaning, cooking, assistance in getting up and going to bed, shopping and personal care. Carers will even sleep over.

Many of those living in retirement villages are far from ready for these services. “The changing nature of retirement living means many of our property owners don't see it as a time to slow down,” says Nick Sanderson, CEO of Audley Villages. “They instead see it as a time to do all the things they enjoy. We have owners taking on wing-walking challenges for charity, writing books about their lives or taking time out to travel. Our aim is to actively improve the health and wellbeing of our owners so they continue to live life to the full.”

The costs

The monthly fees at Audley properties are in the region of £850, rising in line with inflation. In addition, you may pay annual parking fees of around £120 and ground rent ranging from nothing to £500. You also pay council tax.

Buyers should generally watch out for deferred management charges and exit fees. These are common across the industry and may come as a shock to loved ones winding up your estate. The deferred management charge is payable on the sale of your home or a change of occupier.

Home operators claim this helps keep monthly fees lower and gives them the

funds they need for maintenance of historic buildings and facilities, the costs of which can be significant and might leave owners unable to sell their properties if they were not covered. The charge is typically 1% of the sale price for up to a maximum of 15 years of you living there – so up to 15%. But it can be more.

Some operators allow residents to sign up to reduced monthly fees in exchange for a 2% charge on sale of the property. The deferment charge is not always capped. And your loved ones may find themselves paying monthly fees until the property is sold, even when you have passed on and are not using the facilities.

In addition, there will be sales fees. Typically, there will be a sales administration fee of 1% of the final achieved sale price or market valuation – whichever is greater – and, assuming the operator markets the property, a 2% sales agency fee. Both these fees will have VAT on top.

Critics of retirement villages say these fees are punitive. They also warn that resale prices may be significantly lower than the original purchase prices of new properties. Other research suggests prices have risen. The key point to remember is that, as with any investment, you may lose money.

Read the small print

Retirement villages are well marketed, and many of those who live in them are delighted with the facilities, the care and the companionship they offer. But negotiate the purchase price keenly and make sure you understand fully the costs you are signing up for before committing – and make sure your family understands, too.

How close are we to a four-day working week?

In 1930 John Maynard Keynes predicted that the biggest problem mankind would face in 2030 would be leisure – what to do with all our free time. Economists, forecasters and politicians have been promising us a four-day working week for years. With a revolution in office life currently taking place, could the dream finally be possible?

Melanie Wotherspoon



On September 23 1956 the front page of the *New York Times* ran a headline: “Nixon foresees 4-day work week”. The then Vice President said Republican Party policies assured a fuller life for families and the transformation would happen “in the not too distant future”.

In 1967 futurist Herman Kahn predicted it for the end of the 20th century. It was even a flagship policy in Labour’s failed 2019 manifesto, which pledged that a 32-hour week would be reached in 10 years.

The four-day working week always seems imminent, yet it never arrives. Instead, we appear overworked and more stressed than ever.

Around two-thirds of UK employees work longer than their contracted hours – by 6.3 hours a week on average. According to the Institute for Employment Studies, just over one in 10 in the UK work over 48 hours in a week. On top of this, the pervasiveness of email ensures many employees are “always on”, which a 2016 study found leads to emotional exhaustion and hinders work-family balance.

Some 44% of all work-related cases of ill health were attributed to stress, depression and anxiety In 2018/2019. The Japanese language contains the word 過勞死 (Karoshi), which means “death by overwork”.

This is a global problem, but it was not always like this.

Hunt, gather, rest

Our ancestors had the right idea. Dismantling popular belief that hunter-gatherers were constantly working to fend off starvation, cultural anthropologist Marshall Sahlins proposed that they were in fact “the original affluent society”. The hunter-gatherers followed the “Zen road to affluence”, because, contrary to principles of modern economics, they had finite needs and wants – and were

Image: Andreas Prott/Alamy

able to fulfil them easily by devoting just 15-20 hours a week to the bare essentials.

Societies after the Agricultural Revolution had land to attend to, so their workload increased – but not to the extent we might imagine. According to Juliet B. Schor in *The Overworked American: The Unexpected Decline of Leisure*, peasant families in the 13th century worked no more than 150 days a year.

