because reproductive competition among males for territories favours size — but also because selection favours females small enough to fit inside a shell to care for their young.

Finally, although the possible biological origins of human sex differences continue to fascinate, human sexual dimorphism is really not that striking. Men and women are boringly similar in size compared with other primates, and obviously outclassed in the oddity stakes by the other species highlighted here.

Fairbairn has simplified some material and left certain complexities out. For instance, there is nothing on the recent research documenting striking differences between the sexes in gene expression, affecting everything from early development to social behaviour, and little on the fact that we have only just begun to understand how a single genome can produce such diverse forms. But *Odd Couples* is a pleasure to read. There is humour (including an eye-rolling joke or two), but no reliance on the anthropomorphic cuteness so common in popular books on animal behaviour — especially sexual behaviour. There are certainly moments where the author 'geeks out' on the details, and this is part of the appeal. You walk away from this book with a deeper understanding of both these creatures and a biologist's mind.

I am inevitably biased in favour of Fairbairn's theme, having spent my working life trying to understand the amazing diversity of reproductive behaviours. Even so, I found reading the book like taking a holiday in a foreign land with an enthusiastic and expert guide. You will come back with good stories, and a new appreciation of the amazing diversity of life on Earth and the forces shaping it. You may even find your perspective on bigger questions shifting.

As Fairbairn concludes: "The enduring message from all of this is that there is clearly no one way of being a male or a female." When it comes to sex roles, all bets are off in the animal kingdom. ■

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GEOLOGY

Written in stone

Ted Nield relishes a deft tracing of the relationship between the rise of geology and the novel in the turbulent nineteenth century.

When we imaginatively recreate the past, we enter a dangerous landscape: we may find ourselves needing a philosophical map. Things become even more treacherous when trying to recreate the ways our ancestors looked back at history. This entails deciphering a palimpsest. Its cartographic vagaries may further distort our hindsight. Adelene Buckland attempts just such a recreation in her book *Novel Science*.

Buckland tries to get inside the heads of the Britons who were writing into existence a scientific geology while developing a great literary form: the nineteenth-century novel. She succeeds triumphantly.

Like their descendants today, the groups driving these two grand projects were not much separated from each other in the late eighteenth and early nineteenth centuries. Victorian geologists, and Charles Lyell in particular, were deeply concerned with evolving appropriate literary and visual forms that would convey their geological discoveries. The creative

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Ocean of Life: How Our Seas Are Changing
Callum Roberts (Penguin, 2013; £10.99)
Overfishing, acidification, plastic pollution, biogeographical shifts: marine conservation biologist Callum Roberts lucidly lays out the range of issues affecting the world's oceans. A sobering look at Earth's biggest biosphere. (See Stephen R. Palumbi's review: *Nature* **484,** 445–446; 2012.)

Antarctica: An Intimate Portrait of the World's Most Mysterious Continent
Gabrielle Walker (Bloomsbury, 2013; £8.99)
Science writer Gabrielle Walker unveils Earth's southernmost 'wild lab' in this vivid and accessible mix of researchers' stories and environmental writing. (See Francis Halzen's review: *Nature* **483,** 272–273; 2012.)

act of writing was, for them, as essential a part of scientific practice as any other, and they looked to contemporary writers of fiction for models. Meanwhile, those novelists — beginning with Walter Scott, and later including the likes of George Eliot, Charles Kingsley and even Charles Dickens — drew from the new science of geology and the awareness of deep time that it brought into popular consciousness. They found a new profundity with which to disturb and enrich their narratives.

The evolution of these two fields, geology and literature, mirrored and drove each other. The scientists sought to develop rigour, the novelists to achieve seriousness. 'Romance', in both cases and senses, was the enemy.

Buckland begins by taking us through the emergence of geology from its highly speculative, theoretical roots. In the early to mid-eighteenth century, speculation about Earth's structure and history was the preserve of *Weltall* theorists — system-builders who focused on how the cosmos began. They devised all-encompassing cosmogonies, then cherry-picked their evidence to suit. Even the Scottish geologist James Hutton, whose *Theory of the Earth* (first made public in 1785) ushered in a properly constrained, scientific approach to the rock record, sat within this tradition. But Hutton introduced — and Lyell firmly established — a key principle that University of Cambridge don William Whewell termed 'uniformitarianism' in the 1830s. This doctrine, which holds that all interpretation of the past must refer to processes that can be seen operating on Earth today, remains the central concept that makes geology 'scientific'.

