Books & arts

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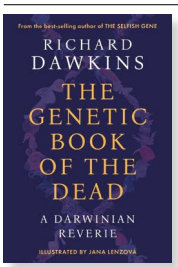
Whales still have leg bones, despite not using them — a vestige from previous mammalian evolution.

Richard Dawkins's book of the dead is haunted by ghosts of past works

The Oxford ethologist offers glimpses of evolutionary history — but plays it too safe. **By Nathaniel Comfort**

Richard Dawkins, the ethologist, is widely known for two ideas encapsulated in the titles of his first two books: *The Selfish Gene* (1976) and *The Extended Phenotype* (1982). In the former, he argues that selection operates at the level of the gene, rather than the level of the 'animal' — Dawkins makes all organisms 'honorary animals' (a dubious distinction for, say, a sequoia tree). For Dawkins, genes have agency; an organism is a mere vehicle that genes use to make more genes. In the latter book, he argues that the full collection of an animal's traits, known as its phenotype, should extend beyond the boundary of the body to include behaviours and their outcomes. Examples range from beaver (*Castor* spp.) dams to the unfortunate life of the marsh warbler (*Acrocephalus palustris*) that is duped into receiving, incubating and raising eggs of the cuckoo, a completely different bird.



The Genetic Book of the Dead: A Darwinian Reverie
Richard Dawkins
Yale Univ. Press (2024)

Most of his books have since been developments and reframings of these ideas, and his latest work, *The Genetic Book of the Dead*, is one of these. The titular allusion to 'books of the dead' — ancient texts meant as guides for passing from death to the afterlife — isn't especially apt. As a prominent atheist, has there ever been an author less concerned with the afterlife? Dawkins's real interest is the long-dead animals of the past, who leave

their fossil impressions in clay — a book by, not of, the dead.

More productive for him is the image of the palimpsest, an ancient scroll or tablet from which the text has been scraped away to make room for fresh messages. Where the erasure is incomplete, ghosts of earlier texts peek through the veil, sending shadow messages forward to later readers. Analogously, bodies and genomes — phenotypes and genotypes — often reveal things about their ancestors. Think of the vestigial floating leg bones in a whale, or the scraps of Neanderthal DNA afloat in the genomes of modern Europeans.

Dawkins extends this textual metaphor to suggest that we can "read" an organism for clues as to its forms, functions, environment and history. Comparative anatomists have been doing this for centuries with body parts, and geneticists are beginning to do it with genomes. Dawkins invents a corny "scientist of the future", named "SOF", on whom he projects his speculations of what genomics might someday be capable of. None of this is very helpful in understanding evolution. The central metaphors of earlier books, such as *The Blind Watchmaker* (1986) and *The Ancestor's Tale* (2004), did more analytical work for him.

Like those books, this one recapitulates the basics of Darwinian evolution, the selfish gene and the extended phenotype. He explains them crisply, sometimes lyrically, with examples from natural history. Although the arguments are familiar, the animal stories are often marvelous. It's easy to forget, perhaps, what a fine natural-history writer Dawkins is. He gamely brings up the palimpsest or the book of the dead now and again, but I found it forced and gimmicky. Metaphor can be a powerful tool for gaining insight into a complex subject, but push it too hard and it shatters.

Dawkins is an observant Darwinian and an unapologetic adaptationist — one who thinks that essentially any trait you can observe or measure reflects the action of natural selection. Biologist Stephen Jay Gould called this view the Panglossian paradigm (S. J. Gould and R. C. Lewontin *Proc. R. Soc. Lond. B* **205**, 581–598; 1979). For Dawkins, as for French philosopher Voltaire's endlessly optimistic Dr. Pangloss, "all is for the best in this best of all possible worlds" (*Candide*, 1759). Hence, to Dawkins, almost any organism is perfectly adapted to its environment, with the exception of several of what he calls "constraints on perfection".

For example, in mammals, the recurrent laryngeal nerve — which controls breathing, swallowing and the vocal cords — seems far from ideal. It overshoots the larynx and is halfway to the sternum before it doubles back up through the neck to reach its targets. This might seem to be bad design, but it's explained by evolutionary history. The nerve originated in fishes, which have no necks. When reptiles invented necks, the short arc of the laryngeal nerve was pulled and stretched into its current loopy form.

