



A researcher assesses a rice crop engineered for enhanced disease resistance.



BOOKS *et al.*

BIOENGINEERING

The future of life

A futurist probes the potential of engineered organisms and biologically inspired devices

By **Adrian Woolfson**

On the night of 4 July 1776, the Irish immigrant and official printer to the Continental Congress John Dunlap entered his Philadelphia printshop and began to typeset the first printed version of a document that was to become the enduring North Star of the “American experiment.” It comprised an ideological handbook for its utopian aspirations and a codification of purported essential self-evident ground truths that included the equality of all men and the rights to life, liberty, and the pursuit of happiness. By the morning, Dunlap had produced an estimated 200 copies of the American Declaration of Independence, which Abraham Lincoln would later refer to as a “rebuke and a stumblingblock... to tyranny and oppression.”

In his erudite, optimistic, and timely book *Superconvergence*, the futurist Jamie Metzl laments the lack of any such authoritative reference to inform our exploration of an equally expansive, intriguing, and uncharted territory: humankind’s future. Replete with unprecedented opportunities and existential risks hitherto

unimaginable in life’s history, the new world we are entering transcends geographical boundaries, and—as a result of humankind’s global interdependencies—it must, by necessity, exist in a no-man’s-land beyond the mandates of ideologies and nation-states. Its topography is defined not by geological events and evolution by natural selection so much as by the intersection of several exponential human-made technologies. Most notably, these include the generation of machine learning intelligence that can interrogate big data to define generative “rules” of biology and the post-Darwinian engineering of living systems through the systematic rewriting of their genetic code.



Superconvergence: How the Genetics, Biotech, and AI Revolutions Will Transform Our Lives, Work, and World
Jamie Metzl
Timber Press, 2024.
432 pp.

Acknowledging the intrinsic mutability of natural life and its ever-changing biochemistry and morphology, Metzl is unable to align himself with UNESCO’s 1997 Universal Declaration on the Human Genome and Human Rights. To argue that the current version of the human genome is sacred is to negate its prior iterations, including the multiple species of human that preceded us but disappeared along the way. The sequences of all Earth’s species are in a simultaneous state of being and becoming, Metzl argues. Life is intrinsically fluid.

Although we are still learning to write complex genomes rapidly, accurately, without sequence limitation, and at low cost, and our ability to author novel genomes re-

mains stymied by our inability to unpick the generative laws of biology, it is just a matter of time before we transform biology into a predictable engineering material, at which point we will be able to recast life into desired forms. But while human-engineered living materials and biologically inspired devices offer potential solutions to the world’s most challenging problems, our rudimentary understanding of complex ecosystems and the darker sides of human nature cast long shadows, signaling the need for caution.

Metzl provides some wonderful examples of how artificial species and bioengineering, often perceived as adversaries of natural life, could help address several of the most important issues of the moment. These challenges include climate change, desertification, deforestation, pollution (including the 79,000-metric-ton patch of garbage the size of Alaska in the Pacific Ocean), the collapse of oceanic ecosystems, habitat loss, global population increase, and the diminution of species biodiversity. By rewriting the genomes of crops and increasing the efficiency of agriculture, we can reduce the need to convert additional wild habitats into farmland, he writes. Additionally, the use of bioengineering to make sustainable biofuels, biocomputing, bio foodstuffs, biodegradable plastics, and DNA information-storing materials will help reduce global warming.

Meanwhile, artificial intelligence (AI) can free up human time. By 2022, DeepMind’s AlphaFold program had predicted the structures of 214 million proteins—a feat that would have taken as long as 642 million years to achieve using conventional methods. As Metzl comments, this places “millions of years back into the pot of human innovation time.” The ability to hack human biology using AI will also have a tremendous impact on the human health span and life span, not least through AI-designed drugs, he predicts.

Metzl is right when he concludes that we have reached a “critical moment in human history” and that “reengineered biology will play a central role in the future of our species.” We will need to define a new North Star—a manifesto for life—to assist with its navigation. Metzl argues for the establishment of a new international body with depoliticized autonomy to focus on establishing common responses to shared global existential challenges. He suggests that this process could be kick-started by convening a summit aimed at establishing aligned governance guidelines for the revolutionary new technologies we are creating. ■

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