in *Nature* that Alpha Centauri B, a member of our closest star system, just 4.3 light years away, has an Earth-sized planet orbiting — albeit with a tight, sun-hugging 'year' of just 3.236 days, far from the presumed habitable zone (X. Dumusque *et al. Nature* **491,** 207–211; 2012).

This was sure to resonate with readers of Stansilaw Lem, Robert Silverberg, Philip K. Dick and, again, Asimov and Clarke, who all made use of the Alpha Centauri system in their fiction. It also appeared in the television series *Buck Rogers in the 25th Century*, *Doctor Who* and *Star Trek*. Indeed, Zefram Cochrane, the *Star Trek* character who 'invented' the warp drive, lived there.

So what do these two scientific developments mean for science fiction? Kim Stanley Robinson, author of the bestselling *Mars Trilogy*, takes a radical view. He suggests that we get over the idea of interstellar travel altogether: a probe would take 28,000 years to get to Alpha Centauri. "We can't go fast enough to get to any of these places," he says.

Barnard's star was once "the place for nearby space", Robinson says, as his novel *Icehenge* (Ace, 1984) — in which characters build a starship headed for it — attests. Now that researchers have identified some 840 exoplanets, and NASA's three-year-old Kepler space telescope has spotted 2,320 candidate planets, "there may never again be a single default destination", Robinson continues.

In his recent book *2312*, which imagines humanity three centuries from now, spread across terraformed planets, asteroids and moons in our own Solar System, Robinson writes frankly about the galactic hinterland we inhabit. "The stars exist beyond human time, beyond human reach," says the narrator. "We live in the little pearl of warmth surrounding our star; outside it lies a vastness beyond comprehension. The solar system is our one and only home."

A probe would take 28,000 years to get to Alpha Centauri. We have to get more realistic.

Of the idea that we are destined to go to the stars and inhabit, if not the whole Universe, maybe the whole galaxy, Robinson cautions "it's a fantasy, of power, transcendence and a kind of species immortality. We have to get more realistic." ■

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COMPUTER SCIENCE

Virtually there

John Gilbey applauds a call for the digital to join the physical, biological and social in science.

In *On Computing*, Paul Rosenbloom examines the case for computing to enter the pantheon of great scientific domains alongside the physical, biological and social sciences. The centenary year of computing pioneer Alan Turing's birth seems a fitting moment to put the idea to the test.

The study of computing, dated from Turing's work, is only about 80 years old. It is variously claimed by engineering, physics, mathematics, linguistics and psychology — or seen merely as a supporting technology whose academic roots are irrelevant. Despite this, computing has arguably made more, and deeper, inroads into the daily life of humanity during the past 50 years than any other academic discipline, underlying a series of life-changing products. Imagine life today without mobile-phone networks, the Internet or medical imaging.

Drawing on his background in artificial intelligence, robotics and cognitive architecture, Rosenbloom leads us through the past, present and potential futures of computing as an academic discipline and demonstrates its linchpin position in a multidisciplinary environment.

He uses a novel 'relational' approach, unveiling the structures and connectedness across the various subfields of computing by looking at types of implementation and interaction within and between the existing major domains of science. To help clarify these relationships, Rosenbloom uses metascience expression language, a notation that facilitates the representation of the multidisciplinary fields and topics within science. Metascience expression offers both a technical context for Rosenbloom's anecdotal material and a framework within which to debate the core tenets of the argument. Non-specialists who persevere with these sections of the book will benefit from a much more structured understanding of the make-up of the computing sciences.

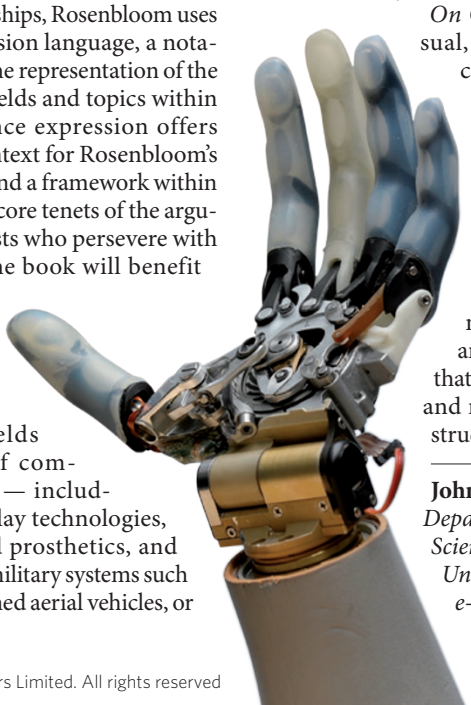
Rosenbloom fields many examples of computing innovation — including immersive display technologies, neurally controlled prosthetics, and quasi-autonomous military systems such as advanced unmanned aerial vehicles, or drones. These demonstrate that traditional demarcations between real and virtual environments will blur over the coming years as interfaces between human and machine are integrated to the point of invisibility. One example is the rapidly expanding field of augmented reality systems, early versions of which are already embedded in smartphones and tablets.

On Computing — The Fourth Great Scientific Domain
PAUL S. ROSENBLOOM
MIT Press: 2012. 312 pp. $35, £24.95)

Rosenbloom's reasoned analysis should help academia and the wider technical community to ensure that this transition is managed so as to deliver benefits to humanity in general. Otherwise, that enormous and life-changing power will be unfairly subjugated by a small minority of interests — technical, economic or political.

The text is permeated with a sense of delight in the opportunities offered by advances in the computing sciences. Rosenbloom offers elegant examples of the innovative ways in which computing developments and mature research areas can have hugely productive synergy — such as in surgical robotics and sophisticated prosthetic systems.

On Computing is an unusual, and welcome, mix of conventional academic text and personal odyssey. Any work citing Jane Austen and Richard Feynman in the same chapter easily passes my test for an interesting interdisciplinary read. Much more, this book offers an innovative set of tools that could kick-start debate and research on the future structure of the sciences. ■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