

## AUTUMN BOOKS



ILLUSTRATIONS BY JONATHAN BURTON

## Reassessing the father of chemistry

Robert Boyle's character is often obscured by the shadow of Isaac Newton, but a masterful biography reveals him as larger than life, explains **Peter Anstey**.

### Boyle: Between God and Science

by Michael Hunter

Yale University Press: 2009. 400 pp.  
£25, \$55

In the latter half of the seventeenth century, Robert Boyle (1627–91) was the leading natural philosopher in Britain. Yet although historians have been piecing together a more-detailed profile of him in the past three decades, his popular image extends little beyond the law that bears his name and his most famous publication, *The Sceptical Chymist*. As

with his contemporaries Robert Hooke and Christiaan Huygens, Isaac Newton's shadow has obscured our view of Boyle. But previous biographers must share the blame for Boyle's faded image, not least the first, Thomas Birch. Writing in the 1740s with his collaborator Henry Miles, Birch removed letters and whole unpublished works from Boyle's papers in order to perpetuate the anodyne image that suited the polite tastes of the day.

Nevertheless, there is no paucity of material with which a biographer can work. Indeed, the most impressive feature of biographer Michael Hunter's *Boyle* is the meticulous care

with which he has combed the vast quantity of published and unpublished materials — including portraits, printed images and medallions — relating to Boyle's life. Hunter masterfully interweaves the narrative of Boyle's intellectual development and scientific achievements with a measured assessment of Boyle's diffident, even convoluted, personality.

The tale begins with Boyle's domineering and ambitious father, Richard, the Earl of Cork, and moves through his infancy, childhood and Eton school years. Then follows his Grand Tour of Europe, on which Boyle had seminal experiences that were to shape his earnest Christian

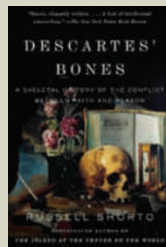
## NEW IN PAPERBACK



### The Age of Wonder: How the Romantic Generation Discovered the Beauty and Terror of Science

by Richard Holmes (Harper Press, £9.99)

This award-winning book explores links between science and Romanticism around the start of the 1800s. "To guide readers through the science and culture of this period, Holmes masterfully dips in and out of the life of Joseph Banks," wrote David Bodanis in his review of the hardback edition (*Nature* **457**, 31–32; 2009).



### Descartes' Bones: A Skeletal History of the Conflict Between Faith and Reason

by Russell Shorto (Vintage Books USA)

Russell Shorto interweaves the fate of philosopher René Descartes' bones with a narrative of Cartesian philosophy and beliefs, also exploring "the history of the uncomfortable relationship between Catholicism and Cartesianism", wrote Lisa Jardine (*Nature* **455**, 863–864; 2008).

faith and his early intellectual trajectory, and from which he emerged as a precocious adolescent.

Perhaps surprisingly, Boyle's first exploits as a writer were directed to moral and devotional topics. But at the age of 22 he was "transported and bewitched" by experimental chemistry and never looked back. So began a life dedicated to the study of nature: a life that was funded by the substantial means he inherited from his father, and that is epitomized in the title of his popular later work *The Christian Virtuoso*.

The most compelling chapters in Hunter's narrative cover Boyle's time in Oxford from the winter of 1655–56 and his emergence, in the early 1660s, as a celebrated public figure and emblem of the early Royal Society. These years were his most productive, both in terms of experimental results and written output: from 1660 to 1666, he published a dozen books at an average of 140,000 words per year. Other works took shape in this period, emerging in later decades; and still others have only recently been unearthed and published in the definitive 14-volume *The Works of Robert Boyle* (Pickering and Chatto, 1999–2000), of which Hunter is an editor.

In his publications, Boyle introduced a new and distinctive natural philosophy called corpuscularianism. He also stressed the interplay of theory and experiment in the construction of natural histories, an approach that was to dominate British science for four decades. However, most significant was the series of innovative experiments Boyle performed with his air-pump, J-tube and long pipette. Through the clever manipulation of air and mercury and with careful measurement, he established that the pressure of the air is inversely proportional to its volume. Furthermore, he solved the long-standing problem in animal physiology as to the cause of air entering the lungs in respiration: there is a differential in air pressure between the expanded lungs and the atmosphere.

Yet there is more to Boyle than the careful experimenter. Hunter shows how in the eyes of his contemporaries, from the royal court to savants abroad, Boyle was a larger-than-life character. This stemmed in part from his

overt religiosity, his reputation for professional integrity and his understated philanthropy. But it is the inner Boyle whom Hunter is most concerned to explore: Boyle the doubter, the vacillator, the stuttering and conscience-stricken man revealed in private notes written near the end of his life. Hunter displays fascination and impartiality, even wavering respect, but in the final analysis it is not clear that he really likes Boyle. However, the biographer shows maturity

by leaving the reader latitude to make up their own mind about what made Boyle tick.