So what changed? In the middle of the 18th century, with the population growing rapidly, enormous labour demand and extreme poverty took families to the burgeoning industrial cities of Britain. Factories now teemed with workers, including children as young as five, who worked 14-to-16-hour days, six days a week. Although workers at the time felt little of the benefit, the consensus today is that the Industrial Revolution made life more secure in the long term and kickstarted an escalation of living standards that we have continued to prosper from ever since.

Pre-industrial societies may have had more free time for leisure, but they didn't exactly live in luxury. Our long working week is the sacrifice we make for fridges and central heating and Netflix. Leisure is expensive: if we were to make more time for it by lowering working hours, our output would decrease and our standards of living would decline – right?

Worker productivity

Not necessarily. At the beginning of the 20th century some forward-thinking industrialists began to question the correlation between hours worked and productivity. In 1926 Henry Ford announced a reduction of the working week in his plants, from six eight-hour days to five. He astonished his peers by keeping wages at the same level.

Ford figured his workers would be happier, better rested and more productive with an extra day off. Plus, workers needed

“Three-quarters of Britons favour a four-day week – nearly half would take a 20% pay cut.”

enough time away from the production line to make use of the cars rolling off it.

“It is high time to rid ourselves of the notion that leisure for workmen is either 'lost time' or a class privilege,” Ford said of the decision. The company's president, Ford's son Edsel, explained: “Every man needs more than one day a week for rest and recreation... We believe that in order to live properly every man should have more time to spend with his family.”

Ford's instincts, though perhaps counterintuitive, were correct: productivity rose. The US officially adopted the five-day week in 1932 to counter rising unemployment in the Great Depression.

The picture today

Between 1870 and the 1980s the average amount of time Britons typically spent in full-time work fell from 3,000 hours a year to nearer 1,700. Research from the New Economics Foundation (NEF) think tank estimated that if this trend had continued we would now be able to finish our working week by Friday lunchtime. It didn't. From the 1980s progress slowed to a crawl. Working hours in the UK and the US have actually increased since 2010.

NEF found the stagnation in working hours was caused by falls in trade union membership and labour market regulations. After the 1980s, while productivity levels continued to rise, workers saw no compensation in faster wage rises. As a result, lower earners chose to work longer hours, because they could not afford lower pay.

In Germany, by contrast, a partial strike by 1.5 million metalworkers in 2018

led to the largest trade union, IG Metall, winning the right for its members to enjoy a 28-hour working week for as long as two years without a loss in wages.

Automation

Our biggest ally in the battle for shorter working hours – and some might call it a dubious ally – is technology. In the past hundred years combine harvesters, factory robots, barcode-reading machines and myriad other pieces of equipment have boosted the workforce's productivity across most sectors – from manufacturing and retail to agriculture. Technology has allowed people to get the same jobs done faster.

Today we are in the midst of a great technological revolution. The World Economic Forum predicts machines will be able to handle nearly half of all work tasks by 2025 – up from 32% in 2020. (At the same time, although the number of jobs created still surpasses those destroyed, the rate of job creation is slowing, while the rate of destruction increases. Automation is a double-edged sword.)

The big question facing employers is whether, with the help of technology, reducing the working week may increase productivity, as it did for Ford nearly a century ago.

Testing the water

In 2018 New Zealand estate planning firm Perpetual Guardian trialled a four-day week with no loss of pay. It reported no drop in output – the shortened hours were balanced out by a 20% increase in productivity. Staff suffered less stress and felt happier and more likely to stay in their jobs. The policy was made permanent last October. Andrew Barnes, CEO of the firm, said: “This is an idea whose time has come.”

In Japan, where working hours are notoriously high, Microsoft implemented

the policy with its 2,300 workers in 2019 and saw productivity jump 40%. It also saved 23% on electricity costs and 60% on printing costs. In July last year the Japanese government unveiled its economic policy guidelines, which included recommendations for an optional four-day week.

Closer to home, British magazine company Target Publishing cut pay for its 30 staff during the pandemic, introducing a four-day week to compensate – before discovering how effectively it worked. Full pay was reinstated in July 2020 – with the shortened week preserved.

Target's MD, David Cann, admitted there were teething problems but said people just worked more efficiently. Meetings got a lot shorter! "COVID-19 has changed how every business operates," he said. "We're determined to make the change a positive."