"It's easy to forget, perhaps, what a fine natural-history writer Dawkins is."

Evolution has to work with what it's got; it has no way to go back to the drawing board and redesign that nerve along a more direct path. "Imagine," Dawkins writes, "what the jet engine would look like if the designer had had to start with a propeller engine on his drawing board, which he then had to modify, step by tinkering step, until it became a jet engine."

This is a fine way to make the point that evolution must work inside the constraints of history. But why must we invoke this language of designers and engineers and perfection, rather than just writing about evolution as a historical process?

I suspect it's a constraint on the perfection of Richard Dawkins books. Dawkins's previous works include several polemics against creationism, such as *The God Delusion* (2006). In that work, he used the language of 'perfection' and 'engineering' to hammer home why nature isn't designed. Vestiges of those arguments peer through his present argument, for example in his occasional sideswipes at creationists as well as at the very language of engineering, design and perfection. *The Genetic Book of the Dead* is itself a palimpsest of Dawkins's evolving evolutionary thought.

Vestigial phrases

Another constraint on Dawkinsian perfection is his insistence on using the language of "genes for" specific traits. He has long denied being a genetic determinist in the literal, philosophical sense. Yet, since *The Selfish Gene*, he has indulged in an orgy of deterministic language. He refers to "genes for expert climbing", "genes for penis size" and "genes for short carnivorous intestines whose cells secrete meat-digesting enzymes", among many others.

Now, Dawkins knows perfectly well that these genes don't actually exist. "There are really really really only genes for changed proteins," he writes, reassuringly. His "genes for" is a figure of speech, a metaphor, of a piece with the "selfish gene".

But this isn't merely a harmless way of popularizing complex ideas. First, it's increasingly out of step with a modern understanding of the gene and of biology as being infinitely flexible, subtle and responsive to the environment. Epigenetics, for example, modulates gene expression in subtle ways we can't begin to predict. Today, the genome looks less like a vault storing the family jewels and more like a "sensitive organ of the cell", in cytogeneticist Barbara McClintock's prescient phrase.

Second, psychological studies have shown that genetic-determinist language seeps insidiously into public discourse and can make people more inclined to buy into racist tropes about biological differences (B. M. Donovan *et al. Science* **383**, 818–822; 2024).

But there might be hope. In the last two chapters, Dawkins takes steps towards this contemporary scientific environment, although once again his imagery holds him back. Using the early evolution of bacteria, viruses and eukaryotes (critters with a membrane-bound nucleus), he suggests that DNA maybe isn't so selfish after all.

His interest here is in 'vertical' and 'horizontal' genetic transmission. The most familiar kind of vertical transmission is DNA passed down through the generations, from ancestors to their descendants. But other kinds exist,

Richard Dawkins argues that behaviour, such as dam building, count as a phenotype.

ROSANNE TACKABERRY/ALAMY

too. In mammals, Y chromosomes travel vertically, but only from father to son. By contrast, the vestigial genomes of chloroplasts (in plants) and mitochondria (in organisms) are passed down from the mother to all her children, because they lie in the cytoplasm and at fertilization, all the cytoplasm comes from the egg.

These parallel strands of vertical transmission form a genetic warp, through which is woven the weft of horizontal transmission. When you catch a cold from someone, that's horizontal transmission. So is the rapid spread of antibiotic resistance, which is carried in circlets of DNA called plasmids and transferred from germ to germ during so-called bacterial sex. So widespread is horizontal DNA transfer in microorganisms that, for many large stretches of microbial DNA, phylogenies are more a tangled net than a tree. It is a weird and wonderful, only vaguely Darwinian world.

In the viral colony

Dawkins fixates on the viruses. They are vehicles of horizontal transmission: as they hop from one host to the next, they might rip out a bit of the host's DNA, or leave a little behind from a previous host. But when they become incorporated into a genome, they might pass vertically as well.

This brings us to Dawkins's "radical conclusion": the gene pool of any species is a colony of viruses, "each hell-bent on travelling to the future". He concludes: "You are the incarnation of a great, seething, scrambling, time-travelling cooperative of viruses."

Again, he does not mean this literally. He uses "virus" as shorthand for a bit of DNA that moves through time and space, changing vehicles as a pub-crawler changes Ubers. This is a pretty big step for Dawkins, but still he clings to the anthropomorphic notion of genetic agency. Once again, the metaphor, pushed too hard, becomes limiting.

