



ECOLOGY

Redefining nature

Shahid Naeem compares two books that call for us to embrace the influence of humans on ecosystems.

In Mary Shelley's novel, Victor Frankenstein assembled parts of dead humans into a creature he brought to life by unorthodox scientific methods. The resulting being, although human in form and function, was seen as a monster. If we were to assemble a thing made up of plants, animals and microbes, and then breathe ecological life into it, would it be nature or an unnatural monster? Two authors examine this issue: Emma Marris in *Rambunctious Garden* and Nigel Dudley in *Authenticity in Nature*.

If one defines 'natural' nature as assemblages of native species that occupy large, unbroken areas without obvious human influence, and that exhibit normal (1,000-year average) rates of extinction, origination and ecosystem function, then there is no such thing on Earth today. The destruction of the natural world began some 2 million years ago, with burning and hunting by *Homo erectus*. In the past 50,000 years, *Homo sapiens* took these skills to new heights, culminating in the Industrial Revolution, in which some

Rambunctious Garden: Saving Nature in a Post-wild World

EMMA MARRIS
Bloomsbury: 2011. 288 pp. £20, \$25

Authenticity in Nature: Making Choices about the Naturalness of Ecosystems

NIGEL DUDLEY
Earthscan: 2011. 256 pp. £19.99, \$34.95

25 million square kilometres of grasslands were burned, 12 million square kilometres of forests vanished, and floral and faunal extinctions skyrocketed worldwide. If the loss of the natural world is nothing new, does it matter? Both authors think not.

Dudley opens *Authenticity in Nature* by recounting his boyhood experiences at the Attenborough Nature Reserve near Nottingham, UK. Now leased by a mining company to a wildlife trust, it was for centuries grazing land. To visitors, it is nature. Marris goes a step further in

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Rambunctious Garden, suggesting that birds and bees on New York's Fifth Avenue constitute nature. I could go one better: my formative childhood experiences of nature were the dioramas of the American Museum of Natural History in New York. My mind's eye breathed life into the stuffed, encased creatures; for me, they defined nature.

Both authors review what is natural and unnatural from an ecological perspective, but their approaches are different. Marris, an accomplished science writer who regularly writes for *Nature*, follows the tactic of David Quammen (*The Song of the Dodo*; 1996), Stuart Pimm (*The World According to Pimm*; 2001) and Jonathan Weiner (*The*

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Beak of the Finch; 1994). In this, her first book, she brings together her many travels and encounters to create a Kerouac-like journey through

which her thesis emerges. She posits that significant parts of the modern world are or will become "rambunctious gardens" — unruly entanglements of weedy species that follow in our wake. Because nature is ever changing, on the scale of Earth's history, rambunctious gardens are as legitimate as any other manifestation of nature. We should embrace our creations, not shun them as monsters.

Marris makes effective use of the popular voice, but sometimes goes overboard. Phrases such as "North American mammoths went kaput" do injustice to the gravity of such issues. Similarly, frequent references to "ecologists", as in her claim that most ecologists dislike anything that "reeks of mankind", belies the broad spectrum of views that such researchers hold.

Dudley's book is more sombre, similar to Simon Levin's *Fragile Dominion* (1999), E. O. Wilson's *The Future of Life* (2002) or Carolyn Merchant's *Reinventing Eden* (2003). An established environmental scientist, Dudley also uses his travels to bring colour to his writing, but his hypothesis comes from a thoughtful examination of various attempts to define 'natural' and 'wild' — by scientists, philosophers, managers, non-governmental organizations and policy-makers. Dudley demonstrates that there is neither coherence nor consensus as to what constitutes naturalness or wildness. He suggests that we focus instead on "authenticity".

For nature to be authentic, Dudley posits, it need only contain a web of interacting species that provides stable ecosystem functions and services. The islands of Hawaii, for example, are inhabited by humans, have suffered innumerable extinctions and are riddled with non-native species. Yet they remain complex and productive ecosystems — not natural, ▶

▶ perhaps, but authentic Hawaiian ones. Being authentic does not involve having native or endemic species or being devoid of people, and is thus a more tractable environmental goal than achieving naturalness or wildness.

