

High-tech summer boredom-beaters including a smart Rubik's Cube, ultimate marbles, music, gardening, barbecuing and scribbling.

Gadgets

by Caramel Quin



Thinkers Notebook

\$19.99

Tech nerds will love this paper pad's easy-to-digitise pages for collaborative working. Stationery nerds will love the mix of ruled and dot grid pages and the way you can pop out pages to reorder them. Punctuation nerds, however, will not love the lack of apostrophe.

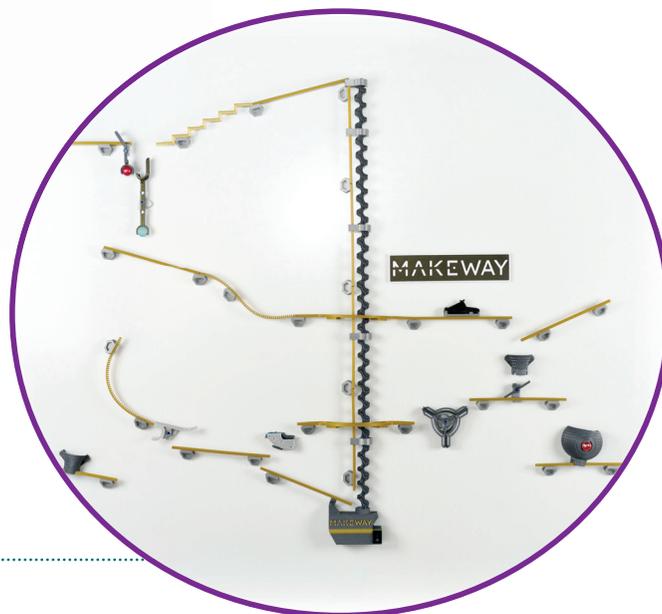
thinkersnotebook.com

Makeway

from \$49

This Kickstarter success story (they asked for \$8,000 and raised well over \$2m) turns any magnetic surface into a giant, marvellous marble game, complete with ridiculous Heath Robinson-style contraptions (Rube Goldberg machines for our American readers).

kickstarter.com/projects/makeway



Shure Aonic 215

£259

Shure has been used by everyone from Elvis to J-Lo. These sound-isolating earphones offer supreme comfort and fidelity, featuring the same tech used by musicians for in-ear monitoring on stage. Battery life is up to 32 hours and codecs include aptX, AAC and SBC.

shure.com

HANDS-ON REVIEW...

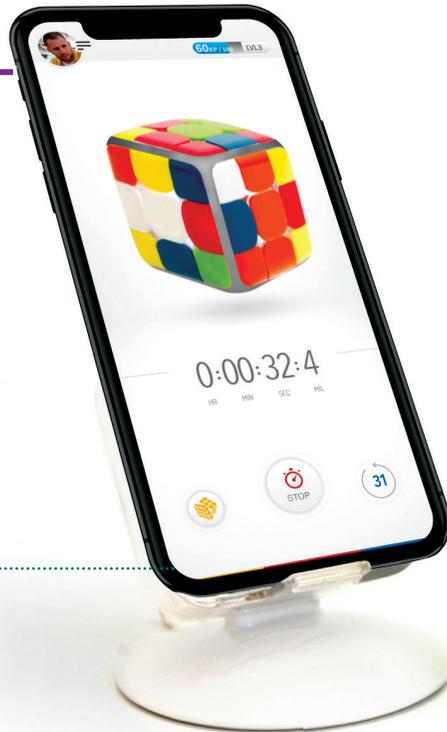
... bit.ly/eandt-gadgets

GoCube

from \$59.95

Rubik's Cube gets smart, with Bluetooth so the companion app knows precisely which tiles are where at all times. It can record your moves, teach you to solve the cube, even set you challenges. Battle friends or strangers to solve the exact same arrangement.

getgocube.com



Everdure Cube by Heston

£149

A portable barbecue for foodies with all mod cons: cool-touch handles, non-scorch base, storage, cutting board. Perfect for patio-table cooking, camping or a barbie on the beach. Comes in four cool colours and has Heston Blumenthal's stamp of approval.

