Visitors learn about the Moon at a planetarium in Jena, Germany.

MARTIN SCHUTT/GETTY

EDUCATION

A cosmos on the ceiling

Marek Kukula enjoys a history of the planetarium, that mix of science and spectacle.

A childhood visit to a planetarium can be a defining moment, points out William Firebrace at the beginning of *Star Theatre*. A building that attempts both to model and explain the cosmos is often our first experience of the collision of science and entertainment. *Star Theatre* is a cultural history rather than a scientific one, but inevitably pivots on science communication. It offers fascinating insights into how astronomy has, through planetariums, evolved over the past century from a tool for education and personal improvement to a crowd-pleasing public spectacle.

Firebrace, an architect and writer, sites the spiritual origins of the planetarium in ancient Egypt, where the star-spangled body of sky goddess Nut was thought to arch over the Nile Valley. Cosmic models also have a surprisingly long technological prehistory, involving astronomical clocks, walk-in revolving globes and giant mechanical orreries, many astonishingly complex. In the late eighteenth century, Dutch wool carder and amateur astronomer Eise Eisinga built an elaborate working model of the Solar System in his living room, although the space proved too small to accommodate the recently discovered Uranus. (Eisinga's wife, Pietje, insisted that the mechanism include storage for clothing and crockery.)

Star Theatre: The Story of the Planetarium
WILLIAM FIREBRACE
Reaktion: 2018.

The modern planetarium — a dome into which a simulacrum of the night sky is projected — is a newer invention. The prototype appeared on the roof of the Carl Zeiss optical-instruments factory in Jena, Germany, in 1924, devised by visionary engineer Walther Bauersfeld. Known as the *Sternentheater*, or star theatre, the structure used radical design: a central multi-lensed projector and a lightweight geodesic dome.

It arrived at an exciting time for physics and astronomy. Albert Einstein's general theory of relativity and the discovery of galaxies outside the Milky Way by Edwin Hubble were fresh in the public mind. Other breakthroughs were around the corner, including evidence for the expansion of the Universe (Hubble again), Karl Jansky's early forays into radio astronomy and Clyde Tombaugh's detection of Pluto.

The planetarium concept also chimed with contemporary social and political movements. In the Weimar Republic of interwar Germany, these hinged on the civilizing force of publicly accessible art, design and science. Sadly, the Second World War destroyed many planetariums from this first German wave, which borrowed architectural elements from neoclassicism and Bauhaus.

Moscow's 1929 constructivist planetarium combined a proletarian ethos with revolutionary engineering: a paraboloid dome in reinforced concrete. During the cold war, the building became newly relevant as a showcase for the Soviet Union's mid-century triumphs in space (T. Radford *Nature* **525,** 452–453; 2015). Along with promoting an egalitarian idea of space exploration as the destiny of the Soviet people, it was used to familiarize cosmonauts with the constellations and workings of the Solar System.

Postwar superpower rivalries proved fertile ground for a new wave of planetariums, in

which the edifices again fulfilled ideological roles. In the United States, plutocrats were its main financiers. Their often eccentric buildings were inspired by the exuberant aesthetic of pulp sci-fi magazines. As Firebrace notes, US popular science was "linked to mass entertainment, to adventure, exploration and individual encounters with the unknown".

Philanthropist banker Charles Hayden is said to have believed that "feeling the immensity of the sky and one's own littleness" should be accessible to all, although Firebrace dryly points out that sense of size might also depend on socio-economic status. The 1935 planetarium built in New York City in Hayden's name featured Saturn-shaped light fittings and was crowned with a bronze dome that used soundproofing to create the illusion of isolation in space.

Britain came relatively late to the planetarium party: the iconic London Planetarium opened its doors only in 1958. Built in a style described by Firebrace as "modest and buttoned up", it was attached to the Madame Tussauds waxworks museum — an uneasy conjunction that seems only slightly less bizarre when one remembers that both were in the business of simulation. (The planetarium ceased functioning as such in 2006.)

Our era of space telescopes and robotic probes has coincided with a revolution in planetarium technology. Audiences are freed from a fixed vantage point on Earth. They can now fly virtually across the Solar System and beyond by way of a seamless mix of computer-generated and real images provided by digital projection systems at, say, the Adler Planetarium in Chicago, Illinois, or the Peter Harrison Planetarium in Greenwich, London.

