

switch from embryonic to fetal haemoglobin.

Not content to cruise around their luxury human condos, microorganisms also hack into our nervous systems. In her eye-opening, entertaining and slightly disconcerting *This Is Your Brain on Parasites*, journalist Kathleen McAuliffe contends that our minuscule passengers act like puppet masters, manipulating how we think, feel and act. I will think of cats differently now that I am aware that their parasite *Toxoplasma gondii* may have the ability to affect human behaviour, and is implicated in mental illnesses such as schizophrenia. Men harbouring this parasite are, furthermore, more inclined to break rules, and are more reserved and suspicious. McAuliffe ingeniously suggests that the psychoactive chemicals produced by microbes could be used to develop mind-altering medicines.

Focusing on how the microbiome may cause chronic conditions such as persistent pain and irritable bowel syndrome, gastroenterologist Emeran Mayer's *The Mind-Gut Connection* depicts the brain, the gut and its microorganisms as a unitary structure tightly knit, anatomically and chemically. He asserts, albeit with rudimentary evidence, that the enteric nervous system — the mesh of neurons that governs the gastrointestinal system — functions as a mini-brain, relaying sensory information from the gut to the central nervous system. It was fascinating to learn that microbes contain ancient versions of many signalling peptides and hormones found in the human alimentary tract, including noradrenaline, serotonin and endorphins. That may argue in favour of his thesis. Mayer speculates that early programming errors in the putative brain-gut-microbiome axis can result in medical conditions that might benefit from treatment with probiotics.

We are descended from microbes, have evolved around them, and incorporate elements of them into our cells. Microbiome profiling is certain to become as routine as blood testing, and the extensive treasure chest of bacterial molecules will doubtless be used to change the way we are. Our microbial companions may even influence our responses to important medicinal agents, such as the anti-PD-L1 and anti-CTLA4 drugs that reinvigorate the immune systems of people with cancer. Several regional initiatives, including the US Human Microbiome Project and National Microbiome Initiative, have been established to study the human microbiome. The complexities of cataloguing, mapping and characterizing microbial biology on a worldwide scale promise to make sequencing the human genome look easy. A global programme seems to beckon. ■

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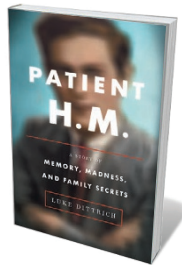
Books in brief



Bird Brain: An Exploration of Avian Intelligence

Nathan Emery IVY (2016)

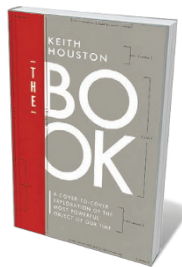
Cognitive biologist Nathan Emery has been on the cutting edge of research into avian intelligence since the 1990s. In this sparkling, superbly illustrated summation of the cognitive science, ethology and hot debates, Emery encapsulates the “feathered ape”. He compares the avian brain to the mammalian to reveal functional similarities in disparate anatomies (likened to fruitcake and layer cake, respectively) and tours spatial memory, migratory sense, tool use and more. From the wattle-bopping of black grouse (*Tetrao tetrix*) to the dung baiting of burrowing owls (*Athene cunicularia*), a masterful explication.



Patient H.M.: A Story of Memory, Madness, and Family Secrets

Luke Dittrich RANDOM HOUSE (2016)

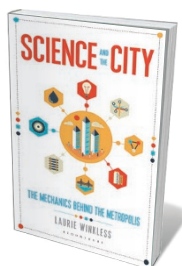
In 1953, experimental surgery left Henry Molaison with severe amnesia; he became ‘HM’, a star patient studied by neuroscientist Suzanne Corkin for almost 50 years (see D. Draaisma *Nature* **497**, 313–314; 2013). Luke Dittrich offers a very different perspective — he is the grandson of William Scoville, the lobotomist who operated on Molaison. Dittrich fleshes out the official account with nuanced biographies of the troubled Scoville and profoundly damaged Molaison, revelatory conversations with Corkin and accounts of behind-the-scenes scientific scuffles. Disturbing and illuminating.



The Book

Keith Houston W. W. NORTON (2016)

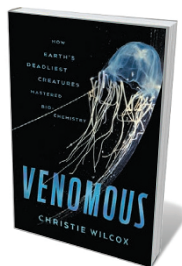
The physical book has reigned as an agent of culture for 1,500 years. Keith Houston's deft history of the object wraps entire civilizations into the telling, propelling us through the evolution of writing, printing, binding and illustration with gusto. The material innovations dazzle, from papyrus, vellum and paper (dating to second-century AD China) to the spattered path of inks. Equally gripping is the trajectory of production technologies, as the finical skill of scribes gives way to Johannes Gutenberg's printing revolution and, ultimately, the streamlined wonders of modern lithography.



Science and the City: The Mechanics Behind the Metropolis

Laurie Winkless BLOOMSBURY SIGMA (2016)

‘Up’, ‘Switch’, ‘Wet’: physicist Laurie Winkless's chapter headings hint at a briskly bouncy ride ahead in this primer on the science embedded in cities. And so it proves, as she ponders wind-confusing skyscraper design, water-supply technologies such as “fog-sucking nets” and 3D-printed bridges. Perhaps most engrossing is her evocation of how modern subway systems are built — by delicately “threading the needle” through dense subterranean convolutions. The thickets of subheadings and bolded-up key terms may irk, but the witty Winkless has done her homework.



Venomous

Christie Wilcox FARRAR, STRAUS AND GIROUX (2016)

Evolutionary biologist Christie Wilcox mines reams of research on venomous fauna, a vast cross-taxa group that ranges from the platypus (*Ornithorhynchus anatinus*), which delivers venom containing 83 toxins, to the Komodo dragon (*Varanus komodoensis*), whose anticoagulant-laced version bleeds victims dry. We may cringe at snakebite necrosis, but Wilcox reminds us that venoms are “complex molecule libraries” with medical potential — so safeguarding their biodiversity also preserves biochemical riches. **Barbara Kiser**