everdurebyheston.co.uk

Stihl GTA 26

£149

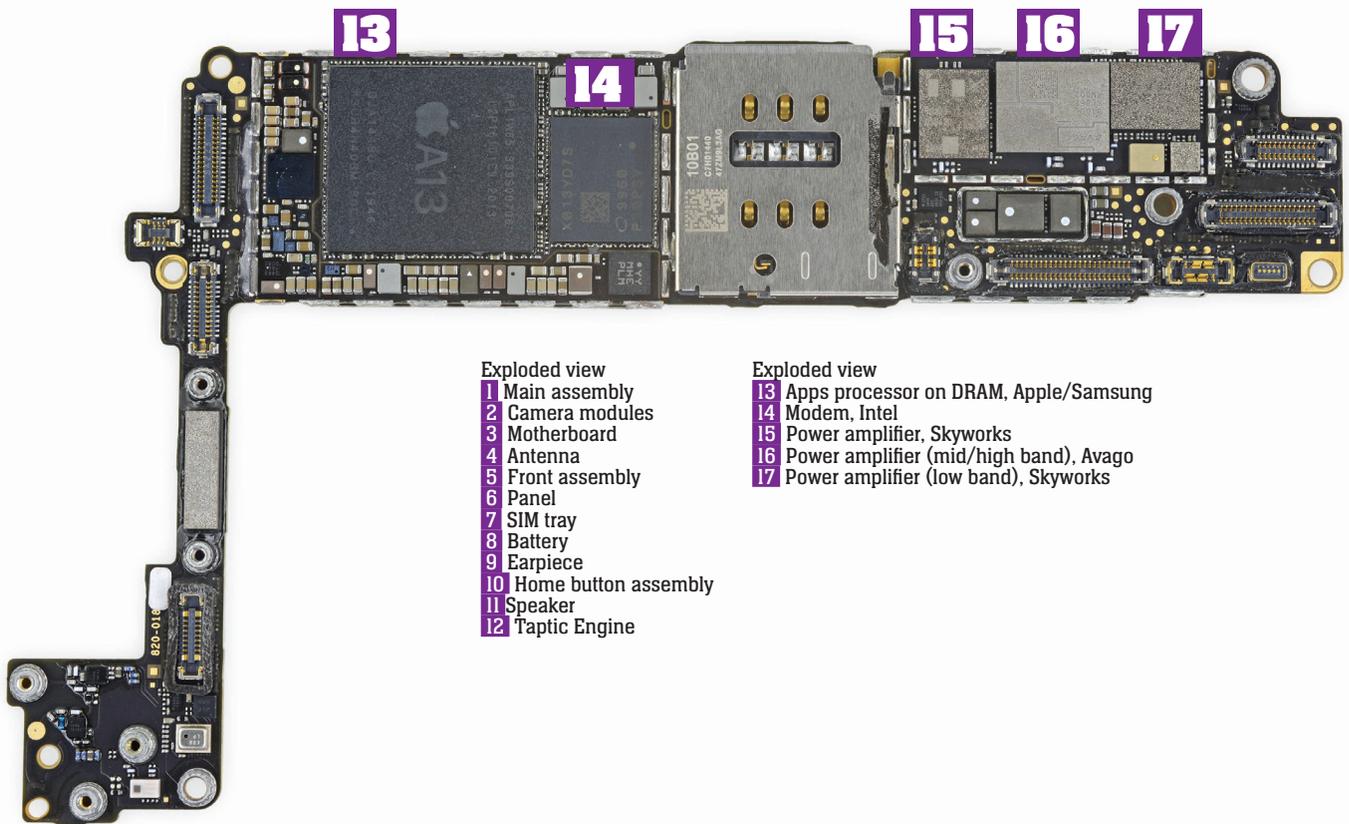
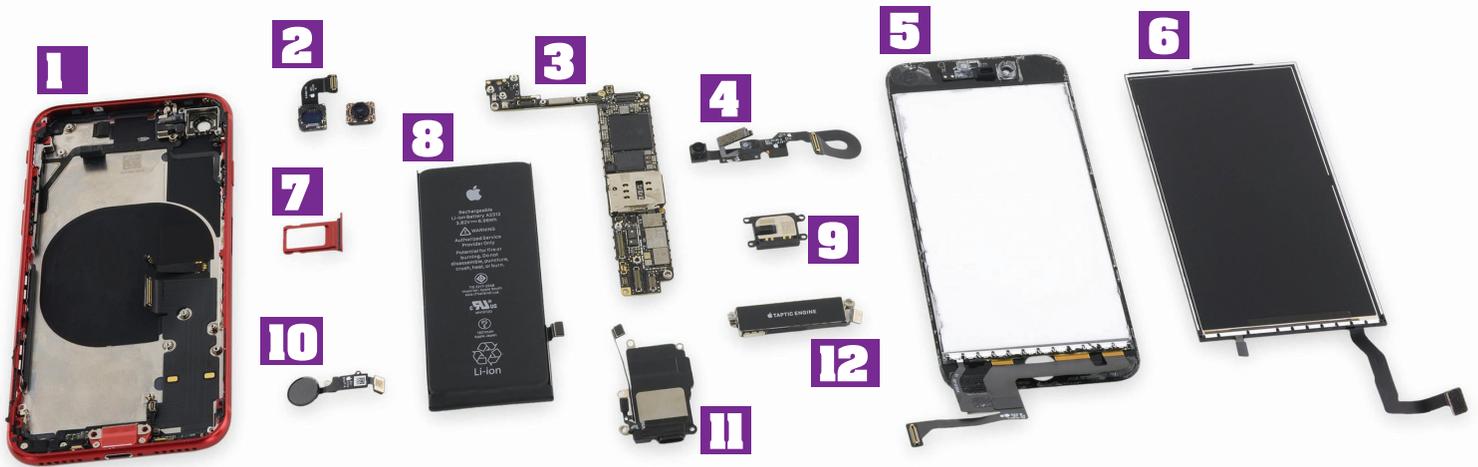
This looks like a mini chainsaw but it's billed as a cordless pruner: perfect for tackling home pruning jobs effortlessly without loss of limb. One battery is enough to chop 80 logs with 4cm diameters and it comes with two batteries and a charger. stihl.co.uk