Novel Science: Fiction and the Invention of Nineteenth-Century Geology
ADELENE BUCKLAND
University of Chicago Press: 2013. 384 pp. £29, $45

Within uniformity, however, questions remained — even into our own times. Did today's processes always operate at today's rates? Is the tiny snapshot of human experience an adequate sample of Earth history? And does the occasional rare event leave more of a trace in the record than the long ages that pass in between?

Lyell adhered to an overly strict constancy of rate for Earth processes — perhaps because, as Buckland reminds us, he trained as a lawyer. Using his chief skill of rhetoric, he sought to establish that, on an Earth of extreme age, everyday processes would efface any occasional catastrophe. For Lyell, gradualism was all. Another crucial turning point on the road to rigour and respectability was the foundation of The Geological Society of London in 1807, in whose hallowed halls I work. The society set itself against all theorizing in favour of information-gathering.

> THE DOCTRINE THAT ALL INTERPRETATION OF **THE PAST** MUST REFER TO PROCESSES THAT CAN BE SEEN OPERATING ON EARTH **TODAY** MAKES GEOLOGY 'SCIENTIFIC'.

But the society's literate builders of geology, such as Lyell, William Buckland and William Conybeare, fretted that their science might be embodied in or even traduced by literary forms that militated against the quest for academic dignity. Their loathing of 'theory' led them to suspect any reliance on its narrative analogue, 'plot' — with its emphasis on causality and motive. They reviled popularizers such as Robert Chambers — revealed as the author of the scandalous 1844 book *Vestiges of the Natural History of Creation* only after his death — who succumbed to such literary devices. (Some things don't change much.)

Wishing to purge their science of romance, they sought a drier narrative approach. This could have endangered their mass appeal. Happily, it didn't. Lyell and his peers each assumed the role of the wandering romantic, allowing a public fascinated by their discoveries to picture the heroic geologist — such as the weatherbeaten Adam Sedgwick pausing atop Glyder Fawr, one of Wales's highest mountains, like some human embodiment of painter Edwin Landseer's *The Stag at Bay*.

Meanwhile, contemporary novelists were inserting discursive philosophical elements into their writing. As Buckland argues, Scott did the most to reinvent the novel for his contemporaries as a credible literary form fit for gentlemen to read, as well as ladies. Scott, followed by Elizabeth Gaskell, Eliot, Kingsley and others, distanced their art from the yarn-spinning romancers of yore, such as Laurence Sterne, who cleaved more to the ancient traditions of Miguel de Cervantes and François Rabelais.

As both groups strove for realism, geologists discovered Scott, and he them. Buckland's book is the story of how they, and successive generations of geologists and novelists, helped one another to write the past into existence. It culminates, for me, in the work of geologist-novelist Kingsley, who even seems to have striven for the fusion of story-line and stratigraphy. Buckland will send you scouring the second-hand bookshops for long-forgotten works.

The relationship between science and literature has proved to be a rich seam of inquiry since 1983, when Gillian Beer produced her seminal book *Darwin's Plots* (Cambridge University Press). In the intervening decades, Earth scientists, with their strong historical bent, have worked with science historians and literary critics to create today's vibrant, culturally integrated field. A few inconsequential slips apart (neither William Buckland nor Conybeare were among the 13 founders of the Geological Society of London), Buckland meets this multidisciplinary challenge well in *Novel Science*. ■

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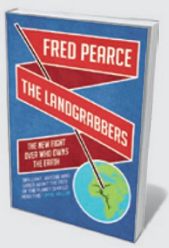
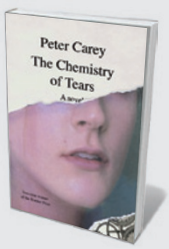


The Landgrabbers: The New Fight Over Who Owns the Earth
Fred Pearce (Eden Project Books, 2013; £9.99)
Delving into the recent 'land grabs' in developing countries, science journalist Fred Pearce mulls over solutions, such as including African smallholders in the global agricultural economy. (See Wendy Wolford's review: *Nature* **485,** 442–443; 2012.)



The Chemistry of Tears: A Novel
Peter Carey (Vintage, 2013; $15)
The history of science and engineering flavours this moving novel centring on a nineteenth-century automaton. Peter Carey's meditation on time and early 'artificial life' raises questions about what it means to be human. (See Minsoo Kang's review: *Nature* **484,** 451–452; 2012.)