And again, a historical explanation of cause and effect through time is more straightforward. The living world is connected by, among other things, a vast web of genetic material. Flowing among organisms are genes, yes, but also all kinds of other genetic element.

DNA doesn't want to do this, it just does, for many interesting reasons and with many complex effects. DNA, that marvelously complex and poorly understood substance, is woven deeply into the fabric of the living world, shaping all of it but, on its own, determining nothing.

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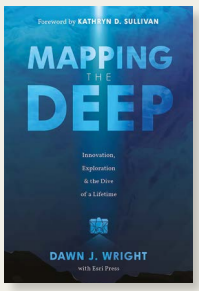
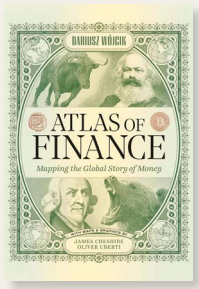
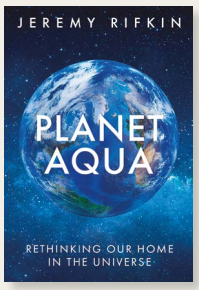
Books in brief



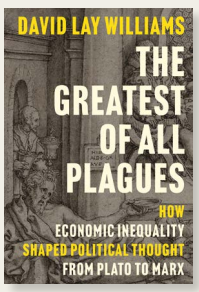
Mapping the Deep
Dawn J. Wright *et al.* *Esri* (2024)
When Dawn Wright submitted her master's thesis in the 1980s, her supervisor told her that she had no future in oceanography. Today, she is a distinguished oceanographer and chief scientist at software company Esri. In 2022, she became the first Black person to visit Challenger Deep, the deepest place on Earth's sea bed, more than 10,000 metres below the sea surface. This charming book, written by Wright in collaboration with four Esri Press colleagues, shows how, in her words, "we can turn the unknown deep into the known deep".



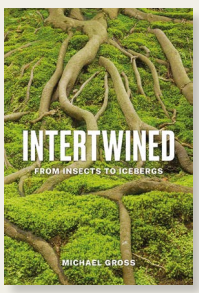
Atlas of Finance
Dariusz Wójcik *et al.* *Yale Univ. Press* (2024)
Indigenous Australians prospered with a continental bartering network that required no money, until European colonialists arrived. However, most other societies have depended on money — that is, "anything that can simultaneously act as a medium of exchange, unit of account, and store of value". This intriguing, large-format atlas of intricate maps and graphics with commentaries by economic geographer Dariusz Wójcik and ten colleagues aims to demystify the world of finance, with considerable success.



Planet Aqua
Jeremy Rifkin *Polity* (2024)
Earth as *terra firma* is an illusion. It is really a water planet, noted the European Space Agency in 2021, calling it planet aqua. But global warming is destroying humanity's ability to control its water supply because increasing evaporation from the ground and ocean precipitates "more violent and exponential water events", writes economic and US social theorist and political adviser Jeremy Rifkin. His urgent book argues for Earth's water to be seen more as a "life source" than a "commercial resource".



The Greatest of All Plagues
David Lay Williams *Princeton Univ. Press* (2024)
Plato argued that economic inequality — in the form of harsh poverty and extreme wealth — breeds civil war, "the greatest of all plagues". One could be reminded of today's United States, and many other nations, argues US political scientist David Williams, in his thoughtful reconsideration of past thinkers' views of economic inequality. He focuses on Plato, Jesus, Thomas Hobbes, Jean-Jacques Rousseau, Adam Smith, John Stuart Mill and Karl Marx: a diverse group, "yet they all clearly understand inequality as a threat to their respective goals".



Intertwined
Michael Gross *Johns Hopkins Univ. Press* (2024)
Science writer Michael Gross is fascinated by the connectedness of the living world — from molecular interactions to global cycles of elements such as carbon and nitrogen. Drawing on a range of species and ecosystems, his ambitious book analyses the "ways in which human activities have unwittingly disturbed these connections". For example, fertilizers and pesticides have disrupted ecological networks. Moreover, climate change is happening too rapidly for evolutionary adaptation by many ecosystems. **Andrew Robinson**