Apple delivers smart reuse in a smartphone at a keen price.
By **Paul Dempsey**

The Teardown

iPhone SE 2020



- Exploded view
- 1 Main assembly
 - 2 Camera modules
 - 3 Motherboard
 - 4 Antenna
 - 5 Front assembly
 - 6 Panel
 - 7 SIM tray
 - 8 Battery
 - 9 Earpiece
 - 10 Home button assembly
 - 11 Speaker
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- Exploded view
- 13 Apps processor on DRAM, Apple/Samsung
 - 14 Modem, Intel
 - 15 Power amplifier, Skyworks
 - 16 Power amplifier (mid/high band), Avago
 - 17 Power amplifier (low band), Skyworks



There is the traditional iPhone bezel rather than whole-surface touchscreen functionality

THE 2020 EDITION of the iPhone SE was planned out well before the coronavirus pandemic but the crisis may make its recent launch even more timely for Apple.

At an entry price of £419 unlocked for the 64GB version (with 128GB at £469 and 256GB at £569), it targets potential customers in the mid-priced smartphone tier, responding to the increasing competition Apple has faced for some time from rivals' increasingly well-specified devices within it.

Right now though, with many consumers expected to rein in spending even as global lockdowns relax, this second iteration of the SE may also win over existing Apple customers who might otherwise not have upgraded their iPhones at all.

The SE is a powerful phone for the price. Most notably, it is powered by Apple's own six-core A13 Bionic applications processor seen in the iPhone 11 (2 x 2.65GHz; 4 x 1.8GHz), albeit here with 3GB of RAM rather than the 4-6GB seen across the flagship models.

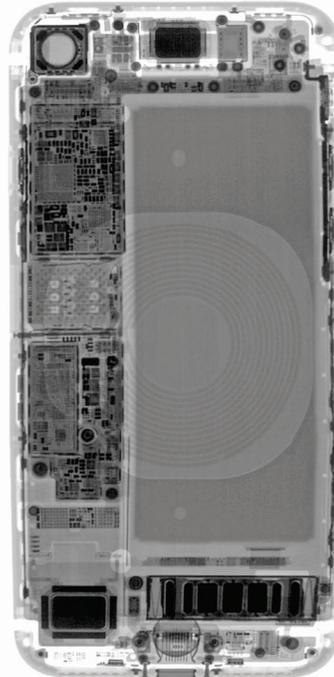
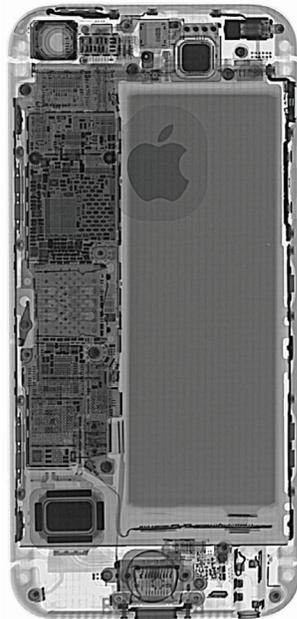
This means that more demanding apps still load and run quickly. Moreover, although Apple has opted for single front and rear cameras (7MP and 12MP respectively) rather than multi-modules, the optical image enhancements offered by the A13 are generally rating as delivering very polished results.

Further 'premium' features on the SE include an IP67 rating for water and dust contamination, and wireless Qi-standard charging. However, as is more and more the case, there is no standard headphone port.

With all this in mind, the SE remains an exercise in extensive design and specification reuse. It could not have been otherwise. To hit the lower price point, Apple has needed to constrain non-recurring engineering costs, taking advantage of the available economies of scale on components.

Apart from pulling across the A13 processor from the iPhone 11, the SE has the same handset's advanced MIMO and Wi-Fi capabilities. However, the main inspiration is the iPhone 8. The SE has the same 1,334x750ppi

The iPhone SE 2020 (right) is larger than the original SE (left), with a physical layout almost identical to that of the iPhone 8 (centre)



Retina HD display (336ppi), Touch ID fingerprint sensor, 6.96Wh battery and Taptic Engine. The camera modules do differ, but only slightly.

An X-ray examination by iFixit and Creative Electron found this trend carrying over to the physical layout (see opposite), notwithstanding a few changes to ports, antennas and some of the silicon.

There is also the more traditional iPhone bezel as opposed to whole-surface touchscreen functionality. That does perhaps date the SE a little.

Overall, iFixit scores the 2020 iPhone SE at six out of 10 for repairability. A middling score generally, but a comparatively high one for an Apple device. Many of the components are modular and relatively easy to source. Access to the display and battery (two of the most common sources of smartphone failures) is straightforward.

On the downside, the IP67 seals do complicate access (though that is one trade-off many consumers will happily make), but perhaps a bigger issue is that the glass rear panel is hard to replace.