Not-for-profit Be the Business found 18% of UK companies open to moving to a four-day working week, while 5% had already done so. Meanwhile, a 2019 survey commissioned by price-comparison website KnowYourMoney found three-quarters of Britons would

"Between 1870 and the 1980s the time Britons typically spent in full-time work fell from 3,000 hours a year to nearer 1,700."

favour a four-day week – with nearly half of employees even willing to take a 20% pay cut.

Government involvement

So there is support for the idea and evidence it can work. But the unavoidable truth is that reducing working hours and weeks has usually required government legislation and intervention. In the early 1800s long hours spent working with heavy machinery led to accidents and injuries. Worker unrest and growing public awareness of child labour conditions compelled the British government to introduce the Factory Act of 1833, which banned children aged from nine to 13 from working more than nine hours a day.

Today, similarly, nationwide reductions in working weeks are imposed from the top down. France introduced a 35-hour

week in 1998, down from the previous legal limit of 39 hours. Launched under the slogan "Work less, live more", it aimed to encourage businesses to hire more workers rather than overworking current staff and to improve the work-life balance of French citizens. Every hour worked over the limit was considered overtime, which was compensated by either additional salary or days off.

The French are divided on its success. Its critics hold the law responsible for making businesses less competitive. Nicolas Sarkozy came to power with the slogan "Work more so you can earn more", but he only made the legislation more flexible rather than abandoning it altogether. Neither does it apply to everyone – it doesn't affect business owners, and the average French employee still works 40.5 hours a week. The truth is that you cannot mandate that everyone stops work: many people live for it.

A look to the future

Not all sectors can expect to make productivity gains through shorter hours – think transportation, service and health. Moreover, with Britain facing a shortage of skills across so many sectors, cutting the working week is unlikely to be something many policymakers here are contemplating.

Nonetheless, the COVID crisis has encouraged fresh thinking. Before lockdown no-one would have believed so many of us could work from home effectively. Today many companies are downsizing their offices and embracing home working as a way of cutting costs, reducing the burden of the five-day-a-week commute for staff and reducing their carbon footprint.

The four-day working week may still be a dream of the future for most of us, but perhaps – just perhaps – some of us might soon find ourselves edging closer again to the four-and-a-half-day week!



City workers in the 1980s – a work hard, play hard culture. But was it productive?

Image: Trinity Mirror/Mirrorpix/Alamy

Diversity across the board

Companies are coming under more pressure to have more diverse boards and management. That means including more women and more people of colour, and more people from under-represented minorities. But what evidence is there to show that this improves how companies perform and the profits they make for you, the investor?

Archie Pearson



The idea that diversity can improve an organisation has never been so widely acknowledged, yet it is by no means new. Espoused in academic circles for around half a century, it is frequently traced back to management theorist Meredith Belbin's formative studies of workplace cooperation and collaboration.

Belbin pioneered the then-revolutionary notion that the most effective teams are those comprising different types of people. He famously encapsulated his findings by urging firms to understand the respective attractions of “a collection of brilliant minds and a brilliant collection of minds”.

This kind of thinking is now entering the mainstream, with the investment community among its most determined proponents. Last year, for example, Nasdaq – the world's second-biggest stock market in terms of market capitalisation of shares traded – proposed introducing binding diversity targets for its listed companies.

Subsequently approved by the US Securities and Exchange Commission, this move will require each of around 3,000 businesses to appoint to its board of directors at least one woman and one person who is from an under-represented minority or who self-identifies as LGBTQ. The aim, says Nasdaq CEO Adena Friedman, is to “push the needle” in raising awareness of diversity's benefits.

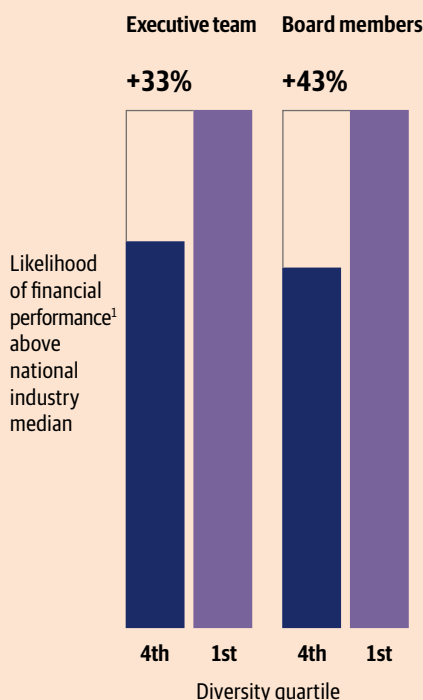
The Financial Conduct Authority (FCA) is currently exploring a similar scheme for financial services in the UK. It wants women to account for a minimum of 40% of a board's membership, a woman to occupy at least one senior position and at least one member to come from a non-white ethnic background.

