

► it easier to elicit oversight information from intelligence fortresses such as the National Security Agency than from some Silicon Valley firms.

Pasquale provides an informative survey of developments in the representative fields of search, reputation and finance to bolster his argument that a laissez-faire approach to algorithmic decision-making is taking us to places where most of us will not want to go. As the power of advertising providers such as Google AdSense grows, for example, many online publications are seeing a decline in their advertising revenue. Homeland security 'fusion centres' are integrating government data collection (which is constrained by law) with unregulated information from private data brokers, in the name of information sharing. More promisingly, Pasquale points to the US Treasury's little-known Office of Financial Research, sometimes called "the CIA of finance", which aims to provide regulators with real-time intelligence on financial markets. The book is full of instructive anecdotes on such matters, backed by useful research.

There are occasional lapses. Pasquale's remark that "Political dissent is a routine target for surveillance by the FBI", for instance, is not accurate. More often, the book provides appropriately sceptical insights. Did Twitter somehow block the 2011 Occupy Wall Street protests from its own list of high-profile trending topics, critics wondered? The answer is no: trending is a reflection of a relative increase in prominence, not of absolute popularity, as Twitter officials eventually deigned to explain.

The opposite of the black-box society is an "intelligible society", and Pasquale's discussion of it features remedial proposals big and small. Why couldn't the US Library of Congress provide a public book-search function to complement the digitization project Google Books? Why not commission a public credit-scoring system based on open-source software? The underlying question is, why can't the tools of algorithmic decision-making be turned against black-box systems in an open, accountable manner?

It is tempting to say that the political process needed to enact such reforms has itself become a black box. Yet in *The Black Box Society*, Pasquale finds reason to believe that even some of the most secretive and unresponsive institutions can be held to account. Elucidating the problem is a first step. ■

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Bill Andrews (left) and Aubrey de Grey have conflicting views on how to delay ageing.

AGEING

Eternal obsession

Monya Baker reviews a documentary film profiling two scientists bent on longevity.

Many people want to live forever; few devote their lives to the goal. *The Immortalists*, a documentary film by Jason Sussberg and David Alvarado, tracks two men obsessed with 'curing' ageing. Although their goals are identical, the pair could not be more mismatched. Aubrey de Grey, a geneticist trained at the University of Cambridge, UK, sports a scraggly, chest-length beard and flits around research facilities in Mountain View, California, part-funded by PayPal co-founder Peter Thiel. He regularly pops open a beer at ten in the morning. Bill Andrews, previously a director of molecular biology at biotech company Geron, is a well-trimmed teetotaler who struggles to keep

The Immortalists
DIRECTED BY JASON
SUSSBERG AND DAVID
ALVARADO
Structure Films: 2014.

the lights on at Sierra Sciences, a company he founded in Reno, Nevada.

The first half of the film consists of extended clips of de Grey and Andrews outlining their visions for stalling biological time. Andrews has put his faith in finding small molecules to boost levels of telomerase, the enzyme that restores the fraying ends of chromosomes and declines with age. De Grey has a flamboyant seven-pronged strategy that involves identifying new enzymes and inserting them into a person's body through genetic engineering to create cells that clear out molecular debris. Eventually, the enzymes will be replaced by nanotechnology. Chalkboard-style animated graphics illustrate their key points; the nanobots are particularly cute.

The explanations are framed as straightforward instruction, with no indication of how

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far they are from the scientific mainstream. This deficiency is eventually relieved by the appearance of Leonard Hayflick, the octogenarian cell biologist who convinced a once-sceptical scientific community that ageing has a molecular basis. Although he praises Andrews' and de Grey's enthusiasm, Hayflick gently torpedoes their hypotheses. "Reversing ageing is like reversing gravity," he says.

It is left to neuroscientist Colin Blakemore, former head of the UK Medical Research Council, to ask whether the world would be better off if people routinely lived to 1,000. (At a San Francisco screening of the film, the audience hissed when Blakemore cited "flaky Californian expectations" to explain de Grey's success in establishing a lab in Silicon Valley.)

The film steers so clear of lionizing or lambasting that it misses the opportunity to show how mainstream scientists are attempting to delay ageing. For example, the Buck Institute of Research on Aging, also in the San Francisco Bay area, might have provided a useful counterweight to demonstrate ongoing work to pick apart molecular mechanisms and evaluate ways to stall ageing, as would trials that are testing the capacity of drugs such as rapamycin to extend life in pet dogs or reduce age-related maladies in humans.

