Shaping tomorrow with biotechnology, a profile of Tess van Stekelenburg at Hummingbird Ventures

With #QVCS, Maddyness profiles different funds to give founders and entrepreneurs the information they need to choose the right investor. Today we speak to Tess van Stekelenburg, investor at Hummingbird, about exponential curves and the digitisation of biotechnology.

I had been obsessed with cells growing up. In high school I had a cabinet in our biology classroom where I grew bacteria on petri dishes. I would go out into stores and find all kinds of antimicrobials to plate on the dishes and spent hours studying the microscopic warfare.

When I graduated I visited a Biological Research Station in Borneo and was shocked at how much of the country had been cleared for palm tree plantations. A few months later I started my degree in Biological Sciences and learned that microbes could be programmed to produce palm oil. I quickly came to learn that the possibilities of engineering biology were massive: with the surge in tools for computational design and an increasing understanding of gene to function relationships, much of our physical world could be built with biology. Whether that's mRNA vaccines to ward off cancer, Impossible Burger's heme proteins that replace the familiar taste of animal meat, the penicillin we isolated from fungi to combat bacterial infections or the hydrogen peroxide that makes up the soap we wash our hands with. The combinatorial complexity that can be reached with a simple 4 digit nucleic code – beyond what we've seen produced in the past 4 billion years of evolution – is mind boggling.

During my studies, new techniques in DNA sequencing and synthesis were driving down the cost to read and write the genetic code in half every two years. We saw this before when the drop in cost of semiconductors opened up conditions for generational companies like Amazon, Facebook and Google to be started, or when the fall in lithium batteries made it economically feasible for electric vehicles and iPhones to be launched by Tesla and Apple. The technological advancements in biological tooling were pointing at a similar trend for biotechnology. I believed it was inevitable that in our lifetime we'd witness the rise of the first biotechnology company at the scale of Apple, Google, Facebook or Tesla.

Yet when I looked around I saw a lot of groundbreaking scientific research but very little infrastructure to support translation out of a lab. I wanted to build the infrastructure to make that happen.

Which industries are you working in?

As a fund we work across industries. I joined Hummingbird to build out our practice in biotechnology. This includes novel drug modalities, software infrastructure to handle emerging forms of high dimensional biological data as well as the hardware automation and manufacturing to scale biological applications. I also think a lot about how we can leverage biotechnology in frontier areas like reforming agriculture and food, materials and chemicals.

What does the future look like?

Given how early we invest it would be detrimental to try to over predict the future. If there's one thing we've come to learn it's that founders have the welding power to create new markets.

One thing we can do is prepare for future markets that might be enabled by exponential curves of technological development. It is surprisingly hard for people to truly grasp what exponential growth *actually* means. It looks pretty boring in the early days hence most people don't notice it. After some years of a few die-hard early adopters hacking away on a pipedream it reaches an inflection point where the exponential change crosses that of linear change. Just how quickly this inflection point tips is hard for people to grasp. The cases of cellular and photovoltaics are telling stories of our incompetence to grasp these curves. In 1980 McKinsey was asked to predict the size of the US mobile phone market by 2000. Their prediction was off by a factor of 100 (100 million vs their 900,000 prediction). Today we still see this in photovoltaics, where the World Energy Organization consistently misprojected the GW in added photovoltaic capacity to grow linearly each year since 2002, despite the past two decades of observed data clearly charting an exponential reality.

While we can't predict *what* specific downstream markets *will* be formed on these curves, we keep an open mind to what *could* be enabled.

What makes Hummingbird's thesis different?

Science is hard and commercialising it carries a lot of technical risk. Because of this, biotechnology as a field has historically seen a standard approach to running a biotech. Roughly put, the best way to de-risk the technology was to build up a waterproof patent landscape and bring in a veteran CEO that had pushed a drug through clinical trials several times before.

We are looking to disrupt this model completely. Our goal is to back a new breed of biotechnology companies with founders at the helm. Fundamentally, we believe the next generation of outlier companies will be built by students and postdocs commercialising research or by outsiders coming into biotech with a fresh perspective, rather than industry veterans.

Can you talk about your biotechnology portfolio?

As a fund we've been early technology backers in several emerging markets. From investing in Turkey's first unicorn and largest exit to date (Peak Games – sold for $1.8B) to being an early investor in one of the world's first cryptocurrency exchanges when Bitcoin was just starting out.

