

EXHIBITION

Dreamscapes

Henry Nicholls

Sleep can be uncertain and dreams so surprising. This very unpredictability makes *Sleeping and Dreaming* perfect curatorial territory for the Wellcome Collection, London's brave venue where science, art and culture converge.

This exhibition lets you ponder an early electroencephalogram machine, peer at a nightmarish vision by Francisco de Goya, survey alarm clocks made in four different centuries, watch a cataplectic fit unfold, find the Salvador Dali and Luis Buñuel film *Un Chien Andalou* on continuous loop and wish you owned a Hizamakura clip-on pillow, to make your desk more comfortable for a nap.

From a central corridor the visitor steps off into the intimacy of dark, spotlight antechambers, each addressing the show's central themes. As a narcoleptic visited by inspiring hallucinations while slipping into sleep, I particularly enjoyed the recess exploring the creativity that may flow from dreams. Here one can listen to 'Yesterday', which Paul McCartney apparently woke up humming, view a cast of *Cyclopoma spinosum* (a fossil fish that Swiss-born zoologist Louis Agassiz claimed to have reconstructed in his sleep) and admire Otto Loewi's Nobel certificate, awarded in 1936 for his dream-inspired discovery of neurotransmitters.

Aristotle and Freud make understated



Restless reveries: a long-exposure photograph captures a subject's movements during sleep.

appearances, allowing room for other scientific responses to sleeping and dreaming. Most of these are anecdotal. The rich artistic and cultural interpretations, by contrast, have greater impact.

There is a lively presence of contemporary art, with the central space occupied by two intriguing pieces. At one end, German photographer Nils Klinger captures sleep in a single still by leaving the shutter open on his slumbering subject for the time it takes a candle, the sole light source, to burn down ('Die Schlafenden', pictured). At the other, London-based sculptor Laura Ford has installed two kneeling child-like figures with donkeys' heads "to recall the fantastical slumbers of *A Midsummer Night's Dream*". The combination makes a disturbing piece.

Sleeping and Dreaming is a result of a collaboration between the Wellcome Collection and its German analogue, the Deutsches

Hygiene-Museum in Dresden, from which the exhibition has just transferred. Both are a result of visionary philanthropy — pharmaceutical entrepreneur Sir Henry Wellcome in Britain and industrialist and oral-hygiene pioneer Karl August Lingner in Germany.

The Wellcome Collection offers a place to "consider what it means to be human" and the Deutsches Hygiene-Museum aspires to reveal mankind's "multilayered cultural, physical, and psychological nature". I await their next joint venture, *War and Medicine*, with interest. ■

Henry Nicholls is a London-based science writer and author of *Lonesome George: The Life and Loves of the World's Most Famous Tortoise*.

Sleeping and Dreaming runs at the Wellcome Collection, London until 9 March. See www.wellcomecollection.org.

Rex appeal

Victorian Popularizers of Science: Designing Nature for New Audiences

by Bernard Lightman

University of Chicago Press: 2007. 528 pp. \$45

The Earth on Show: Fossils and the Poetics of Popular Science, 1802-1856

by Ralph O'Connor

University of Chicago Press: 2008. 448 pp. \$45

Frank A. J. L. James

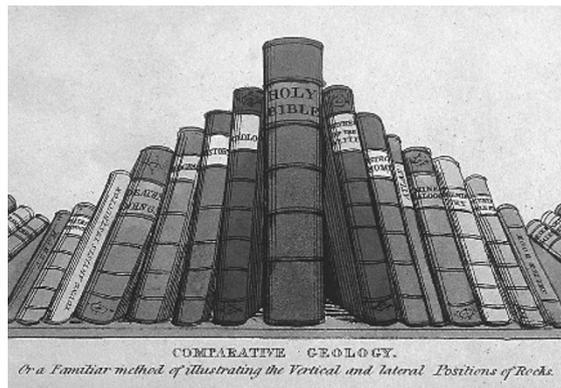
The popularization of science has become a growth area for historical study. It is a natural continuation of the historian's quest to understand the social and cultural context and impact of science, and a consequence of scientists' admonitions over the past 20 years that the public should be better informed.

Implied is that the efforts of earlier generations of scientists fell short of making their work accessible to the public. But Lightman's and O'Connor's books paint a very different picture, at least with respect to the nineteenth century. Their insights come soon after Aileen Fyfe's *Sci-*

ence and Salvation (2004) and David Knight's *Public Understanding of Science* (2006).

At the start of the nineteenth century, science was not an independent profession. Practitioners were often closely linked to medicine and the Church, at least in Britain, the country studied in *Victorian Popularizers of Science* and *The Earth on Show*. In France, there were more opportunities to pursue a scientific career. By 1900, science was widely practised independently in Europe and the United States, and the term 'scientist', coined by William Whewell in 1833, settled into the vocabulary. Science as a body of knowledge had become largely separated from theology.

This trajectory is tracked by Canadian historian of science Bernard Lightman in his survey of popular science in Victorian Britain. He begins with the Anglican ascendancy, in which most scientific work was undertaken by members of the Church of England, frequently those in holy orders. He moves on through showmen such as John Pepper (of Pepper's ghost fame), to biologist Thomas Huxley and evolution, and the astronomer Robert Stawell Ball.