This first comprehensive work on the life of Boyle is a piece of stunning scholarship, a command performance by a gifted historian. It is also a great read. ■

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## Capturing digital lives

### Total Recall: How the E-Memory Revolution Will Change Everything

by Gordon Bell and Jim Gemmell  
Dutton: 2009. 304 pp. \$26.95

### Delete: The Virtue of Forgetting in the Digital Age

by Viktor Mayer-Schönberger  
Princeton University Press: 2009.  
256 pp. \$24.95

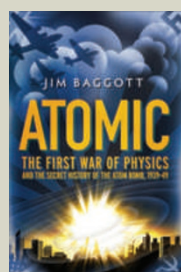
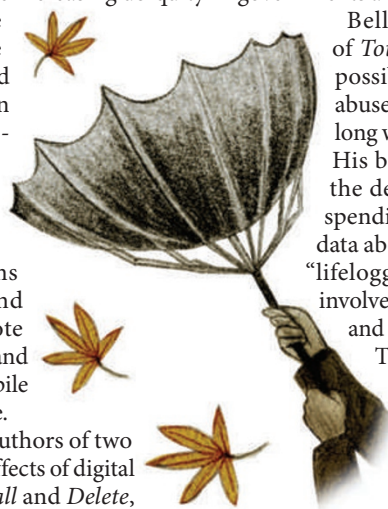
We are entering an era of unprecedented digital power. Thanks to the diminishing cost of digital storage and the increasing ubiquity of digital devices, the day is coming when we will be able to record almost every interaction we have. Digital microphones will capture our brief encounters with strangers; cameras will snap automatically as we enter new rooms or browse the web. And somewhere on a remote server farm, the images and sounds of our lives will pile up in a massive database.

On this at least, the authors of two books about the social effects of digital data storage, *Total Recall* and *Delete*,

agree. Where they differ is in what they think will happen next. Pioneering computer scientist Gordon Bell and his Microsoft colleague Jim Gemmell take a libertarian view in *Total Recall*. Digital media will free us to dip back into the past at will, they argue. Equipped with information that our brains may have lost, we will act more effectively as individuals in every part of our lives. In *Delete*, by contrast, information-policy expert Viktor Mayer-Schönberger believes people and technologies are inextricably woven into the fabric of institutions. Records of our personal data could easily make us vulnerable to the predations of governments and corporations, he warns.

Bell, the first-person narrator of *Total Recall*, acknowledges the possibility that malefactors might abuse our information, but this is a long way from his primary concern. His book is largely a chronicle of the delight he has experienced in spending the past decade gathering data about himself, a process he calls "lifelogging". At the beginning, this involved simply scanning documents and photographs onto a hard drive.

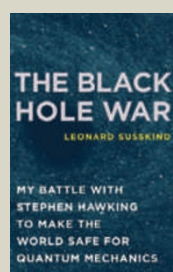
Then he began to look for ways to capture his experiences as they happened. In 2001, this resulted in the birth of the MyLifeBits project at Microsoft Research. Bell's team,



### Atomic: The First War of Physics and the Secret History of the Atom Bomb, 1939–49

by Jim Baggot (Icon Books, £9.99)

Vividly written and impressively researched, *Atomic* covers the efforts of scientists and spies in the United States, Britain, the USSR and Nazi Germany to develop their own atomic weapon. Drawing on material including declassified British secret-service transcripts and documents from Soviet archives, this is a thorough but engaging account of the race to build the atomic bomb.



### The Black Hole War: My Battle with Stephen Hawking to Make the World Safe for Quantum Mechanics

by Leonard Susskind (Little, Brown, £12.99)

Leonard Susskind charts his long conflict with Stephen Hawking over the fate of information in a black hole. Paul Davies's review noted it "skilfully explains the subtleties of the physics that underlie the issue, and includes anecdotes to enliven the technical details." (*Nature* 454, 579–580; 2008.)



which includes software designer and co-author Jim Gemmell, has developed a suite of digital tools for recording, storing and searching everything from old family photographs to kerbside chats.

Today, Bell wears a 'SenseCam' that automatically takes pictures every time a sensor on the device registers something that he might want recalled: a warm body, or a change in light suggesting a change of place. His desktop computer records his every keystroke. When he travels, a portable Global Positioning System continuously reports his location to MyLifeBits, which among other things allows him to log the time, date and place of any images he takes. Occasionally, he likes to play back these images in rapid-fire succession. "Talk about your life flashing before your eyes!" he enthuses.

With no shortage of hubris, Bell views the sort of tools he and his team are developing as evolutionary scaffolding. Humans are cursed with messy, organic brains that are inclined to forget, he argues. We have tried to mitigate this with memory technologies: first language, then writing, now computing. In fact, Bell asserts, "the arc of human development from the Stone Age through the present can be seen as an ongoing quest for Total Recall".

This, of course, is good news for Microsoft and the MyLifeBits team, who are developing the digital gear that makes such total recall possible. For all Bell's visionary thunder, it is hard not to hear in his writing the voice of the corporate salesman. He and Gemmell have described an imminent techno-utopia in which the technology-enabled individual moves the entire species forward to a new stage of socio-technical evolution. Yet at ground level, the book mostly offers a simple, plain-spoken

account of how we can all become better at everything if we first become better consumers of digital technology.

Mayer-Schönberger greets this vision with a polite and scholarly 'humbug'. Like Bell, he believes people will soon be able to capture almost limitless data about their lives. Unlike Bell, he does not equate memory with recall. Rather, he sees it as a process of reconstructing the past in order to act in the present. Likewise, he suggests that individual agency is more than tool-enhanced willpower. It, too,

is a construction, built from both personal and social resources.

