



The sense of smell is essential, coming into play in everything from personal identity to assessing the quality of foods such as this pecorino cheese.

NEUROSCIENCE

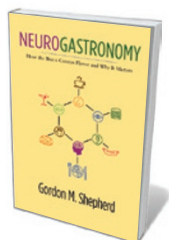
# Scent and sensibility

**Chris Loss** savours a wide-ranging exploration of flavour that takes in evolution and physiology — and suggests it could be key to a healthier future.

The most important apparatus in the culinary arts is not cutting-edge kitchen equipment or exotic ingredients; it is the senses. As neuroscientist Gordon Shepherd describes in *Neurogastronomy*, it's through the senses that we translate the size and configuration of volatile molecules into qualitative meaning, from biochemical into flavourful.

In this succinct yet informative book, Shepherd distills more than 50 years of research — and the collective knowledge of scientists, gastronomes, chefs, anthropologists and artists — to improve our understanding of flavour. He describes the physiology and neuro-circuitry of eating in compelling detail, delving deeply into the brain's systems for flavour detection. After introducing the science, he provides snapshots of seminal academics and culinary figures past and present.

Reading *Neurogastronomy* has convinced me that the answer to the question of why we are here is 'flavour'. After all, the largest gene family in mammals codes for the primary determinants of flavour: the olfactory receptors. These genes comprise around 3% of the whole human genome — a greater percentage than that of immunoglobulin and T-cell



**Neurogastronomy: How the Brain Creates Flavor and Why It Matters**

GORDON M. SHEPHERD  
Columbia University  
Press: 2011. 288 pp.  
\$24.95, £16.95

nose. A puff of air is then pumped past the olfactory epithelium in the upper nasal cavity, where the olfactory receptors are embedded. Volatile chemicals in the air 'tickle' the receptors, which generate a signal in the olfactory bulb. This is converted into an 'odour image' that the brain recognizes as an aroma. As Shepherd explains, retronasal smell has the bigger role in flavour.

We learn that flavour is a multi-modal

receptors combined.

Shepherd starts with the basic science of smell and taste. Smell, he explains, is a dual sense: orthonasal and retronasal. When you take a sniff of something, such as by poking your nose into a glass of wine, that is orthonasal smelling.

Retronasal smelling is more involved. When you swallow food or drink, you close your mouth and exhale through your

perception: other senses come into play too. Mouth-feel — sensing the texture of foods through receptors inside the cheek, palate and tongue — can range from springy, chunky and stiff to gritty, astringent and painful (burning, sticking or aching). Hearing and sound are also important in relation to food texture and enjoyment of flavours: studies have found that crunching raw carrots produces a pitch of 1–2 kilohertz, whereas eating crispy flatbread produces more than 5 kHz. We generally prefer "clearer and louder" food sounds, says Shepherd, who speculates that we interpret them using the brain's neocortex.

Beyond the immediate thrill of tasting chocolate, Thai curry or a red Bordeaux, flavour is an intimate part of ourselves, says Shepherd. Through it we connect to our environment, learn about our individuality and even gain insight into the origins of the human condition.

The book quotes anthropologist Richard Wrangham, who states that the advent of cooked food was key to human evolution: it required less energy to chew and increased the bioavailability of

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nutrients. The energy used to physically and chemically break down food could instead be diverted towards brain development, he says. Shepherd posits that our retronasal olfactory apparatus — and the flavours detected through it — allowed for detection and identification of a broader diversity of nutrients. This process, he says, ultimately led to the establishment of cuisines, which, apart from their national and cultural connotations, are one of the key ways in which humans successfully adapt to their environments.

Understanding that flavour is largely a creation of the brain, Shepherd argues, is crucial to addressing food-related health issues facing society today, such as lowering caloric intake and reducing sodium content without compromising flavour. When the nutritional sciences are applied in the food industry, the focus is often on the effects of including or excluding certain nutrients for health. But with improvements in nutritive heft must come improvements in flavour. The emerging field of neurogastronomy recognizes that requirement, and Shepherd is just one voice in a growing chorus calling for more collaboration among flavour experts, including chefs, neuroscientists and biochemists.