Announcing a consultation, FCA Chief Executive Nikhil Rathi said: “We're concerned that lack of diversity and inclusion within firms can weaken the quality of decision-making.” Echoing this sentiment, Sir Jon Cunliffe, Deputy

“As with other elements of ESG, investors can encourage positive change through the power of active ownership.”

Diversity: the business case

Published in 2018, McKinsey & Company's *Delivering Through Diversity* provided compelling new evidence of the relationship between diversity and financial performance. It concluded that companies in the top quartile for ethnic/cultural diversity among executive teams were 33% more likely to have industry-leading profitability, with the figure rising to 43% for top-quartile ethnic/cultural diversity among board members.



Source: McKinsey & Company: *Delivering Through Diversity*, 2018

¹ – average economic profit margin, 2011-2015, and average EBIT margin, 2011-2015

Governor for Financial Stability at the Bank of England, emphasised the role of “diversity of thought and an array of perspectives” in fostering resilience.

Investors should welcome such initiatives. Along with other considerations around ESG – *environmental, social* and *governance* issues – enhancing gender and racial diversity should be an established goal of engagements with investee companies, as it serves the greater good and contributes to superior performance. Let us take a closer look at why.

From social justice to competitive advantage

Diversity in the workplace has its roots in the broader quest for social justice. It is a product of many decades of advances in policy, practice and thought. Over time, often slowly, the barriers around considerations such as gender, race and privilege have been eroded as the importance of equality of opportunity has gained ever more recognition.

Significantly, the concept of diversity as a source of competitive advantage has emerged only of late. Although it was viewed as fundamentally *right*, a diverse workforce was previously seldom regarded as a catalyst for making an organisation *better*.

Even after Belbin summarised his research in *Management Teams: Why They Succeed or Fail*, originally published in 1981, there was no sudden sea-change in how businesses treated this issue. A tipping point arguably arrived only with the global financial crisis.

Presaging the FCA's recent pronouncements, critics claimed that more diversity at board level might have averted the turmoil of 2007 and 2008. “If it was Lehman Sisters,” said Christine Lagarde, then France's Finance Minister and now President of the European Central Bank, “it would be a different world.”

‘Groupthink’ was identified as a major failing. Writing about the Royal Bank of

Scotland's ill-fated acquisition of ABN Amro, which an inquiry by the Financial Services Authority – now the FCA – said was blighted by a lack of “divergence from consensus”, former *Financial Times* editor Sir Richard Lambert lamented that every one of RBS's directors was “drawn from the same establishment pool”.

A bitter irony of the crisis was that a seminal study of diversity's advantages was released in the same year that the repercussions of *non*-diversity became so apparent. Condemning prevailing corporate models as “the pillars on which the glass ceiling is supported”, McKinsey & Company's *Gender Diversity: A Corporate Performance Driver* evidenced a link between a higher percentage of women in senior positions and higher returns on equity in large organisations.

Eleven years later, in *Delivering Through Diversity*, McKinsey reported that businesses in the top quartile for executive teams' ethnic/cultural diversity were 33% more likely to have industry-leading profitability. The research concluded: “That this relationship continues to be strong suggests that inclusion of highly diverse individuals... can be a key differentiator among companies.”

Beyond window dressing

Today, with ESG as a whole gathering unprecedented momentum, more investors appreciate the vital distinction between ‘talking the talk’ and ‘walking the walk’. With the E of ESG, for instance, this problem most obviously manifests itself in the scourge of greenwashing.

Similarly, an essential challenge with diversity is to move beyond tokenism. As Harvard Business School academics Deborah Bell and Boris Groysberg observed in a 2013 study of gender diversity at boardroom level: “Diversity is about counting the numbers. Inclusiveness is about making the numbers count.”

