

AlphaFold 3: The Future of AI in Biotechnology Is Here

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Key Takeaways

- AlphaFold 3, developed by Google DeepMind and Isomorphic Labs, is a new AI-powered software that accurately models molecular structures and interactions, surpassing existing methods in accuracy and accelerating scientific research in drug discovery and hypothesis testing.
- AlphaFold 3's precise prediction of interactions between proteins and small molecules holds immense potential for drug discovery and understanding the molecular basis of diseases, potentially leading to novel therapies targeting disease-causing molecular alterations.
- The AI-enabled drug discovery process is still in its early stages, with Phase 1 showing a high rate of success, but Phase 2 and Phase 3 requiring further research and data to draw conclusions, indicating the need for longer-term investment and research efforts in this field.

Google DeepMind and Isomorphic Labs have recently unveiled an exciting new breakthrough, AlphaFold 3, set to transform our understanding of molecular biology and drug discovery. This artificial intelligence (AI)-powered software goes beyond predicting protein folding (a process that laid the groundwork for understanding protein structure, a key aspect in drug design), now revealing how proteins interact with DNA, RNA and other molecules, facilitating much better drug design.¹ AlphaFold 3, building on AlphaFold 2's success, employs advanced AI algorithms to accurately model molecular structures and interactions. Its predictions surpass existing methods in accuracy, accelerating scientific research by enabling faster hypothesis testing and drug target exploration.²

A standout feature of AlphaFold 3 is its precise prediction of interactions between proteins and small molecules, holding immense potential for drug discovery. To facilitate its adoption, Google DeepMind has launched AlphaFold Server, offering free access to researchers worldwide. This democratization of cutting-edge computational tools empowers scientists to accelerate discoveries and advancements.

Beyond drug discovery, AlphaFold 3's predictions illuminate the molecular basis of diseases, incorporating biochemical modifications into its models to understand their impact on protein function. This insight could lead to novel therapies targeting disease-causing molecular alterations.

AlphaFold 3 represents a leap forward in understanding and manipulating the molecular machinery of life. With unparalleled accuracy and accessibility, it promises to revolutionize drug discovery and deepen our understanding of biological processes. It also sheds light on how AI is going to lead to a tectonic shift in the world of biotechnology, creating an exciting new megatrend for investors seeking long-term growth.

AI-Enabled Drug Discovery: 2024 and Beyond

The AI-enabled drug discovery topic within the broader ecosystem of AI use cases never fails to get some of the biggest excitement when we do presentations around the world. However, it's important to remind ourselves of what we know in 2024 and what is more about the potential of what could happen at an indeterminate point in the future.

ChatGPT was an excellent example in the software space for thematic equity investors, providing a lesson in how software can spread and scale very quickly. In two months, there were 100 million users.³

Biotechnology is not seeing new drugs and therapies going out to 100 million people in two months. A typical drug discovery process can be roughly 14 years, cost roughly \$1 billion and have a success rate, meaning a chance of getting through all the relevant trials, of around 5%.⁴

As we write these words in May 2024, one cannot go to a local pharmacy and note the shelf with the AI-developed drugs. In a recent research piece, we saw that:⁵

- We can break the drug discovery process into three phases. Phase 1 saw success in 21 out of 24 AI-developed molecules, which included AI-repurposed molecules, AI-discovered targets, AI-designed small molecules, an AI-designed vaccine and AI-designed antibodies. While this is a high rate of success, it's important to recognize there are multiple phases and Phase 1 completion does not lead to a successful, available drug.
- In Phase 2, there are 10 available cases to look at, and there was success in four of them. Forty percent is not bad relative to history, but 10 available cases is a low sample size. It was also noted that four out of the six cases that were discontinued cited more business-oriented rationale as opposed to the actual molecule not being effective.
- There was not yet enough data to draw out any conclusions about Phase 3.

It will be exciting to see more research and progress on this front as we take stock of more and more molecules. It seems that the research access that DeepMind's AlphaFold 3 can facilitate may inspire further research efforts that give us a chance to, as a society, get more molecules into the testing and development process more quickly.

Considering the investment landscape for AI-enabled drug discovery, one can, of course, assume that the world's largest pharmaceutical companies are looking deeply at these techniques. The plus side is that they are diversified businesses, possibly trading on the strength of their GLP-16 portfolio (for example), but the negative is that it is hard to isolate the specific impact of AI-enabled drug discovery on the share price. We are excited about Exscientia and Recursion as examples of companies more directly focused on AI-enabled drug discovery, but we note that we are taking a longer time horizon focus on these firms.

The WisdomTree Artificial Intelligence and Innovation Strategy: Diversifying along Innovation Timelines

At WisdomTree, we have built the [WisdomTree Artificial Intelligence and Innovation Fund \(WTAI\)](#), which is designed to track, before fees, the total return performance of the [WisdomTree Artificial Intelligence and Innovation Index](#). When we think about exposure to the broad AI ecosystem, one of our considerations is the potential timeline for the substantive realization of the innovation.

- When we look at AI-enabled drug discovery, we have companies like Schrodinger, Exscientia and Recursion. We recognize that, even if we are excited by the potential, we do not know when or if these companies will be responsible for blockbuster drugs in the market. We are not likely to have conclusive information on this in 2024. It is an example of an important but longer-horizon innovation timeline.

While it is difficult to know when we will have a stable of AI-designed drugs, it is much more possible, in 2024, to see the world undertake a hardware update cycle with people and companies seeing AI examples and buying those new devices to take advantage of the functionality. We recognize that different AI topics will have different reasonable timelines of expectation, and we are trying to ensure that diversification along this line of portfolio construction is part of our thinking.

1 Deoxyribonucleic acid (abbreviated DNA) is the molecule that carries genetic information for the development and functioning of an organism. Ribonucleic acid (RNA) is a molecule that is present in the majority of living organisms and viruses.

2 "AlphaFold 3 predicts the structure and interactions of all of life's molecules," Google blog, 5/8/24.

3 Source: Visual Capitalist. https://www.visualcapitalist.com/wp-content/uploads/2023/07/CP_Threads-Fastest-100-Million.jpg

4 Source: "New Therapeutic Uses," National Center for Advancing Translational Sciences, 4/19/24, ncats.nih.gov/research/research-activities/ntu.

5 Source for bullets: Jayatunga et al. "How successful are AI-discovered drugs in clinical trials? A first analysis and emerging lessons," Drug Discovery Today, Volume 29, Number 6, June 2024.

6 GLP-1 refers to "glucagon-like peptide," and these are often used to treat certain cases of diabetes or obesity.

7 Source: "Apple's Worldwide Developers Conference returns June 10, 2024," Apple, 3/26/24. <https://www.apple.com/newsroom/2024/03/apples-worldwide-developers-conference-re->

turns-june-10-2024/#:~:text=CUPERTINO%2C%20CALIFORNIA%20Apple%20today%20announced,Apple%20Park%20on%20opening%20day.

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