Joel Paschal on *Junk*, the raft made of plastic bottles that he and Marcus Eriksen sailed from California to Hawaii in 2008.

PETER BENNETT/CITIZEN OF THE PLANET

ENVIRONMENT

A journey on plastic seas

Richard Thompson applauds a chronicle alerting the world to marine polymer pollution.

The story of a voyage bearing witness to plastic pollution in the oceans, *Junk Raft* is a stimulating, thought-provoking and factually grounded read. Science educator and researcher Marcus Eriksen's navigational feat is gripping — 88 days crossing some 4,000 kilometres of open ocean between California and Hawaii in 2008, on a raft crafted from 15,000 plastic bottles wrapped in fishing nets. But it is more. Woven through the chronicle are two equally fascinating storylines: Eriksen's evolution from soldier to research director of the environmental non-profit 5 Gyres Institute in Los Angeles, California, and the journey we all need to take towards a more sustainable use of plastics.

Around 75% of all the litter in our oceans is plastic, and an estimated 5 million tonnes of plastic waste enter the seas annually. Inevitably, this contaminates marine habitats worldwide and, as Eriksen explains, it is now present at the sea surface and on shorelines, in Arctic seas and on the sea bed at depths of 3,500 metres. Around 700 marine species, from sea turtles and corals to sperm whales and albatrosses, are known to come into contact with plastic debris — and can be harmed or killed by ingesting or becoming entangled with it. There are also concerns about plastics accumulating in commercially important species of fish and shellfish. (The waters and shores of Hawaii are particularly heavily contaminated, giving a rationale for Eriksen's destination.)

Junk Raft: An Ocean Voyage and a Rising Tide of Activism to Fight Plastic Pollution
MARCUS ERIKSEN
Beacon: 2017.

This environmental challenge has attracted increasing scientific, media and societal attention in recent years, yet few accounts have conveyed the wider picture accessibly. *Junk Raft* does just this — while exposing our frustratingly slow progress on an issue of major importance to fisheries, tourism and, ultimately, the health of the world's oceans.

Eriksen catalogues the issues associated with the accumulation of marine plastic: the causes, consequences and potential solutions. Our throwaway culture is the main culprit. For more than 60 years, society and industry have been producing more and more single-use items, particularly packaging, designed for disposability. Some solutions lie in better capture of materials at the end of their lives, in a circular economy (see B. Kiser *et al. Nature* **531,** 443–446; 2016).

Eriksen contextualizes the crisis with a timeline of scientific discovery and advancement in our understanding since the 1970s. Alongside this he gives a very personal, somewhat North American, perspective on the tribulations of industry and policy

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engagement: the side plots and blind alleys, and the tactics of avoidance, distraction and denial he has so often encountered in his environmental work. There are parallels, he shows, with the obstacles that faced those who fought to raise awareness around the health impacts of smoking. Eriksen also gives due credit to his collaborators — notably oceanographer Charles Moore, discoverer of the 'garbage patch' in the North Pacific Gyre. Moore founded the Algalita Marine Research and Education in Long Beach, California, which co-sponsored the Junk Raft project.

"Around 75% of all the litter in our oceans is plastic, and an estimated 5 million tonnes of plastic waste enter the seas annually."

Throughout, we are regularly brought back to the realities of life aboard the raft, with Eriksen's fellow sailor Joel Paschal. This is both mesmerizing and eventful, from their slow, occasionally perilous progress to the moments when it seems the raft will disintegrate, littering the ocean with the detritus Eriksen is trying so hard to combat. We see the pair working, eating and sleeping in the confined space of the raft's cabin, a repurposed light-aircraft fuselage. Alongside this are high spots such as the culinary delights of fish and squid cooked straight from the sea. Eriksen's wider journey also takes him onto dry land, where he touches on the accumulation of terrestrial plastic. He learns about the consumption of plastic bags by camels — a serious issue in some desert countries — as he travels back to Kuwait and Iraq, where, 25 years earlier, he had fought as a US marine in the Gulf War.

It can be difficult to gauge the direct impacts of projects such as Eriksen's, but he rightly notes the importance of raising awareness of the risks of disposable plastic. Eriksen has also done much to highlight the environmental consequences of polymer microbeads in the US Great Lakes, providing key evidence that led to the introduction of legislation. (My own team was the first to show the temporal accumulation of microplastics in UK waters, in 2004; see R. C. Thompson *et al. Science* **304,** 838; 2004.)

