Biotechnology is transforming much more than healthcare

Published 8 March 2023

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Why investing in human innovation is a ‘big deal’

Humans have been innovating as long as we’ve been around, but the pace of our innovation is now accelerating rapidly. People are waking up every morning solving new problems that have not yet been solved by anyone. In addition, we are experiencing a super-convergence of technologies where technological innovations feed other technological innovations in a cycle of mutually reinforcing invention.

The computer revolution, for example, makes the artificial intelligence (AI) revolution possible. The tools of artificial intelligence allow us to unlock secrets of complex human biology that are more complicated than our unaided minds could comprehend on our own. Now, with this understanding of the patterns of biology that have evolved over nearly 4 billion years of life, we're able to develop more efficient computer chips that are speeding up our computing power, enhancing our artificial intelligence capabilities, and making it possible for us to unlock even more secrets of complex biology.

What are the applications of this transformation?

1) Healthcare

When people think of the genetics and biotechnology revolutions, they tend to think of healthcare for good reason. We’re all familiar with new cancer treatments, new gene therapies, and other new approaches to healthcare that are truly revolutionary. In a big picture context what we're experiencing is a transition from generalised healthcare, based on population averages, to a world of precision healthcare, which is based on each person's individual biology. If we know who you are on a molecular level, then you can be treated not based on your being a human, but on you being you. So how do we know who you are?

Well, we need the biometric information - electronic health records in more standardised forms. But then we also need to have whole sequence genomes and we are moving toward a world where we are all going to have our genomes sequenced as a foundation of our healthcare. That will unlock a new world of personalised healthcare, where our doctors are going to be working collaboratively with artificial intelligence systems because the AI systems will give us access to a level of nuance and a level of complexity that is greater than what our human minds on their own can process.

2) Plant agriculture

We live in a world transformed by agriculture; populations have grown so rapidly due to the capability of our agricultural systems. A big part of that has been the Haber-Bosch process which creates chemical fertilisers by fixing nitrogen and hydrogen to create ammonia. The ‘Green Revolution’ (with things like new hybridised seeds, modern farm practices, better equipment) has allowed us to triple agricultural plant productivity in the last 70 years[1]. Again, it's why we can have so many humans on planet Earth.

But this success has also come at a cost. We're cutting down forests - half of all arable land is allocated to agriculture and about 15% of greenhouse gas emissions are associated with agriculture[2]. With projected population increases on the horizon, business as usual is not going to be sustainable. Agriculture itself is a form of radical biotechnology, and we're going to need to think about how we can do it in a better and more sustainable way. ‘Better’ meaning higher yields with smaller resource inputs. This cannot be done without the tools of the genetics and biotechnology revolutions.

3) Animal agriculture

Around three quarters of all of our agricultural activity supports animal agriculture which is putting a huge strain on the planet[3]. Of course, a change in dietary habits (to more plant consumption and less meat consumption) would help. But there are other options, including those aided by biotechnology. There’s a whole new field of cell-cultivated animal products, which means we extract the cells from the healthiest, happiest animals we can find and expand those cells in bioreactors to essentially grow the animal products we want and need, in a more sustainable way. Even if just some of our industrial foods start to transition towards other kinds of plant-based meats and cell-cultured meats, it can have a very positive impact.

4) Industrial materials

Currently, the raw inputs that go into our economy tend to be things that we cut down or dig up. As populations grow, we can’t continue as we are. The tools of synthetic biology are giving us the capability to shift from ‘cut down’ and ‘dig up’ models to ‘grow’. We're seeing that in plastics where there are lots of plastics being grown from different biological seed stocks. You may be familiar with synthetic spider silk, which is an unbelievably versatile new material, which is not made from spiders, but by synthesising (using the tools of synthetic biology) to create a spider silk that's stronger pound for pound than steel. It can be used for all sorts of things, including buildings and bulletproof vests.

5) DNA as data storage

Our data storage needs have grown exponentially over recent years. We’re already reaching the limits of the current models of silicon-based data storage and, if we don't continually grow our ability to store and process data, we're going to have a crisis. DNA is the greatest information storage mechanism in history. Information on a computer chip can last 20 years, maybe 30 years. DNA, under the right conditions, can be read 3 million years later[4]. Unsurprisingly, there's a lot of investment by the major computer companies going into this field of DNA as data storage.

Accessing this megatrend

For many decades, I've been thinking about the future, the future of healthcare, the future of genetics and biotechnology. And what the partnership with WisdomTree allows is to translate those insights into actionable steps that can be taken to invest in this future, which I believe is a fundamental story to human habitation on earth.

McKinsey estimates that the bio revolution will be responsible for somewhere between 2 and 4.5 trillion euros of economic activity per year through 2050[5]. So how can investors access this megatrend?

Firstly, it has to be a distributed bet. For example, look at the early days of the internet revolution. You may have pinpointed AOL as the company that was going to 'own the internet'. At such an early point in time, we cannot predict who the winners and losers will be so it can make more sense to make a distributed allocation – distributed with different company sizes, locations, and innovation ecosystems. Secondly, it's important to note that the biorevolution is not just about healthcare. Today, healthcare is the most mature of these markets because we've invested so much in it and because it's so important to us. But this same revolution is moving across all of these other sectors.

The biorevolution is, in many ways, a turning point for our species on this planet. If the 19th century was the century of chemistry, and the 20th century was the century of physics, the 21st century is the century of biology where humans will learn to tweak biology in ways that will both serve our growing needs as humans and help us to better protect our planet.

[1] Source: https://en.wikipedia.org/wiki/Green_Revolution

[2] Source: https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data

[3] Source: https://www.fao.org/sustainability/news/detail/en/c/1274219/

[4] Source: Service, Robert F. "DNA could store all of the worlds data in one room." Science. 2 March 2017.

[5] Source: https://www.mckinsey.com/industries/life-sciences/our-insights/the-bio-revolution-innovations-transforming-economies-societies-and-our-lives

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