or the other supplier almost at random. Snow's revelations encouraged Farr, who was also keeper of statistics at the General Register Office, to use his office to further the analysis. Both Snow and Farr found that householders drawing water from the Southwark and Vauxhall company were many times more likely to die from cholera.

Snow could not identify any specific causative agent, but he argued that the material cause of the disease acted like a living organism, because it could reproduce. Terming it "organised matter", Snow interpreted its incubation period as the time it took for the initial dose to reproduce sufficiently to cause actual disease. He never knew of the Italian microscopist Filippo Pacini's description of the comma-shaped bacillus (which causes cholera) during an 1854 outbreak of the disease in Florence. Snow had died by the time that germ theory became a viable proposition thanks to Louis Pasteur, Robert Koch (generally lauded for discovering the cholera bacillus) and many others.

Snow had another string to his bow: anaesthetics. From the late 1830s he had been concerned with issues surrounding asphyxia and artificial respiration in newborns, and so was an expert on the administration of gases to the lungs. He embraced the arrival of inhalation anaesthesia in 1846. Within a month of ether's first public use in Britain, in December of that year, Snow was researching its chemical properties, and he was administering it for surgeons by the following February.

His general practice soon centred on the administration of anaesthesia in leading London hospitals. He was even called in to give Queen Victoria 'blessed relief' during the births of her last two children. But his lasting contributions lay in the equipment he devised to control dosages of anaesthetic gases, and his research (often on himself) on ether and chloroform, which contributed to the more accurate description of the stages that patients pass through as the anaesthetic takes hold.

Snow was diagnosed with kidney disease more than a decade before his death, and reluctantly, on his doctors' advice, abandoned his vegetarian diet and his total abstinence from alcoholic beverages. One can surmise that his kidney disease contributed to raised blood pressure: he died six days after suffering a stroke, aged just 45.

His reputation then was higher as an epidemiologist than an anaesthetist, and routine filtration of water supplies was still in the future. Both contributions are highly valued now — you can raise a toast to Snow at the pub that bears his name, a stone's throw from the site of the Broad Street pump. ■

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Ginkgo trees can live for thousands of years.

DAVID STEPHENSON/LEXINGTON-HERALD-LEADER/MCT/GETTYIMAGES

BOTANY

A tree for all time

Sandra Knapp relishes a biography of the ginkgo, an arboreal survivor that has outlasted the dinosaurs.

Biographies seem to come in two sorts. The first is a dense compilation of deeds and misdeeds, dates and details of the dead; the second, a hagiography of celebrities still alive and kicking.

Ginkgo is neither. Its subject should by rights be dead, but having outlasted the dinosaurs, is still very much with us. This biography of the ginkgo tree offers a potent mix of science, history and culture, exploring how plants have changed our lives and our planet. And Peter Crane, a palaeobotanist by trade and all-round botanist by nature, is the perfect person to tell the tale.

Lucidly and accessibly, he takes us from the living plant, through its long and fascinating past as seen in the fossil record, and then returns us to the present in sections on the ginkgo in culture and the future of diversity. This tree, he shows us, can be seen as a metaphor for all life on Earth — seemingly fragile, but actually tough and likely to outlive *Homo sapiens*. With its meticulous footnotes, satisfying referencing and gripping narrative, I can see this book becoming a commuter's favourite for scientists and general readers alike.

Ginkgo biloba, as the maidenhair tree was named by the great Swedish botanist Carl Linnaeus, is one of a kind. It is a biodiversity loner, the only species in its genus, family and order. This was not always the case, as Crane shows. Ginkgo relatives first appear in the fossil record more than 200 million years ago, and the lineage has hung on through great extinctions. Long ago, *Ginkgo biloba* had many relatives, but they have all since died out, as it almost did itself.

As he traces these species' amazing journey, Crane introduces key concepts in evolution — the part extinction plays in producing current patterns of distribution, the fact that where things are not found is as important as where they are, and the role of contingency in creating today's diversity. I loved his equation of the stunning plant-fossil trove in Scotland's Rhynie Chert with the Burgess Shale of Canada, that phenomenal array of Cambrian life-forms made famous by Stephen Jay Gould's *Wonderful Life* (W. W. Norton, 1989). There is another book in waiting there.

Ginkgo: The Tree That Time Forgot
PETER CRANE
Yale University Press: 2013. 408 pp. $40

Crane's enthusiasm for fossil-hunting is very real. He recounts a stop in 1982 on a road in North Dakota, where he discovered some perfectly preserved ginkgo leaves and seed fossils from the Late Palaeocene (58.7 million to 55.8 million years ago). This extinct

species is now known as *Ginkgo cranei*, but Crane is more taken with the joy of discovery than the honour of having a plant named for him.

As for the living tree, Crane fills us in on some of its peculiarities, not least its swimming sperm — studied by the reproductive-rights pioneer Marie Stopes during her career as a biologist — and the strange stalactite-like growth it uses for propagation. I went straight out to look at the ginkgo in front of London's Natural History Museum with new eyes.

