and energy of the neutrino. The detector, however, must have immense amounts of shielding to screen out the confounding effects of cosmic rays. Some observatories are buried deep in rock; for the team that would create AMANDA and IceCube, that screening meant Antarctic ice.

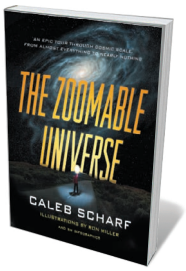
Bowen's involvement began in 1997, when he encountered ice driller Bruce Koci while reporting on efforts to acquire ice cores from mountain glaciers. In the off season, Koci worked for AMANDA, decamping to the South Pole to drill and melt the long boreholes needed to take the detector-laden strings — the plums in the pudding. Koci had to invent new methods for solving issues such as how to keep the huge tanks of water hot, and maintain the flow. In the first season, 1991–92, the team lost the drill. It also became apparent that there were more bubbles in the ice than expected, which interfered with the detectors' ability to capture the faint glow from travelling muons. That meant going even deeper into the ice — and the birth of IceCube. Its detectors start about 1.5 kilometres below the surface.

The Telescope in the Ice acknowledges the many external factors that can help a large scientific project to completion. The fortunes of IceCube (which cost a cool US$279 million to build) were bolstered, for instance, by an influential 1997 report chaired by aerospace executive Norman Augustine; this stressed the importance of international cooperation at the pole, with a subtext of maintaining US dominance in Antarctic research. In 2000, when the Lawrence Berkeley Laboratory in California proposed itself as lead institution for IceCube, the Wisconsin contingent tussled with George Smoot, a future Nobel laureate who wanted to take over as principal investigator. (He failed.) And a well-timed 2002 visit to a White House office by the UW–Madison group, including Halzen, helped to override the reluctance of National Science Foundation (NSF) director Rita Colwell. Bowen covers every twist and turn of the budgetary debates, technological challenges and scientific scepticism, including the occasional much-needed loan from UW–Madison when the NSF could not cough up enough funding.

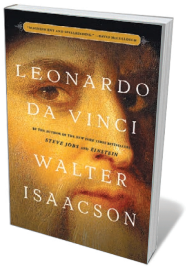
From AMANDA — a telescope no one was sure would work — to IceCube, the 'Fellowship of the Cube' managed to realize its dream of detecting neutrinos in 2011. Today, IceCube spots about 100,000 atmospheric neutrinos a year. In 2013, it reported the first very-high-energy neutrinos coming from outside the Solar System, and each day it sweeps up more and more data, fulfilling Halzen's vision. From his spot within the fellowship, Bowen does justice to its story. ■

Alexandra Witze *is a correspondent for* Nature *in Boulder, Colorado.*

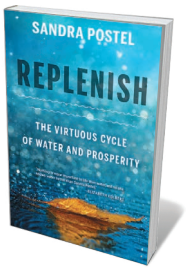
Books in brief



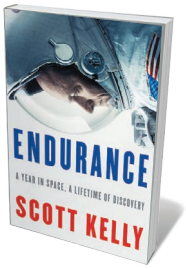
The Zoomable Universe
Caleb Scharf and Ron Miller SCIENTIFIC AMERICAN *(2017)*
In 1977, designers Charles and Ray Eames harnessed camera zoom and graphics to play with cosmic scale. The result: iconic film *Powers of Ten*. Forty years on, after vast advances in astrophysics, the quantum and the subatomic, physicist Caleb Scharf revisits the territory. Zooming from the observable Universe (29 billion parsecs across) to nearly nothing (10^{-35} metres), Scharf's vivid writing meets its match in Ron Miller's mind-bending illustrations. A total delight, evoking the Milky Way as "ringmaster" to a Galactic swarm and musing at the jiggling weirdness of quantum foam near the Planck scale.



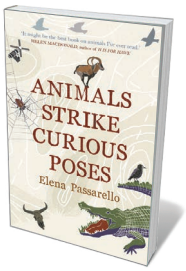
Leonardo da Vinci
Walter Isaacson SIMON & SCHUSTER *(2017)*
Leonardo da Vinci's prowess as a polymath — driven by insatiable curiosity about everything from the human womb to deadly weaponry — still stuns. In this copiously illustrated biography, we feel its force all over again. Walter Isaacson wonderfully conveys how Leonardo's genius unified science and art. His grasp of the skull's structure, for instance, fed the exquisite modelling of his portraits. But the prime focus here is the notebooks — glorious mash-ups mixing to-do lists, bravura drawings of human musculature, oddly random questions and 169 formulae for squaring a circle.



Replenish: The Virtuous Cycle of Water and Prosperity
Sandra Postel ISLAND *(2017)*
Dams, levees, canals: humanity's battle with water is age-old. Yet droughts and flooding cost billions, as the planet is lashed by extreme weather and climate change and our lifestyles lap up gargantuan volumes of H_2O. Sandra Postel's superb study demonstrates how working with wetlands and watersheds can turn that tide. Postel, director of the Global Water Policy Project, cites scores of sustainable wins, from permeable pavements that control storm water in Kansas City, Missouri, to groundwater replenishment in rural Rajasthan, India, kick-started by conservationist Rajendra Singh.



Endurance: A Year in Space, A Lifetime of Discovery
Scott Kelly KNOPF *(2017)*
Biographies by US astronauts are booming, and what's most notable is how distinct the personalities are under the "right stuff" label. Scott Kelly, who spent almost a year aboard the International Space Station in 2015–16, is a markedly down-to-earth high-flyer. A "blue-collar New Jersey" boy, Kelly grew up with an alcoholic father, discovering the joys of study in time to ensure that he became a pilot and, finally, astronaut. The details grip, from the hideously complex simulated missions to the 400 experiments he conducted on board and the insights he developed in his *annus mirabilis*.



Animals Strike Curious Poses
Elena Passarello JONATHAN CAPE *(2017)*
Animals, so often bit players in human history, can gain star status. Thus, the starling whose song reputedly inspired Wolfgang Amadeus Mozart; or Arabella, a web-weaving cross spider studied on NASA's space station Skylab. In 16 powerful, impressionistic essays, Elena Passarello gathers a multitude of these close encounters. From the "near-bestiary" roving ancient Europe to the brave new world of rewilding, she brilliantly explores the conflicts and cruelties inherent in our fascination with animal otherness. **Barbara Kiser**