From this perspective, Mayer-Schönberger raises questions about the power of technology and how it affects our interpretation of time — a topic that Bell largely ignores. He dramatically undermines Bell's case for the value of being able to behold all the times of our lives at once. He draws on a rich body of contemporary psychological theory to argue that both individuals and societies are obliged to rewrite or eliminate elements of the past that would render action in the present impossible: a job applicant must put their former drug addiction out of their mind, a nation must stop dwelling on the cruelty of its former enemies to make peace. Here lies the central irony of our contemporary technological situation: "Through perfect memory, we may lose a fundamental human capacity — to live and act firmly in the present," he writes.

Mayer-Schönberger also fears that ubiquitous recall technologies would give institutions the power to keep a close eye on us at all times. As a result, individuals would start censoring themselves lest their actions and words be used against them, leading to a kind of social stasis. For him, Bell's proposed solution — security systems that allow users full control over their data — does not go far enough. He will only be satisfied if the devices that store the data are programmed to destroy it regularly and automatically.

If Mayer-Schönberger is right — and I'm convinced he is — then the old Kris Kristofferson song might be true after all: in the future, freedom could be just another word for nothing left to lose.

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### Simply Complexity: A Clear Guide to Complexity Theory

by Neil Johnson (Oneworld, £9.99)

The science of complexity is still a fledgling field, but one that is on the rise. In this book, Neil Johnson introduces complexity, explaining what it is and how it affects us, before describing how complexity science can be used in a number of ways, from fighting disease to relationships. He also shows how, in the future, it may shed light on our understanding of quantum physics and more.



### Lewis Carroll in Numberland: His Fantastical Mathematical Logical Life

by Robin Wilson (Penguin, £9.99)

Although better known for his fiction, Lewis Carroll's achievements as a mathematician should not be overlooked. Robin Wilson's book "conjures the spirit of a man who delighted in paradox yet insisted on precision ... and who wanted most of all to stump everyone he knew", wrote reviewer Jascha Hoffman (*Nature* **454**, 580–581; 2008).

# Explorer of the deep

**Jacques Cousteau: The Sea King**

by Brad Matsen

Pantheon: 2009. 336 pp. \$27.95

Pioneer of marine conservation Jacques-Yves Cousteau — affectionately dubbed JYC, Captain Cousteau, Captain Planet, the Sea King or simply ‘the man with the red cap’ — is known worldwide for his exploration of the ocean and his success in popularizing its wonders. Yet those who mistrust his fame often question whether his work was as valuable scientifically as he made out.

Cousteau’s colourful life has already inspired several works in French and English, including two personal accounts by members of the crew of the RV *Calypso*, the legendary ship he used as an expedition vessel and research lab from 1950 until his death in 1997. The latest contribution is *The Sea King* by Brad Matsen, who has been writing books and documentary scripts about the sea and deep ocean for 30 years. Matsen pays only limited regard to Cousteau’s scientific achievements, although he claims to go further than all previous biographies of the explorer, telling the complete story of his life and throwing new light on a complex personality. In this, at least, he largely succeeds.

The book contains many little-known details of events from Cousteau’s life obtained from interviews with relatives and collaborators. Matsen accurately describes the creation of the aqualung, the first free-swimming underwater breathing equipment that Cousteau developed with the engineer Emile Gagnan in 1943, as well as his other technological contributions to underwater exploration. He describes many of the *Calypso*’s expeditions, dwelling at some length on the people who played a prominent part in them alongside Cousteau. These include Philippe Tailliez and Frédéric Dumas, known with Cousteau as the three Mousqueters, or musketeers of the sea; his first wife and business partner Simone Melchior, also

nicknamed La Bergère, or the shepherdess; his two sons; and other long-serving members of the *Calypso* crew.

Cousteau’s story is mostly one of groundbreaking adventure, but Matsen is not afraid to delve into the dark side of his life and character, something previous biographers have been reluctant to do. There is plenty to chew on: his sometimes difficult relationships with his sons, his persistent financial problems, the fate of the *Calypso* (currently being refurbished in Brittany), the controversial role of his second wife Francine and the death of his son Philippe in a seaplane accident in 1979. He also chronicles the sad death from cancer of La Bergère, who was the soul of the *Calypso* and had a key role in many of its voyages.

One drawback of the book is that whereas Matsen covers most of the *Calypso*’s expeditions in detail, inexplicably he devotes only two lines to Cousteau’s Antarctic trip in 1972–73. According to previous accounts, the *Calypso*’s crew considered this journey their most remarkable. It was one of the last on which Cousteau was personally present, directing operations with his wife Simone. It was also the most risky: the *Calypso*’s wooden hull was not built for navigation in pack ice. The films that the crew shot of the Antarctic environment were seen by millions and the expedition was probably decisive in Cousteau’s involvement in the Protocol on Environmental Protection to the Antarctic Treaty of 1991, which designated Antarctica as a nature reserve for 50 years.



The wide popularity of Cousteau’s films and television series may have been one reason why he was sometimes accused of overplaying the scientific value of his work — a largely unfounded criticism born of jealousy and misunderstanding. True, Cousteau’s expeditions usually included professional scientists, and their contributions often came second to the storytelling. Yet he made a hugely important contribution to marine science; first, by developing technologies that enabled people to make observations and carry out experiments *in situ* underwater; second, by the interest he aroused worldwide in the sea and the damage being done to it by humans; and third, by inspiring numerous young enthusiasts to become marine scientists and professional divers.

