in mitochondrial DNA, dietary changes (detected in ancient bones) and cultural shifts, such as the burial of dogs alongside humans, most famously at the 14,000-year-old site of Bonn-Oberkassel in Germany. In 2018, analysis of a tooth found in the grave indicated that humans had cared for a sick puppy for weeks before it died (L. Janssens *et al. J. Archaeol. Sci.* **92**, 126–138; 2018).

There are some mysterious gaps in the narrative. By at least 55,000 years ago, the first Australians had navigated open seas in boats to reach the super-continent of Sahul, or Greater Australia (comprising Australia, New Guinea and Tasmania, which were one land mass when sea levels were lower). These travellers were dogless. Instead of partnering with canids to pursue prey, Shipman posits, they fished and gathered shellfish, or hunted small marsupial animals and birds so fearless of humans that they were easy to capture. Dingoes were brought to Australia by boat about 5,000 years ago, after which Indigenous Australians did form bonds with them. They raised dingo pups as pets and treated them as companions and guardians against humans or supernatural beings.

Global range

None of the earliest Americans, who migrated to North America from Siberia across the land mass of Beringia, were associated with canids, either. An 18,000-year-old puppy, dubbed Dogor ('friend' in the Yakut language), that emerged from melting Siberian permafrost in 2018 could have been an ancestor of dogs or wolves. But the earliest trace of a dog in North America, a fragment of femur from Alaska, is just 10,000 years old.

The Mexican Chihuahua might be descended directly from dogs that lived in the region before the arrival of Europeans, but in South America, wild canines such as the rare bush dog (*Speothos venaticus*) remained untamed. Horrifyingly, conquistadors trained Spanish mastiffs to chase and kill Indigenous peoples of South America. Yet Shipman writes that Indigenous peoples later eagerly adopted European dogs and formed close bonds with them.

As I followed Shipman on her journey, I began to understand why the fellowship of dachshunds – or poodles or pugs or chihuahuas – is one of partnership, not ownership. The companionship of dogs has been shown to ameliorate mental and physical disabilities, and reduce anxiety associated with ageing, loneliness, autism and post-traumatic stress disorder. Perhaps, as Shipman concludes, that is because dogs' friendship and protection have helped us to survive and thrive, together, for millennia.

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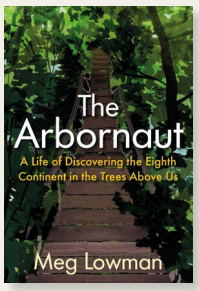
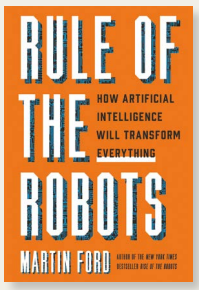
Books in brief

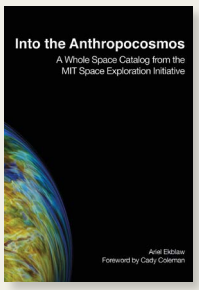
The Other Dark Matter
Lina Zeldovich *Univ. Chicago Press* (2021)
Sewage is the subject of this original, necessary book, which several publishing houses rejected because of the "yuck factor", notes journalist Lina Zeldovich. Her lifelong interest stems from her scientifically trained Russian grandfather, who annually recycled the family's septic tank onto their farm, treating the contents as *dobró* — 'rich'. Zeldovich describes a growing global awareness of how human waste can become sustainable energy source, organic fertilizer and medical therapy.



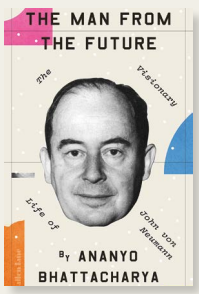
The Arbornaut
Meg Lowman *Allen & Unwin* (2021)
For centuries, the health of trees — even the tallest — was assessed at eye level. Today, more than half of terrestrial creatures are known to live 30 metres or more above our heads, notes tree-climbing biologist Meg Lowman, an "arbornaut" since the 1970s. Her wonderfully informative and evocative memoir explores the "eighth continent" of tree canopies from ropes and walkways, cherry pickers, hot-air balloons, cranes and drones. Her project Mission Green aims to conserve high-biodiversity canopies through local forest stewardship.



Rule of the Robots
Martin Ford *Basic* (2021)
According to software developer Martin Ford, artificial intelligence (AI) will probably transform society faster than electricity did, but with unpredictable effects. His well-informed study notes a 2016 forecast that within five years, radiologists would be overtaken by advances in AI. But that hasn't happened: AI cannot currently integrate key information from sources such as clinical notes. AI's future, Ford concludes, lies somewhere between the science-fictional extremes of utopian *Star Trek* and dystopian *The Matrix*.



Into the Anthropocosmos
Ariel Ekblaw (Ed.) *MIT Press* (2021)
This lavishly illustrated book chronicles the MIT Space Exploration Initiative, founded by Ariel Ekblaw, which develops tools and projects "to truly make space for everyone" says astronaut Cady Coleman's foreword. Ekblaw says the project is "grounded" in the *Earthrise* image taken by Apollo 8, reinforcing humanity's responsibilities as citizens of the planet. The space experiments depicted range from biology and engineering to cookery and music, including social robots to relieve astronauts' isolation.



The Man from the Future
Ananyo Bhattacharya *Allen Lane* (2021)
Hungarian-born mathematician John von Neumann influenced many fields. In 1927–32, he helped to found quantum mechanics. During the Second World War, he was key to the atomic-bomb effort. Later, he co-designed the first programmable electronic digital computer, was an AI visionary and introduced game theory into political science, military strategy, psychology and evolutionary biology. Excellent on the science, Ananyo Bhattacharya's ambitious biography struggles to portray the conflicted human. **Andrew Robinson**