Although it may not have the

snazziest screen, the iPhone SE can do a lot of heavy lifting to run more demanding games and undertake both still and video image tasks, but the battery capacity has been the subject of some criticism. However, you get what you pay for, so keeping a few cheap wireless charging pads handy is probably your best way of ensuring a full day's use.

Generally, the iPhone SE is a

very attractive phone, particularly in the present times, leveraging a lot of Apple's very potent intellectual property. Moreover, it has been well futureproofed for a mid-price device. This again is largely attributable to the A13 engine, but there is also the promise of three or four years of updates from its base point of the latest release of iOS 13. *

KEY COMPONENTS
APPLE IPHONE SE

Part	Supplier	Comments
Apps processor	Apple	A13, Hexacore, ARM-based, 2 x 2.65GHz; 4 x 1.8GHz, Bionic
Memory (DRAM)	Samsung	3GB, LPDDR4
Memory (Flash)	Toshiba	64GB
Power amplifier module	Skyworks	78223-17
Wi-Fi/Bluetooth SoC	USI	339S00648
PA module integrated duplexer	Skyworks	78221-17, low-band
PA module integrated duplexer	Avago	8100, mid/high-band
Modem	Intel	9960 P10 PSV
Power delivery	Cypress Semiconductors	USB, CPD2

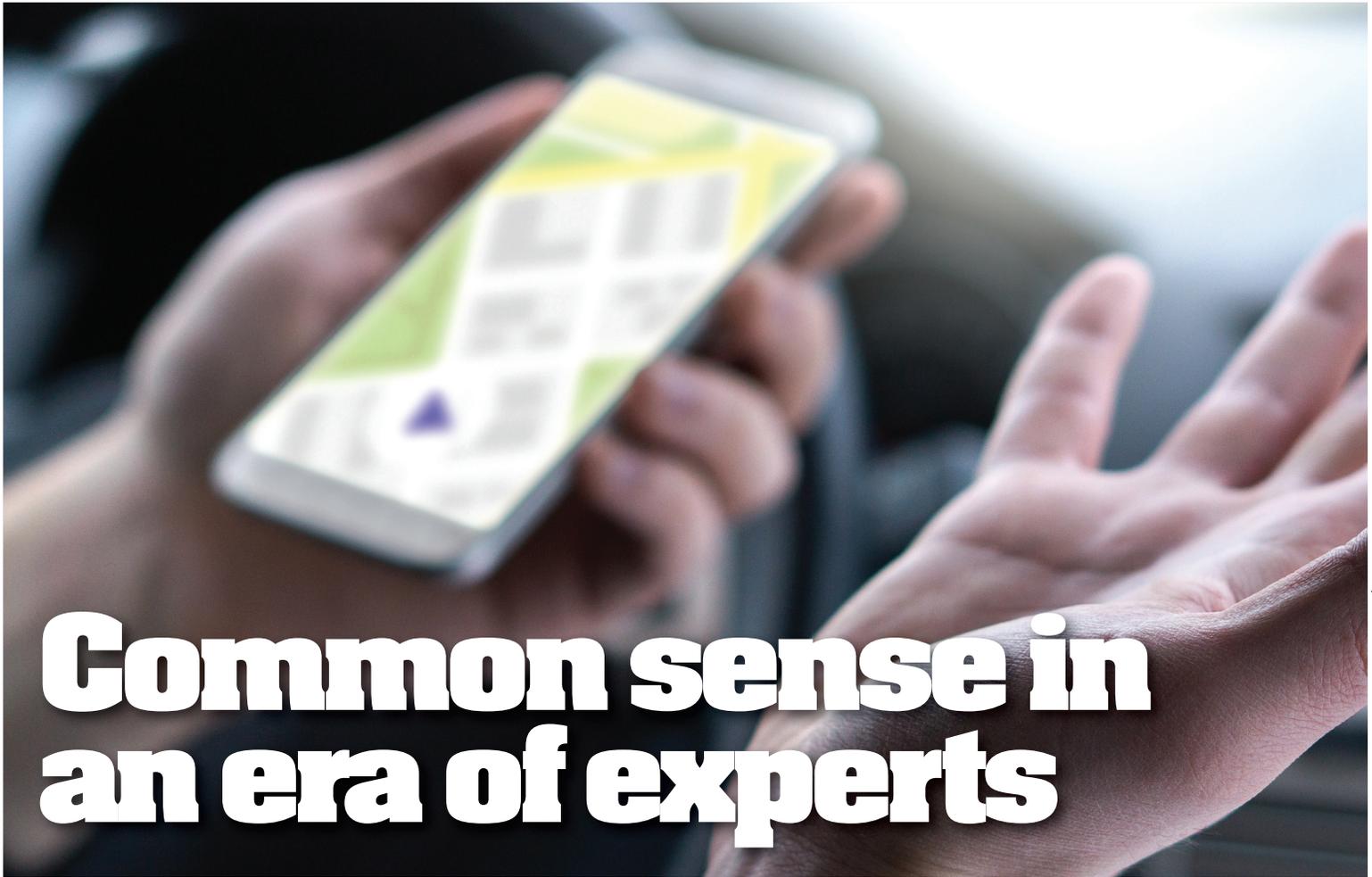
Note: the components listed here are not exhaustive but restricted to key parts whose suppliers and function could be identified.

