



FABRICATE

2022 Summit Report

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Introduction

Suzanne Lee, Founder & CEO
BIOFABRICATE

The 2022 Biofabricate Summit spoke to the significant progress made by global bio-innovators over the last two years. We moved to a two-day program, doubling our speakers to 60 and trebling the size of our Design Lab to over 30 exhibits.

Delivered in partnership with long-standing collaborators [Parley for the Oceans](#), and hosted by [Newlab](#), a singular community of deep tech entrepreneurs in Brooklyn, we gathered an intimate, hi-quality international community of founders, strategic partners and investors both in-person and online.

This year's event reinforced the belief that we're united around ending our dependence on oil, factory farming, and unsustainable agriculture.

Our goal is simple: to advance conversations and build relationships. **Products were launched, investments made, partnerships cemented.**

Thank you to all participants for making this our most impactful event ever.



Networking in the Design Lab

“This is the biggest unlock to emerging companies I have ever experienced.”



Visitors check out the Design Lab between sessions

“I have spent years traveling overseas going to shows when in one Biofabricate I got more than I gleaned in 10 years of Linea Pelle. The fact that attendees are curated is key to networking with like-minded people who want to get things done, not just talk. It's not about which brand you work for but what you care about.”

Liz Alessi, Advanced Sustainable Initiatives Consultant, Coach

Design Lab

A Sneak Peek into the Future



Attendees checking out Ecovative's AirMycelium™ foams on display in the Design Lab



Pollinator Kit launched at the summit ©Checkerspot

In our 2022 Design Lab it was clear to see the exciting progress that has been made over the last two years. We tripled the size of the exhibit (!) with more innovations on display than ever before. We also saw physically larger samples, more prototype products, and we debuted several launches.

Biofabricate's Design Lab is intended not as a sourcing opportunity, but to provide founders, brands and investors with a landscape perspective. With a global pandemic restricting travel over the last couple of years, the importance of the Design Lab was ever more keenly felt, many were seeing sample progress and, in some cases,

meeting up with investments for the first time in person.

Some of the compelling innovations on display were alternative leather materials that were the size of half a cow hide (Polybion), with the softness and drape of lamb skin (Hide Bio), and with unique aesthetics and forms not achievable via conventional production methods. Biologically engineered alternatives to lycra, indigo, and palm oil were also on display, alongside new manufacturing techniques and supply chain models.



Launched & Premiered at the Biofab Summit

This year's Design Lab saw the launch of multiple new product prototypes and prototypical materials. Here, material innovators find a 'safe space' to premiere their latest advancements amongst peers..



At this year's summit, PANGAIA, a material science company that manifests as a fashion brand, launched its first commercial product with Japanese biotech, Spiber (top). Pangaia also gave us a sneak peek at its latest development work with Ecovative using the company's AirMycelium™ foams for footwear (bottom).



Dutch startup, NEFFA, showcased a new seamless prototype bustier manufactured in 3D and made of their MycoTEX mycelium material.



Mexican start-up, Polybion, debuted never-before-seen prototype products which included sneakers, slides and small 'leather' goods. Their half cow size pieces of Celium™ (made of bacterial cellulose) were notable. All of which signified a start-up stepping up to the next level.

“Purpose is the new luxury.”

Parley for the Oceans is a long-standing headline partner to the Biofab Summit.

Parley for the Oceans addresses major threats towards our oceans, the most important ecosystem of our planet.

We share Parley’s belief that the power for change lies in the hands of the consumer – given we all have a choice – and the power to shape this new consumer mindset lies in the hands of the creative industries.



Parley for the Oceans x adidas ©Parley for the Oceans

Parley partners with some of the most prestigious brands in the world, encouraging them to review where and how they source materials, and introducing them to scalable material innovations.

Parley demonstrated how the creation of a movement and branding (Ocean Plastic®), can drive value for brands wanting to offer climate engaged consumers alternate material choices along with activism. Their work with adidas turning plastic trash into a premium material replacing virgin fossil materials (30 million pairs sold by end 2020) laid the ground for material innovators everywhere.

Working to rid the world of plastic waste is not enough. Parley supports the Biofabricate community to help pioneer a new generation of material innovation built with biology not oil.



Parley for the Oceans x Dior ©Parley for the Oceans

New value chains have to be established

Our keynote speaker, Sean Simpson, co-founder and Chief Science Officer at LanzaTech, opened Day 1 by addressing the number one issue for bio-innovation: scale.

LanzaTech didn't actually start with biology. They asked **'which are the best feedstocks to leverage for a process that will have an impact against the oil industry?'**

The answer - **'waste streams from society, agriculture, industry and CO₂ itself.'**

Their circular process uses biology to convert gases from waste streams into

ethanol to produce fibers, polymers and surfactants, amongst other chemicals..

Critically, Sean highlighted how a new value chain had to be established. There was no existing route to deliver transformed steel mill waste gases to fashion brands.





“Our journey to scale
has taken 13 years.”