Their point: simply fulfilling quotas is far from guaranteed to eradicate the

organisational failings that encourage inequality in the first place. According to American economist and social theorist Thomas Sowell, the principal outcome of such an approach is the proliferation of “movie extras” – a cast of characters who might occasionally venture into the foreground but who do not genuinely possess a voice.

This is the stuff of window dressing. It is superficial and potentially disingenuous. The projected image fits the bill, but there is nothing beneath the surface. Some researchers have found diversity can even have markedly negative consequences in such circumstances, with overall job satisfaction declining.

“Managers and workers alike need an ever-greater awareness of the value of accommodating all employees,” says Dr Getinet Haile, of Nottingham University Business School. “As with so many other facets of modern-day corporate life, we've allowed the gap between rhetoric and reality to widen.”

Published in 2011, Deloitte's *Only Skin Deep?* was one of the first high-profile studies to shed light on a damaging propensity to pay lip service to diversity. “Truth be told,” warned the authors, “there appears to be more head-nodding about the business case [for diversity] than a rolling up of the sleeves to take action.”

This brings us to two crucial questions for responsible investors. The first: what can we do to encourage positive change? The second: how can we reliably distinguish between an organisation that is sincerely rolling up its sleeves and an organisation that is merely nodding its head?

“Although it was viewed as fundamentally *right*, a diverse workforce was previously seldom regarded as a catalyst for making an organisation *better*.”

Making – and measuring – a difference

As with other elements of ESG, investors can encourage positive change through the power of active ownership. This might include direct dialogue with investee companies or the exercising of voting rights.

For example, under the targets initially set out in the Hampton-Alexander Review five years ago, all FTSE 350 companies should have 33% female board representation or a timeline for achieving it. But how can we measure success or otherwise? As remarked earlier, counting numbers is one thing – making them count is another altogether. Numerical parity represents only a fraction of the story, while superior performance alone cannot tell us everything about the desired transformation of an organisation's culture.

Again, as with other facets of ESG, an answer is likely to be found in disclosure. Going forward, just as they face growing pressure to be transparent about their commitment to addressing climate change, companies must be compelled to reveal as much as possible about their diversity-focused efforts – not just in terms of targets and programmes but in terms of impacts and corollaries.

Professor Dulini Fernando, of Manchester Metropolitan University Business School, has researched the dynamics of diversity in various settings. “In order to reap the maximum benefits,” she says, “we need to look at satisfaction, internal grievances, external cases, retention and many other factors. We need to understand who continues to feel excluded and devalued in companies that celebrate diversity.”

There is no doubt that the cause of diversity has come a long way, particularly in recent years. There is also no doubt that much remains to be done. As investors, we can play a substantial part in furthering this journey and helping ensure that, in the best traditions of ESG, the resultant benefits extend far beyond the bottom line.

Putting it to the zest

Marmalade as we know it was introduced to wealthy British kitchens in the 17th century, when ingredients were expensive and available only to the rich few. Over 300 years later, Jane Hasell-McCosh's mission to find the best recipe has created a global community of marmalade makers.

Jake Wellesley-Smith

James Keiller is often credited with introducing marmalade to the UK. Legend has it that a ship transporting oranges from Spain took refuge in Dundee harbour and Keiller was the first to find a use for the bitter fruit. Keiller did produce the first commercial marmalade in 1797, but this story appears to be just that – a story. In fact, the earliest known recipe dates from over a hundred years prior, written in the recipe book of Madam Eliza Cholmondeley.

Cholmondeley's recipe is dated around 1677 and now resides in the Chester Record Office. Her 'marmelet of oranges' resembles the spread we use today. However, historian Ivan Day points out that for years before this 'marmalade' was used as a generic term for fruit preserves, which didn't even have to be made from oranges. Apple, pear and quince were often used.

Quince flesh, once simmered and combined with honey, turns a reddish gold, like a richer version of the marmalade colour we know today. This quince paste was imported most commonly from Portugal, and the

word 'marmalade' itself comes from 'marmelo' – Portuguese for 'quince'.