Matsen, like so many others, is rather seduced by Cousteau’s popular image and ignores many of the scientific consequences



## **Leviathan: Or, the Whale**

by Philip Hoare (Fourth Estate, £8.99)

Philip Hoare explores the whale and its significance to humans. Meandering through biology, economics, cultural history and his own obsession with the creatures, he describes everything from the possibility of us surviving in their bellies to gritty details about the nineteenth-century whale trade, concluding that much about the whale remains mysterious.



## **Witness to Extinction: How We Failed to Save the Yangtze River Dolphin**

by Samuel Turvey (Oxford Univ. Press, £8.99)

Naturalist Samuel Turvey gives a personal account of the 2006 survey that determined the baiji dolphin was extinct. Describing it as a “godawful, soul-destroying experience”, he touches on the significance of the baiji’s extinction, local myths of its origin, the failed preservation project and other cetaceans such as the endangered vaquita.



of his work. He could have done more to highlight them. Most of Cousteau's first expeditions on the *Calypso* were predominantly scientific, and during the first years of his ownership she was the only French oceanographic ship, offering scientists the possibility of making direct observations down to 300 metres for the first time. Sponsored by the French National Centre of Scientific Research, his expeditions to the Mediterranean, the Red Sea and the Atlantic resulted in numerous publications,

most of which are collected in the 11 volumes of the series *Résultats Scientifiques des Campagnes de la Calypso*, which contain important contributions to marine science. Cousteau was foremost an explorer, but his contribution to science was immense. ■

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## Darwin's puppy love

**Darwin's Dogs: How Darwin's Pets Helped Form a World-Changing Theory of Evolution**  
by Emma Townshend

Frances Lincoln: 2009. 144 pp.  
\$14.95, £8.99

Even the most ardent fan of Charles Darwin might be feeling weary as his anniversary year draws to a close. Publishers have seemingly explored every corner of Darwin's life: his youth, his marriage, his attitudes to slavery and religion. Emma Townshend adds a fascinating angle — Darwin's love of dogs. Dogs were Darwin's constant companions from boyhood to old age. They were also the animals closest to hand when he explored the implications of his theories. It is surely not coincidental that Darwin's credo was "it's dogged as does it".

In *Darwin's Dogs*, Townshend adds little new to the Darwin biography. Yet her close reading of his correspondence, filtered to references to the family's dogs, produces a warmer, more intimate portrait than others so far. She plausibly claims that, aside from his years at boarding school and on the aptly named ship *HMS Beagle*, Darwin spent every day of his life in the company of dogs.

Motherless at eight years of age and packed off to boarding school, the young Darwin had, by his own admission, a "passion" for dogs,

and his letters home to his three older sisters are packed with affectionate banter about the animals. Writing of how much he missed his family's dogs, and in turn being told by his sisters how much the dogs missed him, was a face-saving way for a young man to admit his



homesickness and exchange affection without embarrassment.

On his first morning back home after five years on the *Beagle*, Darwin went straight to the stables to see how his old "savage" dog, "averse to all strangers", would react to his return. Would the dog treat Darwin peaceably as befitted someone familiar, or would it growl at him showing that it had forgotten its master? As Darwin later recalled in *The Descent of Man*, the dog, "obeyed me, exactly as if I had parted with him only half an hour before. A train of old associations, dormant during five years, had thus been instantaneously awakened in his mind."

As Darwin's thoughts turned to 'transmutation' of species, the actions of dog breeders intrigued him. By carefully selecting those animals best suited to their purposes to form the parents of the next generation, breeders offered Darwin a metaphor — artificial selection — from which he could derive his great guiding principle of natural selection. Dog breeders were especially important to Darwin in trying to understand the sources of phenotypic variability and how varieties bred true to type — questions that were resolved long after Darwin's death.

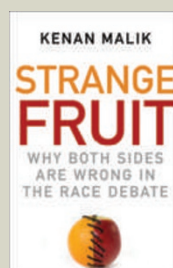
The other major issue with which Darwin grappled on his return to the United Kingdom was that of finding a wife. There too, canine thoughts were never far from his mind. When he listed for himself the pros and cons of a married life, he noted the companionship of a wife to be "better than a dog, anyhow". In Townshend's narrative, we can see in this comment affectionate praise rather than insult.

*On the Origin of Species* opens with a discussion of domesticated animals. When Darwin came to his magnum opus on humankind, *The Descent of Man*, and *Selection in Relation to Sex*, dogs again have centre stage. Dogs, for Darwin, know happiness and sadness, grumpiness, kindness and loyalty. They understand language — Darwin pressed his neighbour, Sir John Lubbock, into testing the latter's dog's vocabulary — and they have a sense of humour. The



**Creation: The True Story of Charles Darwin**  
by Randal Keynes (John Murray, £7.99)

Originally titled *Annie's Box*, Randal Keynes's renamed and re-released book *Creation* focuses on Charles Darwin's relationship with his daughter Annie and how her death subsequently affected his research. "Keynes weaves a rich tapestry that gives the reader a sense of the attitudes and assumptions of the Darwin family and their class," explained Bruce Weber in a review of the hardback edition of *Annie's Box* (*Nature* 411, 739–740; 2001).