We come in so early that often it's just an idea or a basic proof of concept with a whole load of market uncertainty. Our first investment in biotechnology was pure serendipity. Three years ago, through our investments in Turkey, we met a Stanford student from Turkey that had just finished his PhD in Bioinformatics. He was spinning out his work to combat the high maternal mortality rate associated with fetal testing in Turkey. Fetal testing involves an invasive surgery to sample the mother's placenta. In Turkey and other emerging economies this carries a high risk of mortality due to lack of proper hygiene. His company, BilliontoOne, had developed a computational platform to extract fetal insights from non-invasive blood samples. Six years later, it counts over

200 employees, has sold hundreds of thousands of tests and expanded into early cancer detection.

It was at this time that we observed a new type of founding profile in biotechnology. With the growth of digital tools, cloud computing and increased specialisation of outsourcing partners like CRO's & CDMO's – it started becoming easier and easier for a PhD student to launch a biotech and design and run experiments entirely from their laptop.

Our investments in biotechnology have therefore largely centred on backing 'founder-led' companies. Our investments include:

Basecamp Research and Enveda Biosciences, two portfolio companies applying novel computational tooling to learn from the natural world. Basecamp Research is building a protein discovery platform from metagenomic sequencing of extremophilic microbial communities, while Enveda Biosciences is leveraging novel transformer architecture to identify medicinal compounds in plants.

As we improve our functional understanding of nucleic acid, we have an increasing capacity to design new RNA- and gene-therapies that target specific parts of the genome. In our portfolio – *Kernal Biologics* is building a platform to design mRNA 2.0 therapeutics that selectively kill cancer cells and *Ladder Therapeutics* is doubling down on RNA structure to drug the non-coding, 'dark', parts of our genome.

Lastly, as the biotechnology market matures there is a growing need for better software and hardware tools to empower groundbreaking discovery. Every day I am seeing new computational algorithms released to analyse growing volumes of biological data. The team at *LatchBio* builds out infrastructure for scientists to scale these bioinformatic algorithms in the cloud. Another trend is the increasing virtualisation of life sciences. In this vein, our portfolio company *Kaleidoscope* is building a platform to harmonise across wet & dry lab data. On the hardware side, scientists are wasting so many hours pipetting into test tubes and performing repetitive sample prep. Our portfolio company *Automata* is building out an automated robotic platform to free up biologists time so that they can focus on designing better experiments.

What do you look for in a founder?

While we look for technological breakthroughs, a technological insight by itself is not enough to build a generational company. You need a special type of founder and team to see it through.

Thomas Edison wasn't the first to come up with the design of a light bulb, but he *was* the first to bring commercial designs to the mass-market with the Edison Electric Light Company. Apple did not invent the personal computer, but Steve Jobs *was* the first to drive its adoption with his vision for consumer electronics. Ozelem Tureci and Ugur Sahin from BioNTech, weren't the first to build a messenger RNA platform yet their enduring partnership meant they built perseveringly for many years until they hit a stroke of luck with the pandemic.

When we study talent – be it founders or candidates for our portfolio: much of our focus is centred on this *'why'*. Why will they be the ones to bring this technology, or dream to mass markets? What is the chip they wear on their shoulder with them every day: what are the inner voices they want to prove wrong? What makes them run faster than the rest and how will they surround themselves with the world's best talent to build this out?

What are some of the biggest breakthroughs you've seen this decade?

Much like the Galilean revolution enabled by the telescope, new instruments or tools in science open up the possibility to discover new things that need new explanations and paradigms. In biotechnology, I believe we've witnessed three breakthroughs this decade with the capacity to open up new paradigms:

1. The discovery of CRISPR-Cas9 for bioengineering in 2012 opened up the ability to 'write' biology at fine-tuned and modular resolution. Since then, we have identified entire families with newer variations on CRISPR, such as base or prime editing or recombinases to do things like develop novel gene therapies to cure disease.
2. Breaking the atomic-level barrier with Cryo-EM in 2020. The refining of Cryo-EM's resolution to 1.25 angstroms has equipped us with the ability to empirically determine structures of large protein complexes that can not be crystallised, helping us identify entirely new targets for therapeutics.

Large language models entering biology, hallmarked by predicting protein structure from sequence with AlphaFold in 2021. As a result, we have been able to do things like analyse a viral genome to understand its pathogenicity, or design new antibodies and biomaterials custom fit for our needs.

Tess van Stekelenburg in in the investment team at Hummingbird.

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