It is hard to determine exactly when oranges were first used to make marmalade. Recipes like the one in Cholmondeley's book would have been expensive to make and were mainly passed between wealthy households. It wasn't until much later that Keiller and his mother Janet commercialised the spread, making it affordable and available to the working classes. So, although the Keillers didn't discover marmalade, they were integral in its popularisation.

Many of us have our own marmalade heritage stories. Jane Hasell-McCosh, founder of the World's Original Marmalade Awards and Festival, can trace her family connection back generations. Jane's mother married a clergyman. He later became a bishop and moved the family to Rose Castle, a palace in Cumbria, where Jane's mother made marmalade.

Three hundred years earlier, Jane's husband's ancestor also married a bishop and moved to a castle. She collected recipes from the locality, as well as from

London, where the bishop had a second palace. When Jane moved to Dalemain, her husband's family home in Penrith, they discovered an archive of old recipes. And so the wheels were set in motion...

The pith of Penrith

Despite the coincidental family connection, Jane didn't start the World's Original Marmalade Awards and Festival until 2005.

"I remember this desultory moment when I was in hospital for an operation," says Jane. "I woke up and was given toast and marmalade – and it was horrid. I thought: 'There must be something better than this.'"

Jane's stay in the hospital sparked an idea: to seek out the world's best marmalade. An outbreak of foot and mouth in Cumbria in 2001 spurred her decision to make it a public affair. The family lost all their sheep to the disease, as did many Cumbrian farmers. The competition was a way to say: "Cumbria is open for business."

Jane rallied reluctant friends to each make her a jar of marmalade. In the first year she received 60 submissions. In 2021 there were over 3,000.

The jars arrive by hand, collection and post. Each marmalade is tasted and judged in February. Thanks to a longstanding partnership with Fortnum & Mason, Double Gold and selected Gold winners are offered the opportunity to have their marmalade sold in the Fortnum & Mason shop in Piccadilly. The overall winning product is reproduced by artisan jam-maker Thursday Cottage and is also sold at Fortnum & Mason, as well as at Dalemain.

Widespread a-peel

Submissions are sent from all over the world. "We hear the most lovely stories," says Jane. "One woman grows oranges on her balcony in Singapore. Someone

else makes marmalade in the Sahara. A woman in Australia picks her own fruit and makes the marmalade straight away."

It is easy to understand the popularity of the competition when the values underpinning it inspire community spirit.

"There were five key things that I felt were very important," says Jane. "The first was helping small businesses. We created this niche competition for artisanal marmalade businesses, which has proven immensely successful. We produce an awards label they can stick on their jars if they win."

The second element is education. In 2021, incredibly, nine-year-old Flora Rider's Seville Orange Marmalade with Orange Blossom won overall Best in Show. Last year also saw the debut of a First Timers category, which encourages beginners learning how to make marmalade to take part.

Jane's third motivation was to build a community. "I believe the healthiest way of living is living in community," she says. "We introduced the 'Marmalade for a Friend' category last year, and it was really very moving. People were making marmalade for friends who were ill. Someone used the recipe of a loved one who had died. Others made a jar as a present for a neighbour. The gift of marmalade is a wonderful thing."

The kindness of the growing community has facilitated astonishing fundraising – the fourth aspect of the competition. "Since the first year we've raised over a quarter of a million pounds for hospice work," says Jane.

The final element, of course, is Jane's search for the world's best marmalade. The competition receives some unusual entries. "A fairly early submission was made with vintage

champagne, vintage whisky and gold leaf," says Jane. "It was sensational. We've had marmalade with seaweed and with horseradish. The category for gardeners is extraordinary – people will put in turnip."

Dalemain Down Under

Jane's dream is to run festivals in countries around the globe. So far she has taken the festival to Australia and Japan, with incredible success. She originally travelled to South Australia to visit Martindale Hall, a copy of Dalemain, and introduced the competition to interested parties.

"The freshness of the fruit there is incomparable," says Jane. "They started a competition called the Marmal-Ashes – like the cricket, only with marmalade. They send over 11 good jars and true, and we put up 11 against them."

One year the Japanese ambassador attended the Awards and Festival. He was so taken with it that he managed to convince the mayor of Yawatahama to host the festival in his town in Japan.

"It's the perfect place," says Jane, "because there are over a hundred different types of citrus growing there. I remember seeing hundreds of orange trees all the way around the harbour. Citrus is their biggest export."

