and continues to make progress. As well as lithium-iron phosphate, other innovative materials have been used for the three main battery components of anode, cathode and electrolyte. But there is still no lithium battery light enough to power a small electric car over a reasonable distance on a single charge.

Urgently needed are 'superbatteries' with energy densities at least two or three times higher than at present. The most promising candidates are lithium–sulphur and lithium–air batteries, which in principle should be able to store 5–10 times the energy of today's cells. These are conceptually simple, but their implementation has been stalled by a series of apparently insurmountable hurdles: the high solubility of the (polysulphide) discharge products; the high resistance of the electrode materials in the case of lithium sulphur; the slow kinetics of the oxygen electrode; and the instability of the lithium anode in the case of lithium air.

There have been breakthroughs in the past few years with the development of advanced sulphur electrode nanomorphologies, the clarification of the oxygen reduction process, the use of appropriate catalysts for promoting its evolution, and the stabilization of the lithium electrode by covering it with protective films. The road to applications is still long, but the race for the electric car has started. Many car makers are seeking joint ventures with battery manufacturers to pursue the Japanese frontrunners who, having won their early bet on hybrids, are still the major players in electric vehicles.

With demand for lithium set to grow, some question whether Earth's crust contains enough of the metal to sustain its use in vehicles. Fletcher cleverly analyses the debate and gives vivid descriptions of his trips to Bolivia and Chile to visit the two main salt deposits that, together with a third in Argentina, are the richest sources of lithium carbonate. The reserves could last for centuries, so there will be enough lithium to fill up our tanks even in the improbable case of all cars becoming hybrid or electric.

Bottled Lightning is a gripping introduction to this sophisticated technology and its place in our society. My only criticism is that Fletcher fails to credit the group of US and European scientists, including Don W. Murphy, Michel Armand and myself, who in the early 1980s developed the lithium-ion battery concept. The field then fell silent for more than ten years, until the Japanese company Sony optimized the idea for the first commercial lithium-ion battery in the early 1990s. As Fletcher notes, plenty has happened since. ■

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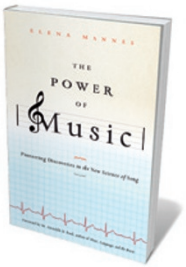
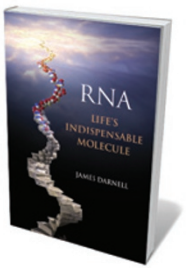
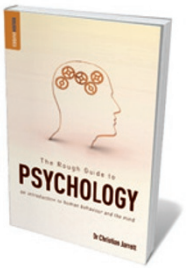
Books in brief



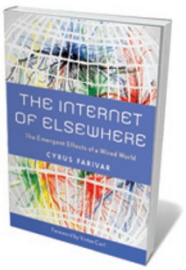
The Power of Music: Pioneering Discoveries in the New Science of Song
Elena Mannes WALKER *288 pp. $26 (2011)*
Why does music move us? In a wide-ranging book that spans science and culture, documentary-maker Elena Mannes — who hails from a long line of musicians and patrons, including the builder of New York's Carnegie Hall — describes what the latest cognitive biology and neuroscience tell us about our emotional responses to music. She points to evidence that music can heal, and looks at why music seems to be almost universal across different cultures.



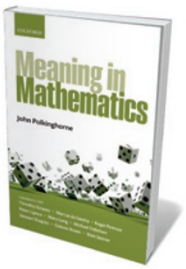
RNA: Life's Indispensable Molecule
James Darnell COLD SPRING HARBOR LABORATORY PRESS *416 pp. $39 (2011)*
The RNA molecule is crucial for gene expression and protein synthesis. Molecular biologist and RNA expert James Darnell rounds up the latest findings on RNA research in this book aimed at biology graduates. He describes how RNA's varied biochemical and structural properties were discovered, how messenger RNAs are generated and produce proteins, how RNA molecules take on regulatory roles in the cell, and how RNAs might have initiated life on Earth.



The Rough Guide to Psychology: An Introduction to Human Behaviour and the Mind
Christian Jarret ROUGH GUIDES *376 pp. £11.99 (2011)*
The basics of psychology are outlined in the latest title in the Rough Guide science series. Starting from an individual perspective, journalist Christian Jarret explores the mind and the brain, touching on memory, intelligence and personality. He goes on to analyse our relationships with others, including how we choose our friends and partners. He covers the psychological basis of crime, learning, sport, politics and shopping, as well as conditions of impaired mental health such as depression, anxiety and schizophrenia.



The Internet of Elsewhere: The Emergent Effects of a Wired World
Cyrus Farivar RUTGERS UNIVERSITY PRESS *296 pp. $25.95 (2011)*
Much of the power of the Internet — good and bad — stems from its global reach. Technology journalist and broadcaster Cyrus Farivar profiles web pioneers in four countries — Iran, Estonia, South Korea and Senegal — to illustrate how the Internet is transforming international communications, politics and economics. His case studies examine the Internet's history and effects in these diverse nations, showing that they are at the forefront of developments in Internet phone services, broadband access and digital law.



Meaning in Mathematics
Edited by John Polkinghorne OXFORD UNIVERSITY PRESS *192 pp. £18.99 (2011)*
Is mathematics discovered or invented? Nine top scholars, including mathematical physicist Roger Penrose and philosopher Gideon Rosen, muse on whether the discipline is a purely intellectual pursuit or a means of uncovering real aspects of nature. Intended for a broad audience, each essay in this volume — edited by mathematician-turned-theologian John Polkinghorne — is accompanied by comments from the other contributors.