**Strange Fruit: Why Both Sides Are Wrong in the Race Debate**

by Kenan Malik (Oneworld, £10.99)

The subject of race is often controversial but, Kenan Malik argues, we shouldn't avoid thinking about it. He attempts to describe what race is and is not, from a biological and cultural perspective, covering modern disputes such as the US approval of a drug for African Americans with heart disease. He also looks at historical views on race and its treatment today.

concept of property ownership, Darwin argued, “is common to every dog with a bone”. With a directness and candour that still shocks today, Darwin mused that a dog’s “deep love ... for his master, associated with complete submission, some fear, and perhaps other feelings” prefigures human feelings of religious devotion.

Townshend shows a deft touch with a considerable body of Darwin scholarship. However, her simplified account of how scientific attitudes to dog behaviour have changed since Darwin is less secure. She mainly blames “behaviourists” in animal psychology for ruling inadmissible Darwin’s sympathetic attribution of human qualities to dogs, noting that anthropomorphism has been reinstated

in recent years by “cognitive psychologists”. However, the rejection of anthropomorphism was not limited to behaviourists and encompassed all forms of animal-behaviour study in the mid-twentieth century. Debate over the degree to which scientific terms used to describe human behaviour can be applied to animals continues to this day.

All in all, *Darwin’s Dogs* is thoroughly entertaining and informative. It is the ideal antidote to Darwin fatigue. ■

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## Forgotten treasure seeker

### **The Fossil Hunter: Dinosaurs, Evolution, and the Woman Whose Discoveries Changed The World**

by Shelley Emling

Palgrave Macmillan: 2009. 256 pp.  
\$27, £15.99

### **Remarkable Creatures**

by Tracy Chevalier

Dutton/HarperCollins: 2009. 352 pp.  
\$26.95/£15.99

Until recently, histories of science were written almost entirely by, for and about men. The nineteenth-century hunt for Jurassic-era fossils along the beaches of the British town of Lyme Regis was no different. Although the names of naturalists such as Georges Cuvier, William Buckland and Richard Owen who used the fossils to overturn society’s ideas about life on Earth are familiar, that of Mary Anning is only beginning to be exhumed. The publication of two books about her life — one factual, one fictional — will raise her profile in the public imagination.

Anning was a poor, working-class twelve-

year-old when she made her first major discovery within the rocks of the perilous sea cliffs in 1811: the first complete skeleton of an ichthyosaur. She went on to uncover many other important fossils, such as the first plesiosaur and the first complete skeleton of the winged reptile *Dimorphodon macronyx*. Collecting and selling small fossils to earn a living, she also led fossil hunts for naturalists visiting Lyme Regis.

Anning’s discoveries made it into the local newspapers. But it was the wealthy collectors and the established naturalists championing her finds in the halls of the Geological Society whose names became associated with them. Although her fossils helped overturn the popular idea that Earth and all its inhabitants were created in six days in 4004 BC, paving the way for Charles Darwin’s great synthesis in 1859, Anning wasn’t mentioned in key publications or lectures.

In her diligent biography *The Fossil Hunter*, Shelley Emling explains that in Anning’s day women had no place in the cut and thrust of science. Urged not to appear outdoors without a chaperone, women were barred from places where learned debates took place and were thought to lack the intellectual rigour or stamina for fieldwork. Despite this, women

did make vital contributions. Anning shared the beaches of Lyme Regis with three other female fossil collectors — the middle-class Philpott sisters, notably Elizabeth, who made well-regarded finds. And Emling describes the activity of two other talented nineteenth-century women, the wives of geologists William Buckland and Roderick Murchison, whose contributions included sketching and labelling of geological samples on expeditions.

But Anning was more than a collector or helper — she was a true scientist. She reconstructed and cleaned her own finds. She devoured scientific articles, often painstakingly copying out the entire text and figures. She engaged in spirited discussions with the men who sought her expertise and her samples. She dissected living sea creatures on the kitchen table to better understand the anatomy of their long-dead counterparts. She even conducted research, surmising, for example, that the rock-like bodies she often found within the skeletons she uncovered — coprolites — were hardened faeces. Together with William Buckland, she reconstituted coprolites in her workshop and deduced what the animals had been eating.

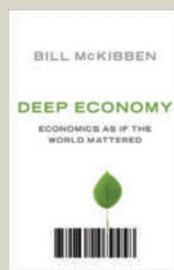
Like many retrospective narratives, Anning’s story has its heroes and anti-heroes, set-pieces and eureka moments. In *Remarkable Creatures*, Tracy Chevalier uses these devices to construct a fictionalized account of Anning’s life. Able to make things up when the details are shrouded in obscurity, Chevalier’s engaging version easily wins out over Emling’s more faithful biography. Chevalier’s unconstrained hand lets one suspend disbelief, such as in “[Buckland] asked so many questions ... that I began to feel like a pebble rolled back and forth in the tide”. By contrast, confined by the facts, Emling’s wearing reliance on the conditional



### **The Earth After Us: What Legacy Will Humans Leave in the Rocks?**

by Jan Zalasiewicz (Oxford Univ. Press, £8.99)

Using the imagined concept of extraterrestrial beings examining Earth for evidence that humanity ever existed, geologist Jan Zalasiewicz looks at what we might leave behind in the geological record. Describing the evidence we have for Earth’s past, he explores our effects on the world and puts them in perspective over the vast timescale of the planet’s history.