Source: iFixit

Access to big data means that we are increasingly outsourcing our decision-making to protocols, experts and technology. But that's not always the best solution, warns author **Vikram Mansharamani**.

Book Interview

by Nick Smith



Common sense in an era of experts

IF YOU'VE EVER allowed your GPS to lead you against your instincts to an empty industrial estate instead of where you were actually going, you will already have experienced what is at the core of Harvard lecturer Vikram Mansharamani's new book "Think for Yourself".

Put another way, "in a data-flooded world we've outsourced our decision-making" to technology. In passing responsibility for making correct decisions to specialists working in narrow fields, we're creating skewed agendas and biased positions. Because we are losing our intellectual autonomy to machines and data, it's hardly any wonder we've become bad at making decisions, says Mansharamani. His book's subtitle – 'Restoring common sense in an age of experts and artificial intelligence' – is an appeal to people to stop relying

on data as a substitute for hard-won experience.

"Think for Yourself" went to press before the extent of the coronavirus pandemic became apparent, but Mansharamani points out that there are many current instances of governmental decision-making related to Covid-19 that illustrate his central point. "We rely too much on the testimony of experts. We need to overcome our love affair with technology, stop being blinded by focus and keep experts on tap, not on top. As much as we want to outsource all of our decision-making problems, we need to take control and only tap into experts when their insight is needed."

In some cases, he says, "experts make assumptions, and only by understanding their logic can we understand their recommendations". In others, experts may simply be failing

to give best advice due to subconscious bias, "especially as academia is organised in silos. So, a cardiology expert is either going to say something is or isn't a heart problem. This kind of silo thinking is not always helpful."

This is never more relevant than when you abnegate responsibility for your decision (in the event that it turned out to be a bad one) by claiming to have done the right thing in seeking expert advice. "We see this all the time at the moment," says Mansharamani, who explains that politicians routinely defend their decisions on issues such as virus containment measures on the basis that they've consulted academics or scientists and received best advice. "The problem with expert advice is that while it can be accurate with 'all else equal', it's rarely the case that all else is equal."

There's a parallel narrative to Covid-19 in "Think for Yourself" that makes Mansharamani's point. At the height of the 2014 Ebola epidemic, a man who had recently returned from West Africa with a fever and severe abdominal pain was admitted to a hospital in Dallas, USA. "Even after healthcare workers learned the patient had come from Liberia – ground zero of the Ebola hot zone – not one of these people treating him considered the deadly virus as a possible cause." Thirty-five minutes after the patient's initial temperature reading, his temperature dropped and, as the rules indicated that his latest temperature level meant that it was the correct course of action for him to be discharged, he was sent home, where he died.

Not long after this, one of the nurses who had treated him needed to take a commercial

'We rely too much on the testimony of experts'

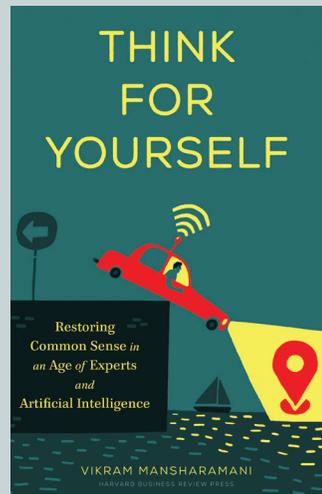
Vikram Mansharamani



Ignoring our intuition when following satnav directions is just one hazard of outsourcing decision-making to technology

WE READ IT FOR YOU 'THINK FOR YOURSELF'

One of the disadvantages of living in the information age is that we've lost our ability to make decisions based on common sense rather than mathematical models. In 'Think for Yourself' author Vikram Mansharamani looks at how today's data explosion has left us in the bizarre situation in which we are routinely handing over managerial responsibility to algorithms, while automatically relying on experts whose range of expertise doesn't extend to a whole view of a problem. Not surprisingly, this is how mistakes are made, and 'Think for Yourself' examines how protocols can create an environment for bad thinking, while intellectual self-reliance can often provide solutions unavailable to data crunchers. While experts and computer-based systems inevitably remain part of the decision-making landscape, they're not infallible.



watching sport is precisely because it cannot be predicted with any certainty. In fact, the reason the players turn up is to contest the outcome.

Mansharamani agrees, explaining that this is where complexity science kicks in, and refers me to his chapter dealing with the Cynefin framework that separates contexts (such as sport) into four groups: simple, complicated, complex and chaotic. Simple is the natural domain for computers: "It could be something like how much interest is due on a credit card. We know the interest rate, we know the balance. The computer can do this and it's never wrong." But as you move through the framework to greater levels of complexity, such as sport, "you find that data could give you misleading results.