Lightman maps the careers of some 30 popularizers, many sparsely covered before, who derived their income from writing science books, including Rosina Zornlin and John George Wood. Strikingly, many of these were professional writers or journalists and not scientific practitioners. Lightman reveals that the print runs of these now obscure figures were roughly the same as those for books published by well known scientific practitioners such as Ball, Huxley and natural philosopher John Tyndall. This suggests that the contemporary reading public could not easily distinguish between material written by a practising

scientific figure and a professional writer.

Because the history of popular science has been studied only recently and has concentrated largely on Victorian Britain, there is little to compare it with in terms of other periods or countries. But the large number of editions of Jane Marcet's various *Conversation* books from the early nineteenth century — and not discussed by Lightman, being pre-Victorian — indicates that there could have been a steady growth in science books before the Victorian boom.

Lightman has only one chapter on how scientific information was displayed, and uses images simply to enliven his text. By contrast, every image Ralph O'Connor uses advances his argument on the popularization of just one science, palaeontology. What Lightman gains in

breadth, O'Connor makes up in depth.

O'Connor integrates the many genres that made fossils popular in the nineteenth century, using images from newspapers, books, magazines and pamphlets — including a striking one from 1828, where books were arranged to look like geological strata (pictured) — as well as John Martin's paintings, lecture illustrations, displays, dioramas and panoramas (for advertisements and handbills). O'Connor shows that promoting knowledge about geology was then similar to the marketing of other types of literature and art — science was an integral part of culture.

Books such as these, and Peter Bowler's eagerly anticipated history of popular science literature during the first half of the twentieth century, have much to offer today's debate

about science education and engagement. Many of the 'public understanding of science' initiatives launched in the 1980s came to grief when the 'real' rather than the 'evaluative' world intervened. Looking back at the Royal Society's 1985 report on the subject, one wonders whether some historical perspective might have helped. History, full of contingency as it is, will not, of course, repeat itself. But the present boom in scholarship on the history of popular science should ensure that we come to appreciate our predecessors' efforts. ■

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Pulling power

The Universal Force: Gravity, Creator of Worlds

by Louis A. Girifalco

Oxford University Press: 2007. 288 pp.
£19.99

Sean Carroll

Gravity, the weakest known force, is the most obvious in our everyday life. The urge to understand it has challenged generations of great physicists, from Galileo and Newton to Einstein and Hawking. Yet gravity remains aloof and mysterious. The attempt to reconcile it with quantum mechanics is one of the most ambitious and urgent programmes of modern physics. Small wonder popular books on the topic — such as Louis Girifalco's addition — have an enduring appeal.

Our understanding of gravitation is encapsulated in Einstein's general theory of relativity. This supposes that space and time together form a dynamical four-dimensional manifold whose curvature influences the motion of matter. Girifalco tackles this well-trodden ground in the time-honoured way: by focusing on the historical development of the concepts and the colourful scientists involved.

Scientists today typically share a distorted and oversimplified view of the development of their subject, passed down through shared anecdotes of a series of brilliant insights and heroic discoveries. The reality is understandably messier and Girifalco weaves an interesting narrative from the complex history of this field. He opens with an extended discussion of Newton before introducing the ancient Greeks and the Copernican revolution.

Girifalco's historical focus allows him to include material rarely covered in other books on gravity. For example, he digresses to contrast the personalities and skills of Michael Faraday and James Clerk Maxwell and the development of modern electromagnetism — the first true field theory that builds a crucial bridge between



Even to Stephen Hawking — here enjoying zero gravity in a jet — the force remains mysterious.

newtonian gravity and relativity.

The Universal Force fills a niche. Many people who might be interested in physics can be turned off by its abstraction, and physicists have an unfortunate predilection for explaining their subject to non-experts by simply watering down the explanations they would give to their students. For anyone interested in the more human side of science, this work is a valuable contribution.

The emphasis on storytelling over concepts, however, creates pedagogical challenges. For instance, the book is free of pictures and diagrams: a puzzling omission. A picture of the patterns made by iron filings in the presence of a magnet would have helped explain Faraday's lines of magnetic force. Referring to the bending of light by curved space-time, the author writes: "There is a picturesque two-dimensional model that can help our understanding." Shame we don't get to see it.

Modern gravitational physics is not the author's specialty — he is a solid-state theorist — and it shows in the sections on general relativity and curved space-time. Girifalco is correct to emphasize that general relativity is

essentially a very simple theory, its intimidating reputation notwithstanding. But it is harder than he makes it out to be in saying, "the laws of physics are the same for everybody, everywhere". Properly interpreted, this motto could equally well apply to newtonian gravity.

Similarly, many of the most exciting aspects of general relativity get short shrift. Black holes and the Big Bang each get a brief chapter, and there is almost nothing about the thrilling prospects for gravitational waves. Hawking's epochal (if theoretical) discovery that black holes emit radiation is a mere footnote, and no mention of string theory sullies the pages. Yes, these subjects have been thoroughly picked over in other books, but a reader expecting an introduction to some of Einstein's more recent progeny will feel cheated.

Caveats aside, Girifalco is a fluid writer, and his stories are compelling. This book about the force of gravity has its feet firmly on the ground. ■

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