

The Book of Life will be the century's most valuable enterprise

Scientists are racing to code the genetic sequences of all complex species on the planet

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Tropical frogs, like the Amazonian kambo, could unlock the antimicrobials urgently needed to combat drug resistance © Alamy

If you think that monetising people's private experiences and personal data will be this century's most valuable enterprise, think again. The real money is going to be made by understanding the biological assets codified in life on the planet.

Scientists are racing to put together what they call the "Book of Life", the genetic sequences of all complex species on the planet and the relationships between them. So far they have only decoded 0.28 per cent of the relevant DNA. By contrast, chemists by the 1930s had set a solid

scientific foundation for discovery and innovation through the periodic table of elements.

But that is about to change. Taking advantage of a million-fold decrease in the costs of genetic sequencing since 2003, when human DNA was first mapped, we recently launched the [Earth BioGenome Project](#). We are seeking to fully sequence everything on the planet, on land and in the oceans, that has cells with nuclei, over the next 10 years.

When we reach full sequencing capacity, we will be generating about 1,000-2,000 times more data than that produced by [Twitter and YouTube combined](#). Significant advances in artificial intelligence and causal machine learning will be needed to decode the many complex networks at work in the Book of Life. This will provide a new foundation for biological discovery and innovation at an unprecedented scale. The [Amazon rainforest alone](#) could be a source of up to 20 per cent of antimicrobials urgently needed to combat drug resistance. This is the top public health challenge of the 21st century, with deaths potentially increasing to [10m per year by 2050](#) if nothing is done.

The Amazonian kambo frog (*phyllomedusa bicolor*) and similar tropical frogs may have the [bio-production instruction sets](#) for these tools buried in their DNA.

A new inclusive bioeconomy can help solve the majority of humanity's problems in energy, water, food, materials, healthcare and transport in a rapidly changing climate. In addition, this new bioeconomy has the potential to boost developing economies that are biology-asset rich — and, in so doing, provide the basis for a new bio-inspired economic development model that can be in harmony with nature and with the custodians of nature.

But we are racing against time, given the pressure on the Amazon basin and the many fires that having been [raging there recently](#). The rainforest's biological library is quite literally being burnt to make space for low-

productivity cattle ranching. This would impose a gigantic cost on the global economy for generations to come.

As a young Cambridge graduate, I founded my first biotech start-up in the Peruvian Amazon. We aimed to use the information codified in the Amazon's biodiversity to diversify the Peruvian economy. We went after anti-cancer agents, hoping to persuade farmers growing coca for drug trafficking to shift to these high-value bioproducts. We failed miserably back then.

Three decades have passed and now preserving life on the planet is not only critical to our own survival as a species, but also to preserve nature's vast biological intelligence codified in the Book of Life over the past 3.5bn years of evolution. Today, biology has become fully digital, so DNA information can effectively be coded as ones and zeros and can thus be programmable to unleash a powerful nature-inspired innovation engine.

However, as a critical precondition, we need to be able to access the vast biological assets from biodiverse nations in the tropics and resolve two conflicting goals. The Book of Life must be open for use by scientists and innovators globally, and we must also insure fair and equitable sharing of the commercial benefits that may result in invention. This is the dual mission of the [Earth Bank of Codes](#) that we launched in partnership with the World Economic Forum, as a sister initiative to the Earth BioGenome Project.

If we are successful, global trade rules may have to be rewritten to properly value the nature-inspired assets and services in developing countries. The race to control the vast biological intelligence embedded in the Book of Life will create competitive advantage and fuel development of the next frontier in artificial intelligence.

To insure maximum societal value and public benefit from the Book of Life, we must act now to put in place proper governance of data access, sharing and use. We must avoid concentrating power in a few Big Tech companies and proactively identify and manage the risks and the many unintended

consequences.

The writer is chairman of SpaceTime Ventures