"In my previous book I talk about the differences between puzzles and mysteries. You can solve a puzzle, like the interest rate on a credit card, but when the problem is more complex and unpredictable, it becomes a mystery and just analysing the data may not get you any closer to connecting the dots."

The point that Mansharamani keeps returning to is that at some stage we need to take control and

regain our intellectual autonomy. We need to trust ourselves to make the right decision on when it is appropriate to call in outside expertise or rely on big data.

Which brings us to the central irony of this excellent, unconventional and stimulating book on thinking for yourself: which is that for nearly 300 pages we're being told what to think by a Harvard professor. Surely, if I were to accept his logic, the thing to do would be not to follow his advice and therefore not think for myself?

Mansharamani, to his credit, likes the idea, but he's too clever to be caught out by such logic-chopping. "That's nothing," he says. "While pitching this book, I went to see a publisher who said to me: 'look. I'm the expert in this, so let's forget all your ideas and stick with mine.' To which I said: 'Have you even read what my book is about?' I went with another publisher in the end." And that's Mansharamani's message in a nutshell. "Just because someone is an 'expert' in their field, or has access to all this data, that doesn't mean that they are better equipped to take your decisions for you." **'Think for Yourself' by Vikram Mansharamani is from Harvard Business Review Press, £22**

EXTRACT DANGEROUS DIRECTIONS

The downsides of blindly relying on algorithms are exemplified by what happens when small errors surface in navigation software. GPS navigation aids allow us to take our focus away from navigating, sometimes with disastrous results.

In 2008, a bus carrying the Garfield High School softball team crashed into a pedestrian bridge in Seattle, sending 21 kids to the hospital. The driver's GPS had routed him under the bridge even though it was too low for a bus. But why didn't he pay attention to the low bridge as he approached it? One reason, perhaps the reason, is that the driver outsourced his thinking to the technology. An algorithm had given him the route, so he didn't stop to think about the bridge's height. You see, the GPS had a 'bus' setting...

Neither the driver nor the bus company had considered the possibility that the system could mislead. As the president of the bus company put it: "We just thought it would be a safe route because why else would they have a selection for a bus?" The bus setting gave them a false sense of security.

In a similar case in 2013, Apple Maps routed drivers across an operating runway at Alaska's Fairbanks International Airport. Drivers mindlessly continued beyond road signs warning them of the runway and drove onto the airport grounds. Listening attentively and focusing on those directions, the drivers stopped thinking about where they were actually driving. Clearly, looking out of the window rather than listening to computer-generated instructions would have been more productive. To avoid a real disaster and potential loss of life, airport officials quickly erected barricades in the hope of preventing more of the same risky outsourcing of thought.

Edited extract from 'Think for Yourself' by Vikram Mansharamani, reproduced with permission.

flight. She reported a fever, but because her temperature was lower than the protocol threshold for restricted travel, she was cleared. Somewhat predictably, she was later confirmed to be infected with Ebola. "The system was designed to prevent situations like this," says Mansharamani, "but failed because judgement and common sense were outsourced to strict protocols."

I put it to Mansharamani that this is essentially the same scenario that plays out in sport week after week, where support staff huddle over laptops on the sidelines crunching data rather than looking at the game. Why is it that, rather than trusting their instincts, these 'sports scientists' turn to computer algorithms to predict play and justify their decisions? Every enthusiast instinctively knows that the reason we are so addicted to

Stealth aircraft, Antarctic science and the strange beliefs of the otherwise brilliant.
By **Mark Williamson, Nick Smith, Vitali Vitaliev**

BookReviews

Stealth, Land of Wondrous Cold, In Praise of Folly

OXFORD UNIVERSITY PRESS

STEALTH: THE SECRET CONTEST TO INVENT INVISIBLE AIRCRAFT

A focus on computer simulations influenced the Nighthawk's flattened design



BY PETER WESTWICK. £20. ISBN 9780190677442

Military research and development is a well-established system, in which countermeasures lead to counter-countermeasures ad infinitum. The development of radar to detect enemy aircraft, for example, was countered to some extent by deploying 'chaff' to produce multiple, confusing echoes on radar screens. Unsurprisingly, this prompted the question – especially during the Cold War – of whether aircraft themselves could be made invisible to radar. This was the genesis of 'stealth'.

The two most familiar manifestations of stealth aircraft are the F-117A Nighthawk 'stealth fighter' and B-2 Spirit 'stealth bomber'. 'Stealth: The Secret Contest to Invent Invisible Aircraft' explains "where those aircraft came from and why they look the way they do".

It tells the story of engineers at two leading US aerospace companies, Lockheed and Northrop, and the contest to build the two planes in a "fantastically fertile" five-year period in the 1970s. As author Peter Westwick points out, their differing approaches produced two very different engineering solutions to stealth, "clearly evident in the aircraft themselves: the F-117 composed of flat facets, the B-2 of curves".

Lockheed's 'Skunk Works' design team devised a computer program, somewhat predictably dubbed 'ECHO', to calculate the radar cross-sections of various designs. As it couldn't handle curved surfaces or edges, this produced the familiar 'squashed diamond' shape, which sceptics christened the 'Hopeless Diamond' (a play on the famous Hope Diamond).

