sounds of up to 250 kilohertz, well above our human limit of 20 kHz. "The unaided ears of a human walking through the forest at night are assaulted by a riot of unheard katydid cross-talk," Wilson recounts. We humans — and, presumably, potential predators — hear warning sounds, but not other, still vital communications.

A Window on Eternity revels in biodiversity and nature's inventiveness. Wilson damns "the corporate priesthood" that views "restructuring … Earth to accommodate vast numbers of people" as progress. There may be those to whom species do not matter, to whom extinction is an abstraction. To Wilson, species are our "phylogenetic kind" and individual species matter to him. He indicts those for whom 'Anthropocene' is a term that carries the political baggage of acquiescence to human domination of landscapes. The world cannot dwindle into a vast garden, he urges. To him, wildlands are "our birthplace"; a further "slide into extinction will turn the Anthropocene into the Eremocene, the Age of Loneliness".

His choosing Gorongosa is surely no accident. In common with much of Mozambique, it lost almost all of its large animals during its wars: by 2001, buffalo had dropped from 13,000 to 15; wildebeest from 6,400 to 1; and hyenas and rhinos had become locally extinct. Entrepreneur and philanthropist Greg Carr drove across the area in 2004, going days without seeing large mammals. He initiated the Gorongosa Restoration Project to plant trees, reintroduce large mammals, and create a tourist centre to make the park self-sustaining. Wilson plants his defiant flag defending biodiversity in a place once so brutally despoiled that its recovery is truly momentous. ■

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CLIMATE ECONOMICS

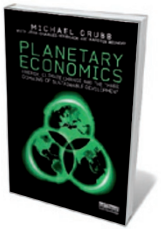
A strained relationship

Scott Barrett examines a study probing the nexus between climate change and energy.

Michael Grubb's provocative *Planetary Economics* claims to be about the "grand challenges of energy and environment", but is really about the relationship between energy and climate change. Grubb briefly notes the scale of the problem: for atmospheric levels of greenhouse gases to be stabilized, net emissions must fall to zero. His focus, however, is on reducing energy consumption and carbon emissions, irrespective of the need to meet any particular target for greenhouse-gas concentrations. It is unclear how much emissions would fall if the book's ideas were actually implemented.

Written with input from fellow climate-policy researchers Jean-Charles Hourcade and Karsten Neuhoff, this is a long and at times repetitive book; but there is something interesting on every page. It reflects a wealth of accumulated wisdom: Grubb has engaged with these issues for more than two decades.

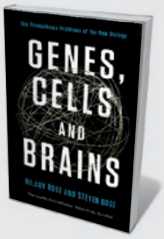
He is critical of dominant theories, such as the assumption that economic agents are rational and optimize every decision. He says that this approach fails to capture the complexities, overestimating the costs of reducing emissions and underestimating the benefits. He rejects the cost–benefit framing and its estimates of the "social cost of carbon" — a concept that puts a monetary value on the damage associated with a 1-tonne increase in carbon dioxide emissions. Instead, Grubb seems to endorse the political target of keeping global temperature rise below 2 °C, as agreed at the 2009 meeting of the United Nations Framework Convention on Climate Change (UNFCCC). Yet the economist Nicholas Stern has supported the same target, in part with reference to the social cost of carbon. It is true that greenhouse-gas concentrations have continued to creep up, threatening any possibility of achieving the target. However, there is no evidence that economic theories are to blame for the failure to cut emissions.



Planetary Economics: Energy, Climate Change and the Three Domains of Sustainable Development
MICHAEL GRUBB WITH JEAN-CHARLES HOURCADE AND KARSTEN NEUHOFF
Routledge: 2014.

What is the solution? Grubb's thesis is that reducing energy consumption and its associated emissions requires policy changes in three domains: satisficing, optimizing and transforming. In satisficing, people and firms overlook cost-effective ways to save energy, such as investing in insulation that promises a reduction in energy bills. Policy can help by nudging an economy closer to the energy-use efficiency frontier, for example by introducing standards for appliances, production processes, buildings and cars. In the second domain, optimizing, people and firms respond to price signals; this ushers in an argument in favour of carbon taxes and cap-and-trade schemes, which allow participants to trade emissions allowances under an overall cap. Transforming involves revolutionizing technology through innovation and investment in infrastructure such as improved electricity transmission.