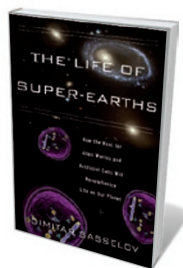
The book highlights key culinary figures past and present. Notably, the nineteenth-century French epicure and politician Jean Anthelme Brillat-Savarin, author of *The Physiology of Taste* (1825), pops up throughout to remind us that what we eat fosters critical evaluation of the natural world. Food and its flavours were the main point of inquiry for Savarin, and he pioneered some of Shepherd's major themes, basic concepts and underlying mechanisms. Along with modern gastronomic heroes such as French chef Paul Bocuse, we encounter US food-science writer Harold McGee, who has inspired and guided chefs towards more evidence-based cuisine, and has investigated the role of flavour chemistry in the science underlying deliciousness.

Shepherd ends with an adept deconstruction of the famous sensory journey of Marcel Proust in his book *Remembrance of Things Past* — specifically, the tisane of lime-flower tea and the madeleine cake that sets Proust off on his epic memory-fest and reveals the hard-wired connectivity of flavour stimuli to memory, emotion and critical thought.

If flavour is the trigger for an act of the imagination as extraordinary as Proust's magnum opus, what else might it do? Shepherd makes an excellent case for neurogastronomy as an important cross-disciplinary field that is likely to motivate a variety of imperatives for our health and well-being. ■

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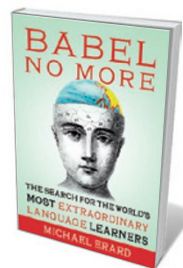
## Books in brief



### The Life of Super-Earths: How the Hunt for Alien Worlds and Artificial Cells Will Revolutionize Life on Our Planet

Dimitar Sasselov BASIC BOOKS 240 pp. \$24.95 (2012)

Planet hunters have been busy bagging their quarries since 1995: known extrasolar planets now number around 600. In this short, sharp look at the subset called 'super-Earths' — rocky or oceanic, but more massive than Earth — astronomer Dimitar Sasselov gives us the science and the speculation about life on other worlds. He suggests that the Copernican revolution, which demoted Earth from its position at the centre of everything, could be brought full circle by new findings from synthetic biology and planetary science.



### Babel No More: The Search for the World's Most Extraordinary Language Learners

Michael Erard FREE PRESS 320 pp. \$25.99 (2012)

Polyglottism has always amazed. But are hyperpolyglots — who speak many languages — neurological oddities, swots or genetically predisposed? Writer Michael Erard's tale of tongues includes such figures as Bolognese priest Giuseppe Mezzofanti, alleged master of 40 languages, and British explorer Richard Burton, who spoke 29 (and 11 dialects). Erard examines sections of multilinguists' brains and tracks down today's hyperpolyglots. He concludes that they are a "neural tribe" — ambitious and willing to reshape their brains.



### Golden Holocaust: Origins of the Cigarette Catastrophe and the Case for Abolition

Robert N. Proctor UNIVERSITY OF CALIFORNIA PRESS 779 pp. \$49.95 (2012)

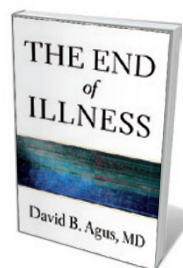
A century of hype has made tobacco the most popular drug on Earth. Although smokers may feel they are working the glamour of film noir, the facts about this lethal habit just get grimmer. For his monumental and sobering indictment, science historian Robert Proctor dug through piles of recently released industry documentation to uncover the activities that lured many scientists into its mill of denial. A tale of giant profits, decades of secrecy over the links with cancer, useless filters and more.



### The Sacred Headwaters: The Fight to Save the Stikine, Skeena, and Nass

Wade Davis and Carr Clifton GREYSTONE BOOKS 160 pp. \$45 (2012)

Splayed next to southern Alaska, Canada's Sacred Headwaters region is a vast panorama of mountains, salmon rivers and canyons criss-crossed with the trails of caribou, grizzlies and mountain goats. Thousands of First Nations people live there. But as anthropologist and ethnobotanist Wade Davis explains, it could become a war zone. Corporations are queuing up to develop the region, halted only by First Nations activists and a government moratorium that lasts until 2013. Carr Clifton's haunting photographs evoke what's at stake.



### The End of Illness

David B. Agus SIMON & SCHUSTER 352 pp. £14.99 (2012)

The billions of dollars spent on medical research have failed to vanquish cancer and other serious diseases. Solutions, argues medical oncologist David Agus, depend on a systemic, whole-body approach rather than a reductionist one. Emphasizing prevention and tailored treatment, Agus advocates the combination of techniques such as proteomics with pragmatic routines based on robust research. Avoiding risky habits and introducing lifestyle changes such as taking aspirin are small steps that could pay dividends, he says.