Despite the scepticism, the utility of the stealth fighter was proved in January 1991, when a dozen aircraft appeared "from nowhere" in the skies over Baghdad. Their angular shape – which Westwick

likens to "flying origami" – rendered them virtually undetectable, as the Nighthawk's radar footprint was "the size of a ball bearing".

Northrop's team also started with a computer, but blended the faces together with curves, relying more on what they termed "phenomenology", which Westwick translates as "highly informed intuition".

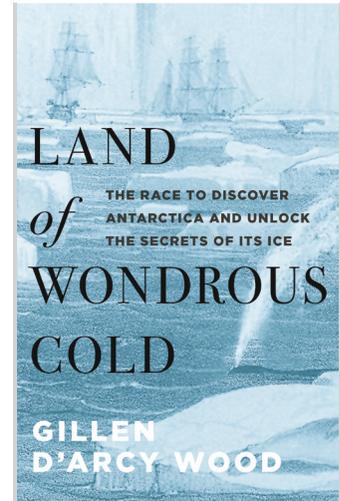
As such, the book offers a fascinating insight into the proverbial different ways to skin a cat, with Lockheed's reliance on computers and Northrop preferring its physicists' abilities in "seeing the waves," as they put it. As a history professor, Westwick is well-placed to draw further comparisons from outside the immediate field to add context by comparing the American labs involved in the design of nuclear weapons, Livermore and Los Alamos: the former relied more on computer code, the latter on "designers' intuition".

Illustrated with black-and-white photos and blessed with more than 30 pages of chapter notes and a 15-page index, this book could come across as a tad academic. However, this is no ordinary history text, more a model for making history accessible.

The familiar 'countermeasures paradigm' is a useful but necessarily simplistic characterisation of military development. In reality, as the book confirms, developments are made by people under time, budget and personal pressures. Contradicting the popular image of the aerospace engineer as "rational, dispassionate and reserved," Westwick opines, "These engineers were certainly rational but not at all dispassionate".

Indeed, it was the engineers' passion that "enabled the invention of Stealth".

Mark Williamson



PRINCETON UNIVERSITY PRESS
**LAND OF WONDROUS COLD:
THE RACE TO DISCOVER
ANTARCTICA AND UNLOCK
THE SECRETS OF ITS ICE**

BY GILLEN D'ARCY WOOD,
£22. ISBN 9780691172200

If ever there was a geographical region that unites humanity's twin obsessions with terrestrial exploration and the advancement of science, it is the continent of Antarctica. And if ever there was a book on precisely that relationship it is 'Land of Wondrous Cold', in which Gillen D'Arcy Wood describes the unfolding drama of the White Continent's role in plate tectonics, climate change and species evolution, stretching back into deep-time history.

Of course, we came to know of these phenomena largely due to the early exertions of human exploration, most notably in the 19th century, when the likes of James Ross, Dumont D'Urville and Charles Wilkes were pushing back the frontiers of both geographical exploration and scientific knowledge.

Subtitled 'The race to discover Antarctica and unlock the secrets of its ice', Wood's latest sensibly addresses the commonly held assumption that Antarctica is a very 20th-century affair, the fiefdom of the so-called 'Heroic Age' explorers such as Scott and Amundsen, Shackleton and Charcot. In fact, 'Wondrous Cold' is manifestly about what happened before that era, while cleverly interweaving modern field science related to concepts

'The Botanic Garden'
includes several
illustrations by
William Blake



HISTORY FROM THE IET ARCHIVES

Poetry of popular science

The copy of Erasmus Darwin's 'The Botanic Garden' held by the IET Library is a 1799 fourth edition of the 1791 collection of two poems – 'The Economy of Vegetation' and 'The Loves of Plants' – which is notable for five engravings by the English artist and poet William Blake including one of the *Amaryllis* shown here.

'The Economy of Vegetation' is divided into four cantos, addressed to the four elements of earth, water, fire and air, and charts the history of the world from creation to the time when Darwin was writing, celebrating scientific and technological progress. He describes in verse the processes of forging metal, mining, and the invention of the steam engine. Mythical figures such as Achelous and Hercules appear, alongside contemporary figures including Benjamin Franklin and Joseph Priestley.

'The Loves of Plants' advances early theories of evolution as well as the Linnaean classification scheme, named after the Swedish botanist Carl Linnaeus who recognised that plants contained male and female reproductive organs. This was seen as controversial at the time, and writers on botany sought to remove overtly sexualised language from their texts. However, Darwin describes in detail the arrangement and proportions of the reproductive organs. The female pistil and male stamen are anthropomorphised as a bride and groom.

'The Botanic Garden' is one of the first popular science books, with Darwin using verse to encourage interest in botany. However, his admiration of the ideals of the American and French revolutions, reflected in both poems, meant that his work fell out of favour as the French revolution became increasingly violent.