Neither volume tries to dismiss 'natural nature' as the cause célèbre of conservation; rather, both encourage adding unnatural nature to that which we seek to preserve. Well protected places that are rich in endemics are important, but rambunctious gardens and authentic ecosystems are crucial too.

Take a modern New England forest. Its ecology consists of garlic mustard from Europe, thorny Japanese barberry, introduced earthworms, soil that is enriched with industrial nitrogen, exotic insect pests such as hemlock woolly adelgids, Asian longhorned beetles and emerald ash borers, and an ungodly number of ravenous deer who know no serious predation. It is a rambunctious garden. It is polluted, stunted, diseased, unstable and has no top predators. But it is teeming with life. It is home to surviving native species; exhibits ecosystem functions such as storing carbon and cycling nutrients; and even provides some ecosystem services by stabilizing the hilly slopes and supplying deer for hunters in the region. This is authentic nature in the Anthropocene epoch.

Yet ecological theory still holds, even if it is complex and inconvenient. If nature is any set of interacting species, through which energy flows and nutrients cycle, then it calls for saving too many species and setting aside too much land. Yet I would caution against making intelligent-design-like arguments that would dispense with ecology, to replace it with something simpler. Nature without ecology is like biology without evolution; neither is viable, neither makes sense.

Marris and Dudley challenge us to revisit the definition of nature in our increasingly unnatural world. But modern ecosystems that are haphazardly assembled from the remains of human development are unpredictable and fragile. With one billion people hungry, two billion poor and three billion in desperate need of water, the hopes of humanity rest on conserving, restoring and sustainably managing the services that nature provides. The bigger question is whether the unnatural nature that we have wrought, although familiar in form and function, will save us or prove to be monstrous. ■

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Building the Large Hadron Collider proved tricky, not least because of fears it would create tiny black holes.

C. MARCELLONI/CERN

PARTICLE PHYSICS

Inside the collider

Joseph Silk enjoys an eloquent take on the Higgs boson, supersymmetry and the world's largest particle smasher.

Mentioning particle physics may silence many dinner parties, but that has not deterred its funders. By the end of 2010, more than €7 billion (US\$10 billion) had been ploughed into the current world-leading machine in experimental particle physics — the Large Hadron Collider (LHC) at CERN, Europe's high-energy physics lab near Geneva, Switzerland. So it behooves the researchers involved to communicate the relevance of the LHC's science goals to the public.

Lisa Randall's *Knocking on Heaven's Door* is the latest attempt to do so. Her eloquent book details the trials and tribulations of the LHC, from conception to implementation, and takes us on a grand tour of the underlying science. Randall, a professor of physics at Harvard University in Cambridge, Massachusetts, and a leading contributor to particle-physics theory, borrows her title from Bob Dylan's soundtrack to the 1973 Sam Peckinpah film, *Pat Garrett and Billy the Kid*. The film is a lament on the death of a gunslinger — and the book's title may be a reference to the prediction that turning on the LHC would result in the destruction of Earth. Fortunately, as Randall describes, this did not happen.

That prediction provides a measure of the LHC's reach, and its hold on the public's imagination. Physicists' ultimate dream is to unify the fundamental interactions of physics. This involves combining

gravity with quantum theory and, in particular, with the forces that hold particles and atoms together in higher dimensions of space and time.

String theorists, whose ranks purportedly include the greatest brains in physics, have predicted that infinitesimal, very short-lived black holes are the unifying factor, the missing glue. Some have predicted that these microscopic objects could be recreated in sufficiently high-energy particle collisions with a powerful particle accelerator such as the LHC. However, most particle physicists doubt that they will actually see such events — Stephen Hawking predicted that, owing to quantum physical effects, microscopic black holes should decay in a fraction of a nanosecond.

But even Hawking might be fallible. Richard Feynman famously said that "nobody understands quantum mechanics". If Hawking was wrong, an escaping black hole might suck up its surroundings: the LHC itself and Geneva (to which humanity could no doubt adapt) and even Earth. Pursuing this logic, a teacher in Hawaii combined



Knocking on Heaven's Door: How Physics and Scientific Thinking Illuminate the Universe and the Modern World
LISA RANDALL
Bodley Head: 2011.
464 pp. £20

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Lisa Randall's
hyperspace opera:
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