Firebrace laments the loss of the old-fashioned shows' subtlety, but modern space extravaganzas have helped to renew public interest in all things astronomical. Perhaps it is their resemblance to cinema and computer games that has allowed them to prosper, even as museum displays are under pressure to attract younger audiences. And one might argue that the modern planetarium can be a highly effective gateway to a deeper engagement with science.

We now understand that much of the cosmos is invisible, and our methods of investigating it no longer rely entirely on electromagnetic radiation. *Star Theatre* ends by questioning the future role of the planetarium — an experience based on visible light — in a Universe of gravitational waves, dark matter and dark energy. But it seems unlikely that the winning mix of drama, technology, design and science will go out of fashion any time soon. As Firebrace concludes: "The heavens are as full of light as ever." ■

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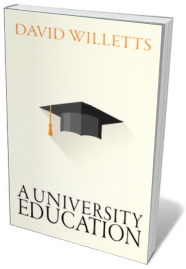
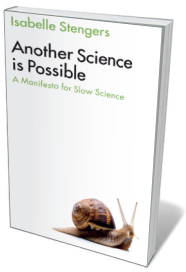
Books in brief

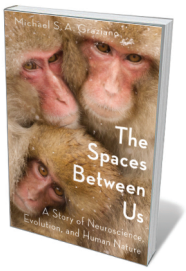


A University Education
David Willetts OXFORD UNIVERSITY PRESS *(2017)*
Worldwide, universities numbered just 500 after the Second World War; the tally is now 10,000. The most venerable handful are, like California redwoods, "deep-rooted, long-lived, and with the power to shape an entire eco-system around them". So declares David Willetts in this magisterial study of the institution. In it, Willetts, UK minister for universities and science from 2010 to 2014, explores the landscapes of research, scholarship and innovation; parses the intricacies of policy; dives into the vexed question of fees; and gives related topics, from globalization to "edtech", their due.

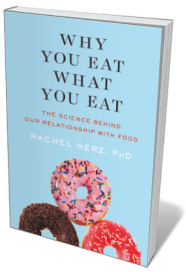
Ten Great Ideas about Chance
Persi Diaconis and Brian Skyrms PRINCETON UNIVERSITY PRESS *(2017)*
What are the odds that the Sun will 'rise' again tomorrow? Just because the phenomenon happens every day, can we be sure it will again? And, most importantly, can we quantify our confidence in that prediction? In ten engaging, profound and occasionally dense chapters, mathematician Persi Diaconis and logician Brian Skyrms review pivotal points in the history of probability and statistics, unified by a central thread: the practical and philosophical pitfalls that lie in the very definition of chance. A volume that should be on every scientist's reading list.



Another Science Is Possible: A Manifesto for Slow Science
Isabelle Stengers (translated by Stephen Muecke) POLITY *(2017)*
Sloppy, conformist, opportunistic and in thrall to a boom-and-bust economy: a worrying proportion of research, argues philosopher of science Isabelle Stengers, is little better than a rush job. Stengers calls for scientists to remember that science is tightly twined with social concerns, and cannot vanquish global issues at speed, or alone. Further, she argues that researchers need to participate in "public intelligence": honest, coherent communication with a scientifically clued-up populace. Although convoluted at times, Stengers's slow-science manifesto is timely, trenchant and thoughtful.



The Spaces Between Us
Michael Graziano OXFORD UNIVERSITY PRESS *(2018)*
We walk through life in a bubble, asserts neuroscientist Michael Graziano. This personal buffer zone is "constantly switched on like a force field" and monitored by networks of 'peripersonal' neurons. Graziano's detailed study splices early work on the phenomenon (such as the 'escape zone' of fleeing prey) into accounts of research, including his own, that is now sketching in relevant brain machinery. Finally, he explores psychosocial aspects and, in a devastating coda, reveals how dyspraxia compromises the ability to decode peripersonal space, with potentially explosive social consequences.



Why You Eat What You Eat
Rachel Herz W. W. NORTON *(2017)*
In this factual feast, neuroscientist Rachel Herz probes humanity's fiendishly complex relationship with food from the inside out. We learn that a fetus detects aromatic compounds from food its mother eats, paving the way for preference; that we eat less of snacks served in red dishes; and that olive oil's aroma may help to control weight. Herz also reveals how, on US election night 2016, a surge in deliveries of 'comfort' foods such as pizza hit New York and other stricken pro-Hillary Clinton cities. An intimate look at food on the brain. **Barbara Kiser**