### **Deep Economy: Economics as if the World Mattered**

by Bill McKibben (Oneworld, £9.99)

Bill McKibben calls for a new focus on developing local, rather than global, economies — advocating that cities and regions should produce more of their own food, energy and culture. Such small, local economies, he argues, offer a greater sense of community and satisfaction, and better protection against an increasingly uncertain future.



perfect — in sentences such as “The bracing early-morning air would have invigorated Mary’s senses” — soon begins to grate.

Emling’s biography is the more thorough and complete work. It also frees us from the claustrophobic atmosphere of Lyme Regis, providing the context of discoveries happening elsewhere. Chevalier’s tale glosses over most of Anning’s later life. But so accurate was her fictional rendering that I felt I was reading

the same book twice. Both works did, however, lack a gripping plot. Emling’s solution was to incorporate peripheral dramas, such as natural disasters befalling Lyme Regis. Chevalier’s strategy was to sneak Elizabeth Philpott into a key session of the Geographical Society and to give Anning a putative lover.

In the end, Anning’s life story can offer no more than a pleasant but sedate read, either in fact or fiction. More evocative was the

drama, brought out well in both works, of how her discoveries shook the world: leering, nightmarish monsters materializing from the clay and hinting at a world far more ancient, savage and uncaring than anyone could possibly have imagined. ■

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## History of the hard stuff

### **Uncorking the Past: The Quest for Wine, Beer, and Other Alcoholic Beverages**

by Patrick E. McGovern

University of California Press: 2009.

348 pp. \$29.95, £20.95

Barley, wheat and grapes in the Middle East; rice, millet and hawthorn fruit in China; figs and dates in the Levant; sorghum and palm sap in Africa; maize, cacao, cactus fruit, manioc and pepper-tree fruit in the Americas; and everywhere, honey. All these substrates were used by early humans in their quest for alcohol.

In *Uncorking the Past*, biomolecular archaeologist and University of Pennsylvania museum director Patrick McGovern argues that the desire for alcohol is innate in humans and other primates. Moreover, he believes that “the uniquely human traits” of self-consciousness, innovation, the arts and religion have been “encouraged by the consumption of an alcoholic beverage”. This is a difficult proposition to prove. In trying to do so, McGovern takes his reader on a world tour, examining the archaeological record for alcohol use across continents and cultures, searching for common themes that are indicative of universal use.

The earliest pottery artefacts with identifiable residues of a fermented beverage — arising from a mixed fermentation of rice, honey and hawthorn fruit — were found in China and date to 7000 BC. Three thousand miles away,

in the Zagros mountains in western Iran, pottery dating to 3500 BC has been found with residue of tartaric acid, indicating wine storage, as well as containers with a calcium oxalate ‘beerstone’ residue from barley beer. In Asia, Europe and the Americas, archaeologists have unearthed buildings that were constructed for the production and storage of various alcoholic beverages. And fermentation vessels and elaborate drinking sets are found in tombs of the rich and powerful across the world. Clearly, alcohol has been a part of human civilization for millennia. But has it played a part in the development of human culture?

McGovern narrates his thoughts in the first person, as if relating them to friends over a drink. He intertwines his own research findings — detailed in his earlier book, *Ancient Wine* — with those of others, and tells stories of quests to recreate ancient beverages. He describes tasting ‘Chateau Jiahu’, a modern recreation of the earliest fermentation discovered in China; and the ‘Phrygian Grog’ he named ‘Midas Touch’, a fermented beverage based on wine grapes, honey and malted barley.

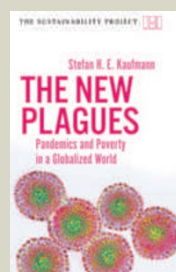
The residues of this were found in bronze containers in the burial chamber of a Phrygian king, perhaps Midas, near present-day



### **Blessed Days of Anaesthesia: How Anaesthetics Changed The World**

by Stephanie J. Snow (Oxford Univ. Press, £9.99)

Stephanie Snow explores how early advances in anaesthetics changed society. “[This] is not a real medical history, nor is it seriously concerned with medicine or society beyond England and Scotland. But it seeks to link developments in anaesthesia with changing social, philosophical, scientific and religious attitudes in those countries,” wrote John Carmody (*Nature* **456**, 38; 2008).



### **The New Plagues: Pandemics and Poverty in a Globalized World**

by Stefan Kaufmann (Haus Publishing, £9.99)

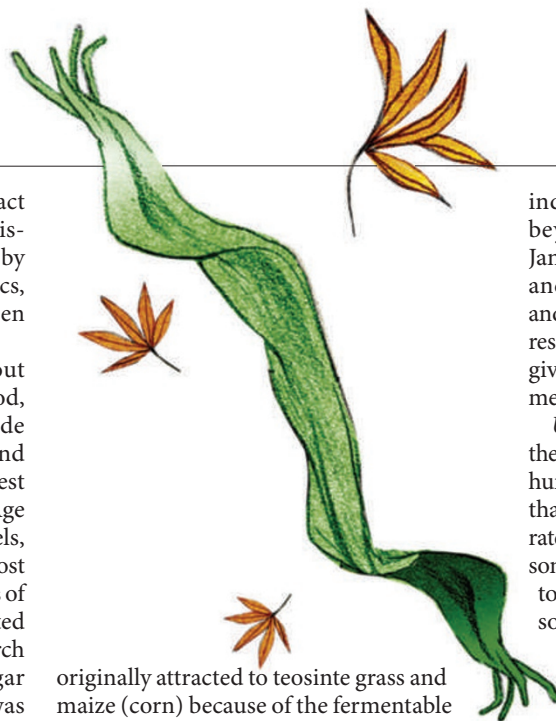
An accessible and up-to-date look at diseases that are on the rise thanks to increased globalization. Describing the various strategies that agents such as microorganisms or prions might adopt, Stefan Kaufmann delves into the conflict between rich and poor in combating outbreaks, and looks at methods for containment.

