

is mainly down to its large-scale, low-cost producers undercutting smaller operations elsewhere. Perceptively, he recognizes the significant amounts of time, money, technological know-how and risk-taking required to find an economically viable geological deposit and set up a mine and extraction plant. He also notes the technical, environmental and economic limitations of obtaining the metals through recycling.

**“Until the mid-twentieth century, only about 15 metallic elements in the periodic table had any practical use.”**

Real and perceived threats to supply security of these metals have led to speculation and hype about resources in more exotic locations. Veronese explores new frontiers for mining, from Antarctica to the deep ocean and even the asteroid belt. This entertaining discussion is realistic about the prospects and the huge financial, technical and environmental risks associated with attempts to recover rare metals from wilder shores. However, although many of these elements are relatively rare and geologically often unevenly distributed, it is unlikely that we will run out of any of them in the near future. As Veronese points out, it is more likely that geopolitics will trigger short-term supply disruption.

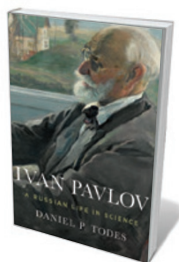


Coltan contains metals key to digital devices.

Although prone to digression and hyperbole, *Rare* makes powerful points about the consequences of conspicuous consumption. The influence of the ‘haves’ over the ‘have-nots’, the willingness of rich countries to export their environmental obligations to poor ones, and the fragility of global supply chains in a resource-constrained world are uncomfortable truths. Yet they must be told. ■

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## Books in brief



### Ivan Pavlov: A Russian Life in Science

Daniel P. Todes OXFORD UNIVERSITY PRESS (2014)

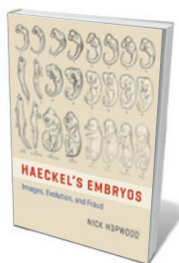
Profoundly researched, densely detailed and likely to be definitive, Daniel Todes’ biography of physiologist Ivan Pavlov was 20 years in the making. The tome is a corrective, not least to the idea that Pavlov was a behaviourist: this obdurate Russian survivor of war, revolutions and Stalinization was in fact focused on “consciousness and its torments”. His immense labours in his factory-like lab produced a mixed legacy. Conditional-reflex methodology, for instance, is a staple of addiction studies, yet Pavlov’s scrutiny of canine saliva for a solution to the ‘hard problem’ of neuroscience came to nothing.



### Trees, Woods and Forests: A Social and Cultural History

Charles Watkins REAKTION (2015)

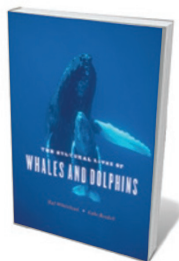
Charcoal, warships, fruit, houses, shade and sheer beauty — the manifold uses of trees have bound them inextricably to human culture. Geographer Charles Watkins’ interdisciplinary exploration of that long, convoluted relationship is a fact-packed dazzler. With Watkins we walk a Neolithic ‘road’ of ash planks, delight in Pliny’s description of German forests as “untouched by the ages and coeval with the world”, celebrate the rise of scientific forestry and ponder the diseases and creeping urbanization now threatening the future of these stupendous organisms. Sumptuously illustrated.



### Haeckel's Embryos: Images, Evolution, and Fraud

Nick Hopwood UNIVERSITY OF CHICAGO PRESS (2015)

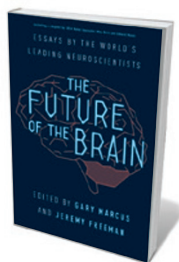
Rarely have images proved so incendiary as the embryo drawings of nineteenth-century experimental zoologist Ernst Haeckel. In this lavishly illustrated volume, Nick Hopwood traces the chequered history of the sketches, which showed similarities between embryos of higher and lower vertebrates, including humans, at particular points in their development. Haeckel intended the images as support for Charles Darwin’s evolutionary theory, but under attack revealed that they were schematics. Hopwood meticulously charts how, despite the controversy, the drawings took on a life of their own.



### The Cultural Lives of Whales and Dolphins

Hal Whitehead and Luke Rendell UNIVERSITY OF CHICAGO PRESS (2014)

This research round-up on cetacean culture opens with a description of one of nature’s great arias: the “high sweeping squeals, low swoops, barking, and ratchets” of the humpback whale. That song, argue cetacean biologists Hal Whitehead and Luke Rendell, is the best evidence of culture in this intriguing family, because it is an indicator of social learning in action — communal singing evolves over time and changes radically over individuals’ lifetimes. Fascinating findings litter this sober treatise, from sperm whales snacking off fishing longlines to the “Star Wars vocalisation” of dwarf minke.



### The Future of the Brain: Essays by the World's Leading Neuroscientists

Edited by Gary Marcus and Jeremy Freeman PRINCETON UNIVERSITY PRESS (2014)

How to unify data from initiatives such as US President Barack Obama’s BRAIN? In this essay compilation, editors Gary Marcus and Jeremy Freeman argue that a “confluence of new technologies” will kick-start astonishing advances in mapping, computation and simulation related to the brain. Geneticist George Church’s “Rosetta Brain” sample, for instance, assembled by methods such as ‘barcoding’ cells, could prove key in brain comparison. **Barbara Kiser**