Jane found contestants were making marmalade more similar to compote. "It was looser – it didn't pass the toast test," she says. "We introduced the idea of a

British-style competition, meaning the marmalade had to be solid enough to stick to a piece of toast. Now they win so many golds."

The zest-overs

Entries are displayed at Dalemain House during the festival. Afterwards contestants are welcome to collect their jars, along with their mark cards and certificates. The most spectacular entries often wind up in Jane's own marmalade museum.

"We receive submissions from all over the world, and not everyone can retrieve their jars," says Jane. "So some do end up in my museum. A remarkable one from South Korea had these beautiful layers: a brown, treacly marmalade at the bottom, then green and gold leaf which looked like oranges on an orange tree."

The rest of the unclaimed jars – those that don't end up on display in the museum – don't go to waste. Surplus marmalade is fed to Dalemain's bees in the winter. "They make a sort of prickly honey," says Jane. "It's not orangey, but it's very nice."





The big sniffers

Dogs are used for their superior sense of smell across a range of fields. Now they are even being trained to detect COVID-19. We take a look at the science behind the snout.

Colin Nelson

We don't call them 'man's best friend' for nothing. Looking after a dog can reduce stress, lower blood pressure and increase levels of oxytocin, a feel-good hormone, as well as help tackle loneliness. Some universities even hold 'puppy days' during exam season to calm students' nerves.

Small wonder, then, that dogs are the favourite pet among UK households. But since 2020 some have swapped their owners' laps for laboratories, taking part in trials to find out if they can detect COVID-19 with their impressive noses.

Possessing a whopping 300 million scent receptors – the average human has between five million and six million – dogs are ideal sniffers. For years they have been used to track down contraband for customs officials, assist search and rescue missions and even identify illnesses.

Scientists have previously trained them to detect certain cancers, malaria, diabetes and Parkinson's. Diabetic Alert Dogs (DADs) pick up on changes in the odour of a patient's breath and sweat that are suggestive of low or high blood sugar levels. In some cases DADs have been able to spot dangerous changes when a glucose monitor has failed to do so – and they are also a lot more fun to have around.

Alarm smells

In the spring of 2020, applying similar principles to those used when training DADs, scientists at the University of Pennsylvania's School of Veterinary Medicine sought to find out whether dogs could be

“Possessing a whopping 300 million scent receptors – the average human has between five million and six million – dogs are ideal sniffers.”

used to detect COVID. Nobody knows exactly what dogs are smelling when they 'sniff out' the disease, but experts believe certain illnesses release specific patterns of volatile organic compounds (VOCs) when they are present in the body.

Dogs are rewarded with treats when they detect specific VOCs during training. This positive reinforcement encourages them to focus on the relevant smell and ignore the others. Dogs could detect the virus with 96% accuracy in a study using urine and saliva.

Trials have taken place at airports in the United Arab Emirates, Finland and Lebanon to see if trained dogs could detect positive COVID cases from passengers' sweat. Success would have significant implications for practical application, since it would be a lot easier to screen people for COVID using their sweat rather than urine or saliva.

Dogs identified negative cases with 100% accuracy and positive cases with 92% accuracy in the Lebanon trial. They were able to identify asymptomatic patients as well as patients with low viral loads. The London School of Hygiene and Tropical Medicine recently published its own research, with similarly promising results.

The trials suggest dogs could soon replace conventional COVID testing in airports and other locations where mass screening is required. In the pilot scheme at Finland's Helsinki-Vantaa international airport they were able to detect positive cases with nearly 100% accuracy, days before a patient became symptomatic. They were also able to detect the virus from a smaller molecular sample than lab-based testing, needing only 10-100 molecules – PCR tests require 18 million.

If using dogs to test becomes common practice, the main advantage will be time saved. Even the quickest test takes 15 minutes, while a dog takes seconds to make a judgement. Two dogs could screen 300 people in half an hour and with minimal risk, since it has been shown the virus cannot be transmitted through sweat. Using dogs is also cheaper and easier than lab-based testing, meaning they could be a huge benefit to countries with limited access to laboratory space and technology.

Dogs would not fully replace lab-based testing, as passengers flagged by them would need to take a confirmatory PCR test and to quarantine while waiting for the result. However, using dogs as an initial screening stage could substantially reduce the number of people required to test and quarantine.