Ankara. For a general reader, the blend of fact and personal narrative is enticing, reminiscent of the mixed fermentations practised by our Neolithic ancestors; but some academics, thirsty for footnotes, may wish he had chosen a more traditional form.

McGovern begins by speculating about the role of alcohol in the Palaeolithic period, suggesting that its shamanic use, alongside other drugs, helped to develop religion and art — a proposition that is impossible to test conclusively. Neolithic and early Bronze Age cultures produced pottery and metal vessels, from which residues can be analysed. In most cases, the first fermentations were mixtures of grains, honey and wild fruit. Grains presented a problem to early brewers because the starch in the grains had to be converted to sugar before fermentation could begin. This was solved in various ways in different cultures: the use of enzymes in human saliva to break down starches is still applied in Africa and the Andes; malting and kilning of the grains is another technique, raising the possibility that beer came before bread; and the use of mould is often found in Asian rice-based brews.

Mixed fermentations, starting with higher sugar concentrations and natural yeast derived from honey and fruits, resulted in beverages of higher alcohol content than those based solely on grains. As cultures gained experience, most moved to single fermentations — beer, fruit wines or mead — with one type of beverage gaining dominance. The social importance of these beverages is reflected in the elaborate nature of fermentation vessels and drinking sets found in tombs in Asia, Europe and the Americas. Alcohol's widespread use is attested in paintings on vessels depicting communal sipping of one drink through shared straws, a scene repeated across many cultures.

The most powerful argument for alcohol as a force for innovation and social development is the claim that the initial domestication of many grains was “motivated by a desire to increase alcoholic-beverage production”, rather than to provide more food. However, only one example is explored in the book, namely the suggestion that humans were



originally attracted to teosinte grass and maize (corn) because of the fermentable sweet syrup in its stalks, and that our selection of the seed kernels of these plants for food followed only afterwards.

The broader case centres on alcohol's perceived ability to spark creativity in some

individuals, encouraging them to progress beyond tradition. In the words of William James: “Sobriety diminishes, discriminates, and says no; drunkenness expands, unites and says yes.” Although that general argument resonates with this reviewer, McGovern doesn't give any specific examples of social advancement through alcohol consumption.

*Uncorking the Past* doesn't prove McGovern's thesis that alcohol has been a significant force in human development, but it does demonstrate that fermented beverages have been incorporated into the fabric of society for millennia. For some, taking a ‘cup of kindness’ may be a ticket to altered consciousness; for most, it invites sociability through temporary effects to our limbic system. Both outcomes are sorely needed in today's society.

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## Living by the calendar

### **The Seasons of Life: The Biological Rhythms that Living Things Need to Thrive and Survive**

by Russell Foster and Leon Kreitzman  
Profile Books/Yale University Press: 2009.  
320 pp. £20/\$28

Much of biology is governed by the seasons. Reindeer seasonally adjust the colour of their eyes for better vision; newborn warblers are programmed to fly from Europe to an unknown destiny in Africa; hibernators turn down their internal thermostat for six months of the year. Most biologists would jump to unravel such seasonal feats if the time constraints were not so forbidding. Russell Foster and Leon Kreitzman lament in their latest book the slow pace of research

on annual rhythms in biology. Yet their fascinating story impresses with its wealth of facts and splendid overview.

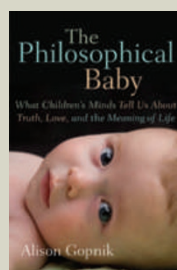
*The Seasons of Life* follows on from the authors' previous collaboration, *The Rhythms of Life* (Profile Books, 2004). Russell Foster, a professor in circadian neuroscience at the University of Oxford, UK, is an eminent scientist in the field of chronobiology, and a passionate one. He helped to discover specific ganglion cells in the mammalian retina that perceive light intensity and are instrumental in synchronizing biological clocks. Kreitzman is a science journalist with a lucid pen. Together, they paint a broad perspective on the functions and mechanisms of biological calendars.

The authors dedicate five chapters to the adaptation of animals and plants to the



### **Decoding the Heavens: Solving the Mystery of the World's First Computer**

by Jo Marchant (Windmill Books, £8.99)  
The 2,000-year-old Antikythera Mechanism was found in 1901, but its significance was only recently revealed. “[This] gripping and varied account will propel the mechanism to greater fame, although it may never achieve the celebrity of the Rosetta Stone that it probably deserves,” argued Andrew Robinson in his review of the hardback edition (*Nature* **455**, 867–868; 2008).