Junk Raft is permeated with a sense of optimism that I share. Most of my research over the past 20 years has been on the accumulation, distribution and impact of marine plastic litter. Despite some differences in our perspectives, I join Eriksen in seeing this as a solvable problem — but one that demands urgent attention. ■

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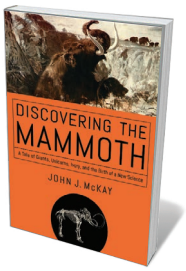
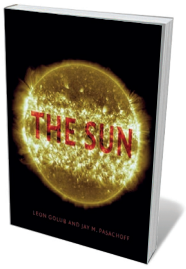
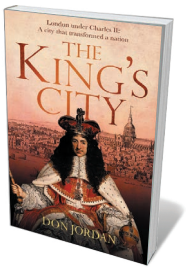
Books in brief



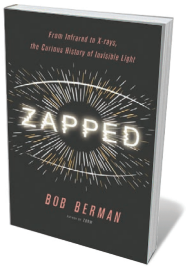
Discovering the Mammoth
John J. McKay PEGASUS *(2017)*
Long before mammoths were described by science, wild debates raged over their hulking fossils. From classical Greece to China, claims that they were dragons' teeth or giants' bones sprang up. As John McKay vividly relates, the scientific saga began in the seventeenth century, when the evocative remains became pivotal to the evolution of vertebrate palaeontology. Among the turning points, he shows, was Siberian tribesman Ossip Shumachov's discovery of a near-complete mammoth carcass around 1800 — later reconstructed, in a stupendous feat of guesswork, by Wilhelm Gottlieb Tilesius.



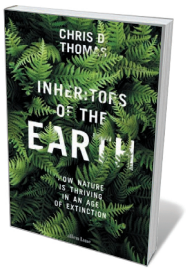
The Sun
Leon Golub and Jay M. Pasachoff REAKTION *(2017)*
It may be just another yellow dwarf, but to us Earthlings the Sun is the undoubted star of celestial objects. Astrophysicist Leon Golub and astronomer Jay Pasachoff elucidate all things solar in this scientific primer. They anatomize sunspots by way of US astronomer George Ellery Hale, who pioneered their observation with his 1889 invention of the spectroheliograph. They explore helioseismology, which allows us to peer inside the Sun; look at chromosphere and corona; and proffer pointers on safe amateur observation. Beautifully illustrated, history-rich and bang up to date.



The King's City
Don Jordan LITTLE, BROWN *(2017)*
Plague-ridden and half-destroyed by fire, late-seventeenth-century London was also a scientific hotbed. Presiding over it for more than two decades was Restoration monarch Charles II. Don Jordan's history captures the shifts he engineered in trade and culture, and his great decision — as one eager to support astronomy and medicine — to establish the Royal Society. Under its aegis, luminaries such as Robert Boyle, Christopher Wren and Robert Hooke parsed nature, from the "springiness" of air to the rotation of Mars, in the process doing much to establish the physical and intellectual London of today.



Zapped
Bob Berman LITTLE, BROWN *(2017)*
As astronomy writer Bob Berman notes in this nimble history of radiation, the idea of invisible light has an oxymoronic flavour. Yet without that spectrum, the Universe would be unimaginable and much of modern technology impossible. His roll call of the brilliant scientists who unpeeled this world include Johann Ritter, Heinrich Hertz and William Herschel, who discovered ultraviolet, radio and infrared waves, respectively. There is plenty, too, on mundane exposure, from the potassium-40 in bananas to the odd mash-up in 'cosmic rays', which includes helium nuclei, protons and antimatter.



Inheritors of the Earth
Chris D. Thomas ALLEN LANE *(2017)*
Ecologist Chris Thomas joins the throng calling for a step change in responses to our radically altered planetary environment. A veteran of the field from Borneo to Ethiopia and an evolutionary biologist, he offers a two-fold argument. First, conservation of as many species as possible is key, to "fuel future dynamism". Second, world biota are resilient, even in the recut jigsaw of altered habitats. As a corrective to doom-mongering, this is no litany of techno-fixes or cherry-picked examples, but may teeter on too many variables. **Barbara Kiser**