“Two dogs could screen 300 people for COVID in half an hour.”

Emotional mutt-urity

It is not just our physical condition that dogs are able to smell – it is our emotional state, too. Research has found dogs use chemical signals, including body odour and the release of hormones such as oxytocin, alongside behavioural signals to identify how an owner is feeling. Unlike their ability to detect specific illnesses, which requires training to develop, dogs' capacity to pick up on human emotions seems to be an innate and adaptive skill. Furthermore, research suggests they can even reciprocate our feelings.

A 2018 study found dogs can differentiate between fear and happiness based on smell. Researchers induced the emotions in male participants and collected samples from their armpits. In the presence of fear the dogs exhibited more stressful behaviours and higher heart rates. They were more likely to interact with strangers when a happy odour was present.

The ability to understand another's feelings is called affective empathy. Dogs use composite signals to do this, meaning they use information from a combination of senses. Eye contact and touch stimulate

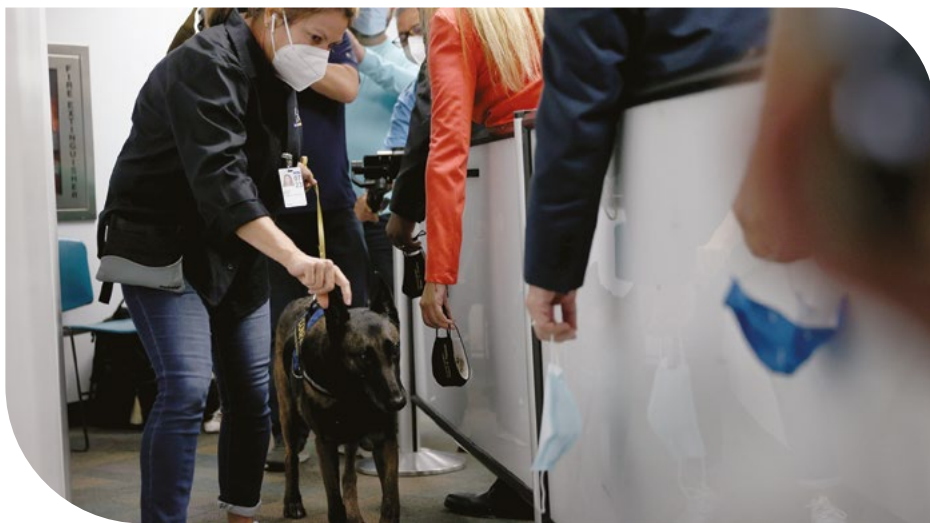
oxytocin release, which allows the brain to focus on social cues. Look into a dog's eyes while stroking its belly and you will trigger a chemical release that helps it identify your emotional state.

Emotional contagion is a social phenomenon that describes the spontaneous spread of emotions between people. When two humans interact they unconsciously mimic each other's expressions, body language and so on. The muscle movements involved in these unconscious actions cause mirror neurons to fire in the brain, causing us to 'feel' the other person's emotion. Dogs also experience this when they interact with each other – and possibly when they interact with humans.

In 2012 researchers found dogs were able to 'catch' human yawns. Since 'contagion yawning' is empathy-related, these results suggest dogs have the capacity to empathise. Additional research found they respond to facial expressions that show basic emotions including anger, fear, happiness and sadness, with changes in their gaze and heart rate.

For years scientists have believed the capacity for emotional contagion evolved as a survival mechanism. However, thinking has shifted since the publication of a study that found the shared experiences and bond between humans and dogs causes oxytocin release. Dogs were compared with hand-raised wolves after interactions with closely bonded humans. Researchers found differences in hormone concentrations and behaviour between the animals were subtle, suggesting it is life experience rather than the evolutionary process of domestication that facilitates emotional contagion.

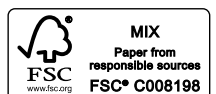
The amount of time spent together correlates with the extent to which emotional contagion occurs. Since early 2020, with everyone spending more time at home and therefore more time with their dogs, the phenomenon has become more prominent. So a smile really is infectious – at least as far as the nation's favourite pet is concerned.



Cobra, a Belgian Malinois, prepares to screen passengers at Miami International Airport.

Image: Joe Raedle/Getty Images

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