### **The Philosophical Baby: What Children's Minds Tell Us About Truth, Love, and the Meaning of Life**

by Alison Gopnik (Bodley Head, £14.99)  
Alison Gopnik's well-written book is an unusual look at the conscious mind. Drawing on research and her own pioneering studies, she reveals that processes in a baby's mind can be as complicated as those in the minds of adults, and asks what brain development can teach us about humanity.



seasons, and six to human seasonality. This preference for humans is unexpected, but appropriate and stimulating. Research interest in human seasonality has been considerable but necessarily of a descriptive nature. The annual rhythm of human reproduction, for example, is well known and has been recorded extensively in birth records. Evolutionary zoologists can only dream of having similar vast data sets.

Until recently, the consequences of birth date for human characteristics was a theme for astrologers rather than scientists. Database analyses now show that the incidence of a host of diseases later in life, such as schizophrenia, multiple sclerosis and suicidal behaviour, varies with the season of birth. This seasonal variation, the authors argue, holds the key to understanding the impact of environmental effects during gestation and early postnatal



life on adult health and lifespan.

Foster and Kreitzman mix suggestive new facts with recently recovered old references: for instance, the Babylonian king Hammurabi recommended using sunlight in the treatment of illnesses 6,000 years ago, pre-empting recent reports of the alleviation by light of depressive symptoms in seasonal affective disorder. The authors lead the reader into the literature on the systematic seasonal variations in suicide, on general mortality and on violence.

Seasonal phenomena in plants and animals are more readily approached by experimentation than are those in humans. The book tells the story of the discovery of photoperiodism — the study of the physiological changes in reaction to the length of daylight — first by Wightman Garner and Henry Allard in plants in 1920, and then by William Rowan in songbirds in 1925.

The authors also detail the

finding of innate circannual clocks: endogenous seasonal rhythms that persist even in constant temperature and day length with a usual cycle length of around 300 days rather than 365 days. Circannual clocks were first found in hibernating ground squirrels by Eric Peggelley in 1966, and in seasonally migrating songbirds in 1967 by Ebo Gwinner, the influential ornithologist to whom the book is dedicated. In the 40 years since then, significant progress has been made by only a few labs. The physiology of the

circannual pace-maker in the Soay sheep, for example, is becoming better understood through studies by Gerald Lincoln and David Hazlerigg at the Centre for Reproductive Biology in Edinburgh, UK.

Foster and Kreitzman have produced a tantalizing account of the facts behind seasonality. Its occasional nickname, 'nature's contraceptive', reflects the key function of seasonal organization: thousands of species across the globe, including those in the tropics, use seasonality to turn off reproduction at times of year when low food supply is expected and individual fitness is better served by

waiting for the next season. *The Seasons of Life* is a joy to read, and a compelling text on the importance of seasonality in the evolution of life on Earth. ■

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## Unmeasurable verse

Physicist and author Alan Lightman's latest work is a book-length poem. In *Song of Two Worlds*, he writes from the perspective of a man reassessing his life after a tragedy. Lightman splits his epic into two sections; in the first, he marvels at the measurable world, the glory of geometry and fact. In the second, he explores the unmeasurable, the pleasure and pain of love, the beauty of a sunset and the night sky. An excerpt from the latter section is reproduced here.

### Excerpt from *Song of Two Worlds*

I am a fragment  
That hurtles through space  
While the breeze of the universe  
Ruffles my hair.

Evening. I gaze  
Through my telescope,  
Searching the colors of stars.  
Some are the hues of goats' wool,  
Some ochre olive,  
Or pink bougainvillea.

In chasms of space  
I see stars born from gases,  
Great thrumming furnaces oozing their heat,  
Convective motions, electron opacities —  
Elsewhere stars dying,  
Cold cinders  
Or giant explosions, eruptions of light,  
Cities consumed in a nuclear blast,  
Billions of years dimmed in a second.

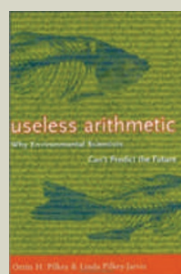
I have learned  
That the heavens are violent and fragile  
And doomed to destruction,  
Just as this thimble the earth.  
All in the cosmos is failing,  
And nothing remains,  
And we measure the hour of the stars,  
As I measure one morning's light.

Here, in the glass of this eyepiece.

### **Song of Two Worlds**

by Alan Lightman

A. K. Peters: 2009. 112 pp. \$24.95



### **Useless Arithmetic: Why Environmental Scientists Can't Predict the Future**

by Orrin H. Pilkey and Linda Pilkey-Jarvis  
(Columbia Univ. Press, £15.50)

Reviewer Roger Pielke Jr wrote: "The authors have identified a critical challenge confronting the modern scientific enterprise: our ability to produce model-based predictions seems to have outpaced our ability to use such tools wisely in decision-making." (*Nature* **447**, 35–37; 2007.)



### **Eating The Sun**

by Oliver Morton (Fourth Estate, £9.99)

There are few books on photosynthesis for the non-specialist. *Eating the Sun* fills that gap, covering the history of its discovery and its processes. "Morton's account of the ubiquitous importance of photosynthesis is an original viewpoint for looking at the world. It is written with verve and an eye for detail. His breadth of scholarship could leave other science writers green — with envy," wrote reviewer Richard Fortey (*Nature* **449**, 284–285; 2007.)