ECOLOGY

Wilson in Africa

Stuart Pimm enjoys a fellow naturalist's first visit to sub-Saharan Africa, and the global lessons drawn from it.

Speeding northwards, I luxuriated in the smooth South African highway: soon we would cross into Mozambique, where I could expect a rutted dirt road. But there wasn't even that. Beyond the border-post's single hut, a braid of narrow, indistinct tracks headed in all directions. We picked the travelled paths; there might be land mines along unbeaten ones. Mozambique had suffered a brutal war of independence and subsequent upheavals between 1964 and 1992. An estimated one million Mozambicans died, wildlife was slaughtered and forests burned. So why

were we there?

For the same reason as Edward O. Wilson — the region's exceptional biodiversity. As he explains in *A Window on Eternity*, "Anywhere I am in the world I love it when the air is warm and moist and heat bounces off the sunlit earth, and insects swarm in the air and alight on flowers." In the book, Wilson explores and revels in Mozambique's Gorongosa National Park, where the wet heat makes for a riot of what the eminent biologist calls "the little things that run the world" — insects and other invertebrates. At the heart of the park is Mount Gorongosa, which, at

1,863 metres high, catches enough moisture from Indian Ocean winds to support a dripping rainforest. In East Africa, you can move from dry grasslands to savannah woodlands to montane rainforest in the space of a few kilometres, with each habitat harbouring unique species.

Unexpectedly, Wilson is new to sub-Saharan Africa: the book is a chronicle of his first visit there in 2011. His responses recall Darwin's enthusiasm on first encountering the Brazilian tropics, marvelling breathlessly at one fascinating species after another.

Inevitably, ants — his speciality — take centre stage. Their social systems led to *Sociobiology: The New Synthesis*, his landmark 1975 study on animal societies. Gorongosa's ants are new to Wilson, however. He picks up a Matabele ant (*Pachycondyla analis*), which "gnashed its mandibles impressively, then ... thrust a long sting into the flesh of my index finger". (He rates the pain as slightly below that of a hornet's sting.) These are the ant equivalent of "sappers and light cavalry" — heavily armoured and specialized for raiding termite communities that build hardened mounds of mud that can reach the size of a bus. The termites have their own soldiers, but the ants overwhelm them by sheer force of numbers and ferocity.

Wilson also delights in driver ants, whose colonies can number 20 million workers. They are blind, but sensitive to smell and movement. Their leaderless swarms engulf the ground and low vegetation, seizing almost any live animal in their path. Useful things, driver ants: nothing quite like a visit from them to clean out vermin-infested tropical homes.

There is a world of sound, too, although it is mostly hidden. Entomologist and photographer Piotr Naskrecki, who accompanied Wilson, gathers the audio. He brings special equipment to record

A Window on Eternity: A Biologist's Walk Through Gorongosa National Park
EDWARD O. WILSON
Simon & Schuster: 2014.

NEW IN PAPERBACK

Highlights of this season's releases

Regenes: How Synthetic Biology Will Reinvent Nature and Ourselves

George Church and Ed Regis (Basic Books, 2014)

In this visionary account of humankind's soaring capabilities in bioengineering, geneticist George Church and science writer Ed Regis redraw the frontier of synthetic biology — and, potentially, some ethical boundaries. Starting with 'simple' bioplastic cups made entirely from plants, they go on to discuss genomic alterations that could spawn virus-resistant humans and resurrect Neanderthals. This is the first book to be translated into a DNA sequence (see go.nature.com/gcgfqa).

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

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

to cut emissions.

What is the solution? Grubb’s thesis is that reducing energy consumption and its associated emissions requires policy changes in three domains: satisfying, optimizing and transforming. In satisfying, 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 investing 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.