Ginkgo ends with a beautiful section on the importance of this tree to human culture. It is revered for its longevity (the most venerable is some 3,500 years old) and beautiful form in China, Japan and Korea, and is one of the commonest street trees in the temperate zone in the West. The tree's loveliness is counterbalanced by a distinct autumnal odour: in Manhattan, where one-tenth of street trees are ginkgos, butyric acid in the seeds' fleshy covering gives off a whiff of rancid butter.

As Crane aptly puts it, its charisma — a mixture of unusual form, strange leaves and sheer staying power — has been an important element in its success and symbiosis with humans. Giant ginkgos are lovingly cared for and replaced when they start to die: the tree at London's Royal Botanic Gardens at Kew, planted some 250 years ago, is cared for as well as any national monument made by human hands.

The ginkgo was common over what is now the Northern Hemisphere between 100 million and 40 million years ago, but is elusive in the 'wild' today. Putatively wild ginkgos are known only from a couple of places in China, and they might be relics of old monasteries or human cultivation. Does it matter? On one level, no: that this species is still with us is itself to be treasured. On another, it does.

Earth's biodiversity has persisted through aeons, but no species has ever affected the planet as we have. Crane provides a wonderful precis of the politics of conservation, and how our own short ecological memories mean we often don't see the forest for the trees, however culturally important. People care for ginkgo trees because they are seen as special. But what of the rest of biodiversity? How can we conserve what we do not know?

The renowned naturalist Alfred Russel Wallace summed it up beautifully in 1863, saying that future generations "will charge us with having culpably allowed the destruction of some of those records of creation [species] which we had it in our power to preserve".

Ginkgo will inspire you to know and care for the organisms with which we share this planet in a new way. ■

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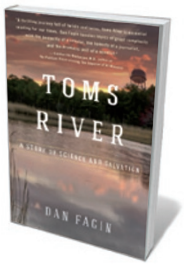
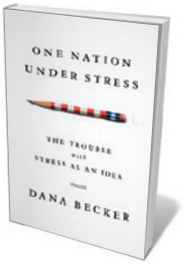
Books in brief

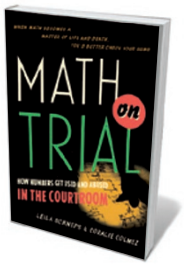


Toms River: A Story of Science and Salvation
Dan Fagin BANTAM *560 pp. $28 (2013)*
This hard-hitting account of cancer epidemiology in the New Jersey town of Toms River is a triumph. Hinging on a prolonged bout of toxic dumping by several companies up until the 1980s, journalist Dan Fagin's chronicle mixes reportage with science and industrial history. Thousands of drums of carcinogenic waste were buried in unlined pits, contaminating ground water; waste water was piped to coastal waters. In 2001, a landmark ruling linked some local cancers to local air and water pollution — a development with resonance, Fagin argues, for China's new industrial boom towns.



One Nation Under Stress: The Trouble with Stress as an Idea
Dana Becker OXFORD UNIVERSITY PRESS *256 pp. $35 (2013)*
Is stress a 'lifestyle problem', or the inevitable result of larger social and political inequities, imbalances and shifts? Sociologist Dana Becker argues that in the United States, the diffuse concept of stress now covers all kinds of tensions — effectively masking their triggers, from dual-career marriages to the frenetic, technology-driven pace of daily life. As a result, real social change in areas such as health care stalls. Becker's analysis tracks the evolution of 'stressism' from its origins as the 'price of progress', through medicalization, gender politics and conditions such as post-traumatic stress disorder.

Are We Being Watched? The Search for Life in the Cosmos
Paul Murdin THAMES AND HUDSON *224 pp. £16.95 (2013)*
Discoveries such as exoplanetary systems, water ice on Mars and extremophile bacteria on Earth, have energized the scientific quest for extraterrestrial life. Here, distinguished astronomer Paul Murdin, who discovered the first black hole in the Milky Way, uses findings from planetary and climate science, astronomy, the evolution of life on Earth and the missions of the Voyager and Galileo spacecraft as a springboard for astrobiological speculation. But this is a measured investigation: Murdin, ever clear-eyed, is well prepared to accept that we are unique.



Math on Trial: How Numbers Get Used and Abused in the Courtroom
Leila Schneps and Coralie Colmez BASIC BOOKS *272 pp. $26.99 (2013)*
How does court evidence add up? Mathematicians Leila Schneps and Coralie Colmez show that it often doesn't: calculations, statistics and probability can be misused, with dire consequences. The authors forensically unpick ten cases in which justice was undone in this way, from recent trials to that of Alfred Dreyfus in nineteenth-century France. Dreyfus suffered a hellish imprisonment for treason after a handwriting expert exaggerated probability — a miscarriage of justice later exposed mathematically by Henri Poincaré.

Frankenstein's Cat: Cuddling Up to Biotech's Brave New Beasts
Emily Anthes ONEWORLD PUBLICATIONS *256 pp. £8.99 (2013)*
Tusked mice, transgenic goats lactating antithrombin, dogs with prosthetic testicles: science writer Emily Anthes reports from the wilder shores of animal biotechnology. A team at Fudan University in Shangai, China, for instance, has created 500 strains of modified lab mouse — and hopes to engineer 100,000. A Florida medical team has made a prosthetic tail for an injured dolphin. There is plenty more, but Anthes devotes the final word to bioethics, arguing that the advances are a chance to commit anew to animal well-being.