2024 Superconvergence biorevolution series: Rise of the self-driving lab

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Key Takeaways

- The drug discovery process is inefficient because we spend a lot of time and money and have a very low chance of success when looking at any new potential molecule. AI may be a tool that can help this process get better.
- Exscientia is one company that is an example of using AI to enhance the drug discovery process. We spoke to them on a recent episode of our Next Big Thing podcast.
- Nvidia has been emphasising its 'omniverse' platform as a way in which different industries may accelerate how AI can help them speed forward certain critical developments. The omniverse could be a very interesting intersection with the 'self-driving lab.'

When constructing our Biorevolution strategy, we worked alongside futurist Dr Jamie Metzl, who is a member of the World Health Organization's expert committee on human genome editing. We believe that we are on the precipice of a remarkable period, which could last a few decades, where we challenge and ultimately evolve how we do things, such as:

- How we handle human health care
- How we grow food for an expanding global population
- How we generate novel materials, chemicals and energy from biological sources
- How we think about storing massive amounts of data with higher density and fidelity than we have in the past

Dr Metzl recently published the book *Superconvergence: How the Genetics, Biotech, and AI Revolutions will Transform our Lives, Work and World*. Over the summer, we will publish a series of blogs that draw attention to some of the ideas presented in the book.

The bottom line

Thematic investing, in a sense, is about storytelling. Superconvergence does a great job conveying the narrative behind the WisdomTree BioRevolution ESG Screened Index.

You've heard of the self-driving car—what about the self-driving lab

Imagine that you are about to take on a new task, but you have to consider the following details[1]:

1. The task could take roughly 10 years, possibly longer, before you know it is complete.

2. The budget required would be in the range of $1 billion, but likely more.

3. The chance of success, meaning you choose to follow a particular path which allows you to progress fully to the finish without needing to restart efforts, is about 5-10%.

Such a task, or a business arranged around the completion of such a task, does not appear very attractive. However, these are roughly the statistics involved in developing a new drug from start to finish.

Exscientia: using AI to improve the drug discovery process

On 7 June 2024, we released a conversation that we had with Exscientia on our Next Big Thing podcast. This company is focused on utilising AI in an attempt to improve different phases of the drug discovery process.

AI represents a new set of tools that we can use to get closer to evaluating different compounds that might be effective drugs or therapies against different diseases. Importantly, the framing of this problem is not 'suddenly AI will save us and create all of these new drugs', but rather that we as a society are currently spending, through our pharmaceutical industry, hundreds of billions of dollars attempting to create new drugs.

What if a new set of tools were to become available that would help us have a more efficient drug discovery process? This is what AI can provide.

The self-driving lab: Connecting the software world with the physical world

From *Superconvergence*[2]:

Researchers across the globe are now working to build new models of "self-driving laboratories," bringing together AI systems and advanced, high-throughput automated machines to help shift the drug discovery and testing process, and all of human-engineered biology for that matter, into superdrive. These automated labs are able to rapidly carry out thousands or even millions of experiments selected by machine learning algorithms to achieve objectives defined by human researchers. A January 2023 Nature paper estimated that this process can increase a human expert's overall research productivity by an estimated thirty times, enabling the humans to reallocate their energies toward exploring tougher scientific questions.

We frequently write about AI. So far, the markets have been very excited about graphics processing units (particularly those from Nvidia) and different software platforms. We have been thinking about how we may

be on the cusp of seeing much more capable robots. Still, we are not yet seeing investors getting excited about robotics more specifically.

Robotics could be the critical link between a world of virtual reality or digital twins and the physical world. Whether one is thinking of a new drug or a new material, it's not enough to have a system that works well within the confines of a virtual system—it also needs to prove out in the physical world and stand the test of real-world experimentation.

Conclusion: Convergence of Nvidia's omniverse with the world of laboratory science

As we write these words, Nvidia has just attained the status of the world's most valuable company[3]. Many are familiar with the company's revolutionary graphics processing units (GPUs), but in listening to CEO and founder Jensen Huang speak at GTC in March 2024 and then at Computex in Taiwan in June 2024, it's clear that Nvidia wants to be seen across the entire tech stack. One of their most interesting discussions regards the 'omniverse[4].'

The omniverse looks like a domain-specific virtual reality world where various simulations can be run. It's not much of a leap to imagine how something like the omniverse could ultimately be empowered to drive the hardware of a self-driving lab at some point in the future. In this way, we can see how a market juggernaut, Nvidia, can be connected to a more currently esoteric concept, the self-driving lab. It may not be long until we see self-driving labs proliferating more widely.

[1] Source: Lohr, Steve. "How A.I. is Revolutionizing Drug Development." New York Times. June 17, 2024.
[2] Source: Metzl, Jamie. Superconvergence: How the Genetics, Biotech, and AI Revolutions will Transform our Lives, Work and World. Timber Press: 2024.
[3] Source: Hamilton, Anita & Adam Clark. "Nvidia Is the World's Most Valuable Company. Can It Hold On to the Crown?" Barron's. June 18, 2024.
[4] Source: https://www.nvidia.com/en-us/omniverse/

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