Grubb argues that advancement demands progress in all of these mutually reinforcing domains. This argument is compelling, but the real questions are how far policy should go in each domain, and precisely how such policy should be devised. How should decisions be made about setting standards, designing cap-and-trade schemes and choosing strategic investments, if not through a cost–benefit rule? How should a carbon tax be chosen if not with reference to the social cost of carbon? Grubb challenges the idea that the price of carbon should be the same everywhere, ▶



Genes, Cells and Brains: The Promethean Promises of the New Biology
Hilary Rose and Steven Rose (Verso Books, 2014)
In this exposé of clashes between society and science, sociologist Hilary Rose and neurobiologist Steven Rose lambast multibillion-dollar biotech research, showing how the Human Genome Project, for instance, has not found disease-triggering genes.

Forecast
Mark Buchanan (Bloomsbury, 2014)
Disassembling the "marvellous machine" of the free market, physicist Mark Buchanan analyses the tempestuous global economy. Principles such as positive feedback loops and fluid dynamics explain the market's natural instability and inform ways to weather future fiscal storms.

supporting instead a "base level" price for developing countries, with others setting higher prices. He backs this in part by appealing to basic welfare economics. But that, as he notes, assumes that financial transfers from rich to poor countries are infeasible, which sits oddly with the fact that rich countries have pledged billions of dollars to the UNFCCC's Green Climate Fund to help poorer nations to mitigate emissions and adapt to climate impacts.

The book's greatest weakness is its lack of an overarching framework. The introduction acknowledges the importance of global collective action, but states that the problem is beyond the book's scope. Grubb concludes that the "next phase of the global effort … is a question of investment and returns". But which nations are to make the investments, which to earn the returns? Countries care about the answers. That is why so much effort has gone into climate negotiations.

Such answers will not be central to how countries address most of the issues in Grubb's first domain. Measures to increase energy efficiency must satisfy mainly domestic criteria, although international trade links will be important for setting technology standards. However, global questions and answers are key to the other domains. They will matter when a country sets a carbon price. They will matter in relation to the investment that countries are willing to give to decarbonization, not least because such investments will pay off only if the carbon price is high.

Despite the criticisms, the book's thesis is relevant to current climate negotiations, which seem to be focusing on what countries are willing to do individually: a kind of enhanced 'business as usual' approach. But for the immense scale of action needed to stabilize concentrations of greenhouse gases — even at a level allowing global temperatures to rise by more than 2 °C — collective action is essential. ■

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MEDICINE

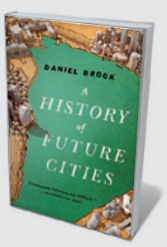
Outside the fold

Giovanna Mallucci assesses the autobiography of Stanley Prusiner, the discoverer of prions.

In his autobiographical book, *Madness and Memory*, Stanley Prusiner charts his journey to winning the 1997 Nobel Prize for Physiology or Medicine, 30 years after his first laboratory posting as a fourth-year medical student — in Sweden, coincidentally. As the subtitle states, the story hinges on Prusiner's discovery of prions, "a new biological principle of disease". It is a remarkable tale: for the scientific discovery at its centre; for its recording of the extraordinary resistance the idea engendered; and for the sheer unfettered animosity, both personal and professional, directed at him throughout from scientists and the media.

Prusiner introduces us early on to how, in 1972, his imagination was caught by the then-unknown infectious agent causing scrapie, a degenerative brain disease of sheep. Then, in the first year of his neurology residency, he was caring for a patient with Creutzfeldt–Jakob disease (CJD), a scrapie-like neurodegenerative disorder we now know to be a human prion disease. What follows is a chronicle of his voyage to isolate and characterize the scrapie agent during the 1970s, up

ILLUSTRATION BY MARTIN O'NEILL; STANLEY PRUSINER PHOTO: RUSS FISCHELLA



A History of Future Cities
Daniel Brook (W. W. Norton, 2014)
As urban innovation soars in skyscraper-studded Dubai, Daniel Brook looks to the original instant cities, where Western architecture invaded Eastern streets. St Petersburg, Shanghai and Mumbai, he argues, traded culture for economic power. (See Mike Davis's review: *Nature* **494,** 427–428; 2013.)

Permanent Present Tense
Suzanne Corkin (Penguin, 2014)
Neuroscientist Suzanne Corkin worked with Henry Molaison, who had irreparable memory loss, for decades. Here she documents discoveries such as the hippocampus's role in classifying memories. (See Douwe Draaisma's review: *Nature* **497,** 313–314; 2013.)