What *The Immortalists* does extremely well is to layer the visionaries' quest for unlimited life with their encounters with mortality. Both shoulder the challenges of caring for ageing parents as they strive to produce boundless youth in a far-off future. The film also revels in its subjects' extra-scientific eccentricities. Andrews' occasionally life-threatening penchant for mountain-top marathons is unexpected — as is the overextended footage of de Grey and his wife, geneticist Adelaide Carpenter, enjoying a roadside picnic in the nude to demonstrate their still-erotic relationship.

Carpenter, whom de Grey credits with spurring his scientific pursuits, has one of the most telling lines in the film. Being a scientist means being able to see what is there, and to not see what is not there, she avows; meanwhile, the movie cuts to footage of expensive scientific equipment, investments made possible less by rational evaluation than by fervent hope. It is the filmmakers who allow the audience to heed Carpenter's advice. By following their subjects across several years and countries, they show *The Immortalists* from many angles, displaying warts, grit and an impossible dream. ■ [SEE NEWS FEATURE P.426](#)

Monya Baker writes and edits for Nature's *Careers* section.

Books in brief



Tasty: The Art and Science of What We Eat

John McQuaid SCRIBNER (2015)

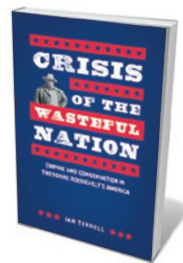
In pinning down the subtle sense of taste, Pulitzer-prizewinning journalist John McQuaid ranges through more than a soupçon of chemistry, neuroscience and genetics. His is a relentlessly moreish narrative, whether he is examining the evolutionary interplay between foraging and human brain development, the protein miraculin's ability to make limes taste like oranges, or the "bizarre, Lovecraftian-looking" double genes of sweet-receptor molecules. Disgust also gets a look-in, through Charles Darwin's account of a Tierra del Fuego's encounter with a tin of cold beef.



The Story of Collapsing Stars: Black Holes, Naked Singularities, and the Cosmic Play of Quantum Gravity

Pankaj S. Joshi OXFORD UNIVERSITY PRESS (2015)

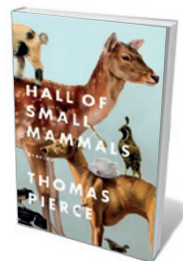
Black holes — whether they exist or not (see *Nature* <http://doi.org/x25>; 2014) — continue to exert a pull on scientific minds and the popular imagination alike. In this lucid overview, theoretical astrophysicist Pankaj Joshi corrals the research on collapsing massive stars and space-time singularities, including the idea that the event horizon might be a 'firewall' of fierce radiation. Joshi sees work in these areas as a lab for testing the pressing problems in fundamental physics and beyond.



Crisis of the Wasteful Nation: Empire and Conservation in Theodore Roosevelt's America

Ian Tyrrell UNIVERSITY OF CHICAGO PRESS (2015)

Theodore Roosevelt, US president from 1901 to 1909, is rightly lauded as a pioneering conservationist. And as historian Ian Tyrrell reveals in this trenchant transnational chronicle, the hyper-energetic 'Teddy' also preached sustainability at a time of domestic outcry over resource misuse. Roosevelt's national urge for global power was as strong as his prescient environmentalism, however; and Tyrrell shows how US interests abroad and the president's vision of a world conservation congress created tension between ethics and economics.



Hall of Small Mammals: Stories

Thomas Pierce RIVERHEAD (2015)

A dwarf mammoth called Shirley Temple ends up in the backyard of a God-fearing insomniac in the American South. A young physicist investigating a hypothetical particle, the 'daisy', has both a theoretical husband, accessible solely through dreams, and a real one. An early naturalist stands helplessly by as a money-hungry showman fashions an implausible monster out of a heap of dinosaur bones. These science-flavoured short stories by *New Yorker* regular Thomas Pierce dance at the edge of possibility, exuding an off-kilter brilliance in their exploration of human longing and fear.



Walls: Enclosure and Ethics in the Modern Landscape

Thomas Oles UNIVERSITY OF CHICAGO PRESS (2014)

Our world may be densely networked, but boundaries from the West Bank barrier to the US–Mexican border fence remain an often controversial presence. In this engrossing ethical study, landscape architect Thomas Oles ponders walls and their potential for oppression or human exchange. Drawing on rich historical examples such as Britain's economically and ecologically valuable hedgerows, Oles offers an ethics test for proposed barriers that questions whether they support commonalities or embed differences. [Barbara Kiser](#)