Daniel Simkin
More at bit.ly/IET-Archives

that would have been alien to the early pioneers: icecap instability, rising sea levels and the Ocean Drilling Program.

Wood's superb account starts right at the beginning of humankind's relationship with the Antarctic, with the first sighting in 1772 by Yves-Joseph Kerguelen of 'Desolation Island' in the sub-Antarctic waters of the Indian Ocean. A year later Captain James Cook became the first to cross into the Antarctic Circle, eventually beaten back by pack ice at 67° 10'. Ninety degrees south – the geographical South Pole – would not be reached for another century and a half, when Norwegian explorer Roald Amundsen pipped Robert Falcon Scott of the British assault party to the post in 1911. By this point polar exploration had become as much about planting national flags on unclaimed territory as it was about scientific discovery.

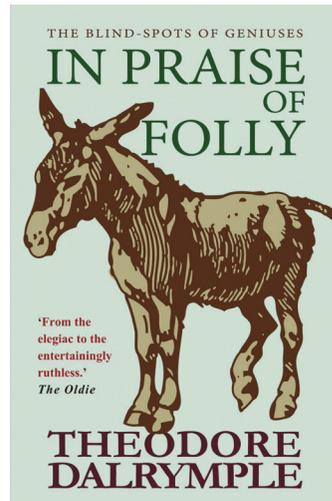
And yet, what is often forgotten is that the first ships to venture into the unknown did so in the name of science. He is careful to maintain that the explorers aboard these vessels are the lens through which we see the story of polar science rather than the story itself (which, as he politely states, has been done "satisfyingly by others" – he could have added, thousands of times.)

The strength of this approach is that Wood is able to span the temporal divide between the 19th century and post-millennial digital science by examining key episodes that link these fabled voyages of discovery to the modern era of polar research. With today's climate emergency high on the political agenda, it's worth remembering that "our newly urgent encounter with Antarctica begins with the resolute but forgotten icemen of the Victorian Age."

Nick Smith

GIBSON SQUARE IN PRAISE OF FOLLY. THE BLIND-SPOTS OF GENIUSES
BY THEODORE DALRYMPLE,
£9.99, ISBN: 9781783341412

E&T readers who are familiar with *The Spectator* magazine may remember Theodore Dalrymple's revealing and witty column, based on his real-life



experiences as a prison psychiatrist, which he authored for a number of years and of which I was quite a fan. I always started reading a new issue with that column, which made me think that Anthony Malcolm Daniels (Theodore Dalrymple is a *nom de plume*) belonged to that rare breed of top-rate physicians who were also acclaimed men of letters: Chekhov, Bulgakov, Maugham, Conan Doyle etc. That impression has been confirmed by Dalrymple's numerous non-fiction books – superbly written, often controversial, and invariably funny – of which this is the latest.

'In Praise of Folly: The Blind-Spots of Geniuses' sees Dalrymple pondering (in his habitual ironic fashion) on the extraordinary ability of many great scientists, artists and writers to manifest abysmal ignorance, childish naivety, and/or plain stupidity in the areas of arts and knowledge other than those they were experts in. To put it bluntly, the book is about the geniuses' unexpected eccentricities (or indeed 'follies'), as seen by an expert (if somewhat facetious) psychiatrist.

In no chronological order, and with minimal narrative structure, Dalrymple lists and analyses the unlikely flaws of acclaimed surgeons and theologians, engineers, writers, scientists and military commanders. We learn of the unexpected cruelty to animals shown by the Reverend Stephen

Hales (1677-1761) – botanist, chemist and engineer, the inventor of the ventilation system in Newgate Prison, which helped to considerably reduce the death rate from 'gaol fever', and the pioneer of blood-pressure measuring. We discover the multi-faceted 19th-century writer and artist Philip Henry Gosse, who was also the creator of the first indoor aquarium, but was nevertheless deluded enough to believe that marine animals – of all species – "were proof of the power and wisdom of God". We are confronted with the totally illogical and utterly incomprehensible attraction of satirist Pelham George Wodehouse to the ideals of Marxism, Soviet-style communism and even Nazism.

What can I say? Even Homer sometimes nods.

Not willing to supply any more spoilers (for the most distinctive feature of all the real-life characters featured the book is the sheer unexpectedness of their follies), I want to reserve the remainder of this review to Dalrymple's inimitable writing style. The book is resplendent with delightful autobiographical (and, for the most part, beautifully self-deprecating) observations of the type: "I can spend hours reading the first paragraphs of a thousand books, no matter how recondite their subject matter. I even relish books with titles such as 'A Brief History of Banking in Plaistow' or 'The Influence of Calvinism on Trade Unionism in Aberdeen'."

Or: "The Editor of my first book told me that the famous publisher Jonathan Cape once said that there were only two things you need to know about publishing. The first is that books about Nelson never make a loss, the second that books about South America never make a profit. My first book was on South America..."

Well, fortunately, 'In Praise of Folly' is not on South America. It is an intelligent and tongue-in-cheek reminder to us all of the old truism that no one, including ourselves, is ever perfect! This book is going to make a profit, I am sure.

Vitali Vitaliev