Sean Simpson, Co-founder & CSO, LanzaTech

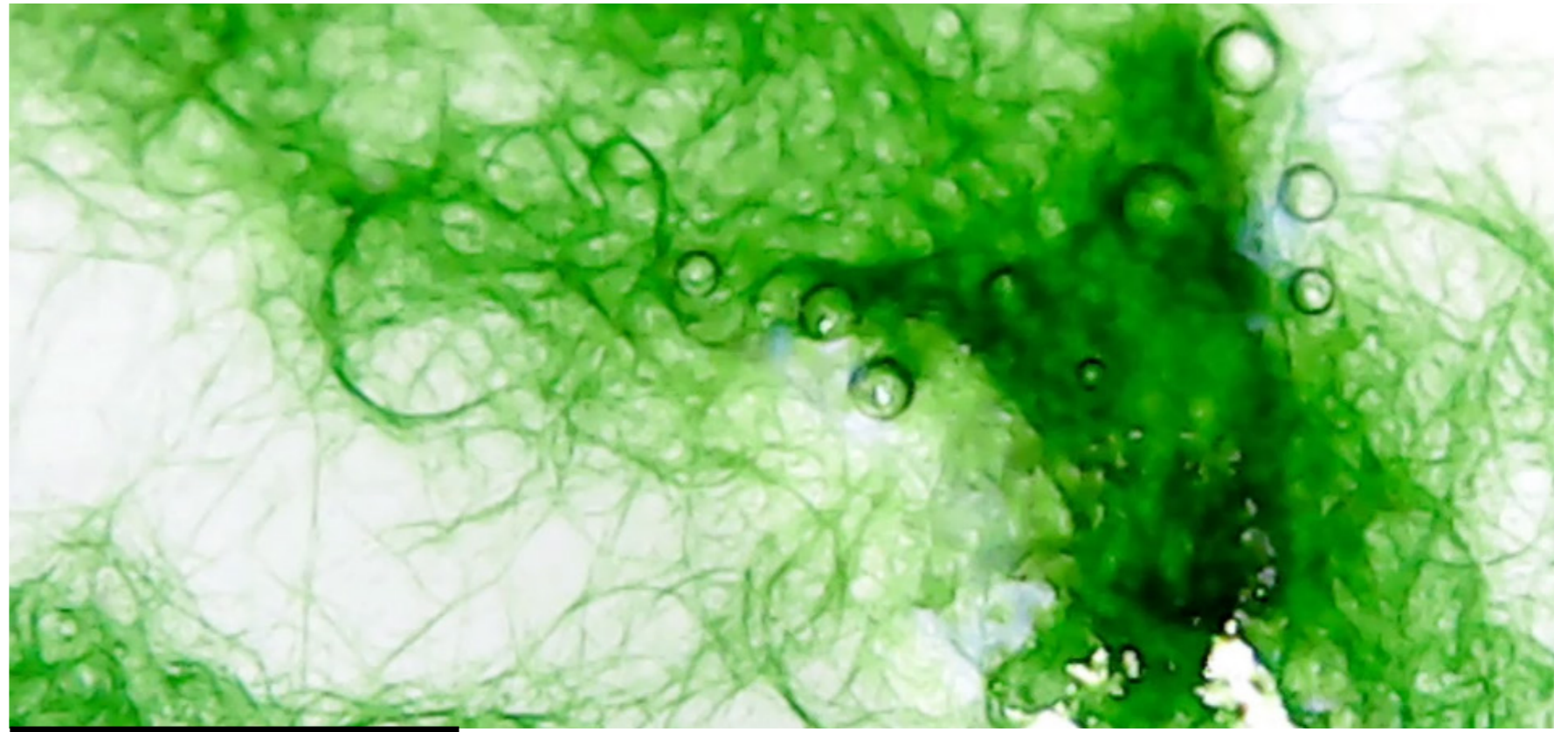
Architecting Living Systems

Can you grow a building?

We heard from world leading architectural researchers using biology to rethink how we can construct our built environment.



Rendering of the INDUS Project ©Shneel Malik



Oscillatoria animalis ©Bio-ID / Prantar Tamuli

As biology increasingly intersects with architectural practice, we noted a **new vocabulary emerging** from the likes of Studio BioCene at UCL in London. For example; **'biointegrated'** design, and **'bioreceptive'** and **'biotic'** building materials.

If you are looking to understand how far the boundaries of architecture have expanded, it's notable that this session included interdisciplinary contributions from molecular biologists, and biochemical engineers as well as architects.

Projects demonstrated how designed geometries can subtly control environmental conditions such as water retention to promote healthy **bioreceptive** structures. These habitats may additionally confer thermal, acoustic, and microbiome benefits.

Lab experiments as part of the Indus project, demonstrated certain strains of microalgae could reduce concentrations of heavy metals in water, such as cadmium, by 10 fold in 30-40 minutes.

Cyanobacteria, used in **biomineralized** photosynthetic materials, were shown to match the performance of traditional bricks.

Martyn Dade-Robertson, of the UK's Hub for Biology in the Built Environment (HBBE), highlighted the challenges of working with biology across scales in architecture.

From the nano scale of DNA, genes and cells, the micro scale of lab materials, through to implementation at the macro scale of the human body, buildings and cities.

Biodesign for architecture brings together wetware (design of biology), software (design of materials) and hardware (design of tools such as bioreactors).

Stimuli such as light or chemicals can be harnessed to modify materials as they grow to create and control functional properties such as strength. This will enable creation of complex composites, responsive and intelligent materials.

Opportunities exist to implement and scale these projects.

Researchers in this session invited policymakers, NGOs and private organizations to collaborate and create local circular economies in both developing and developed countries.

1* kg Encroacher bush = **1** kg mushrooms + **1** kg building materials + **1.5** kg carbon storage

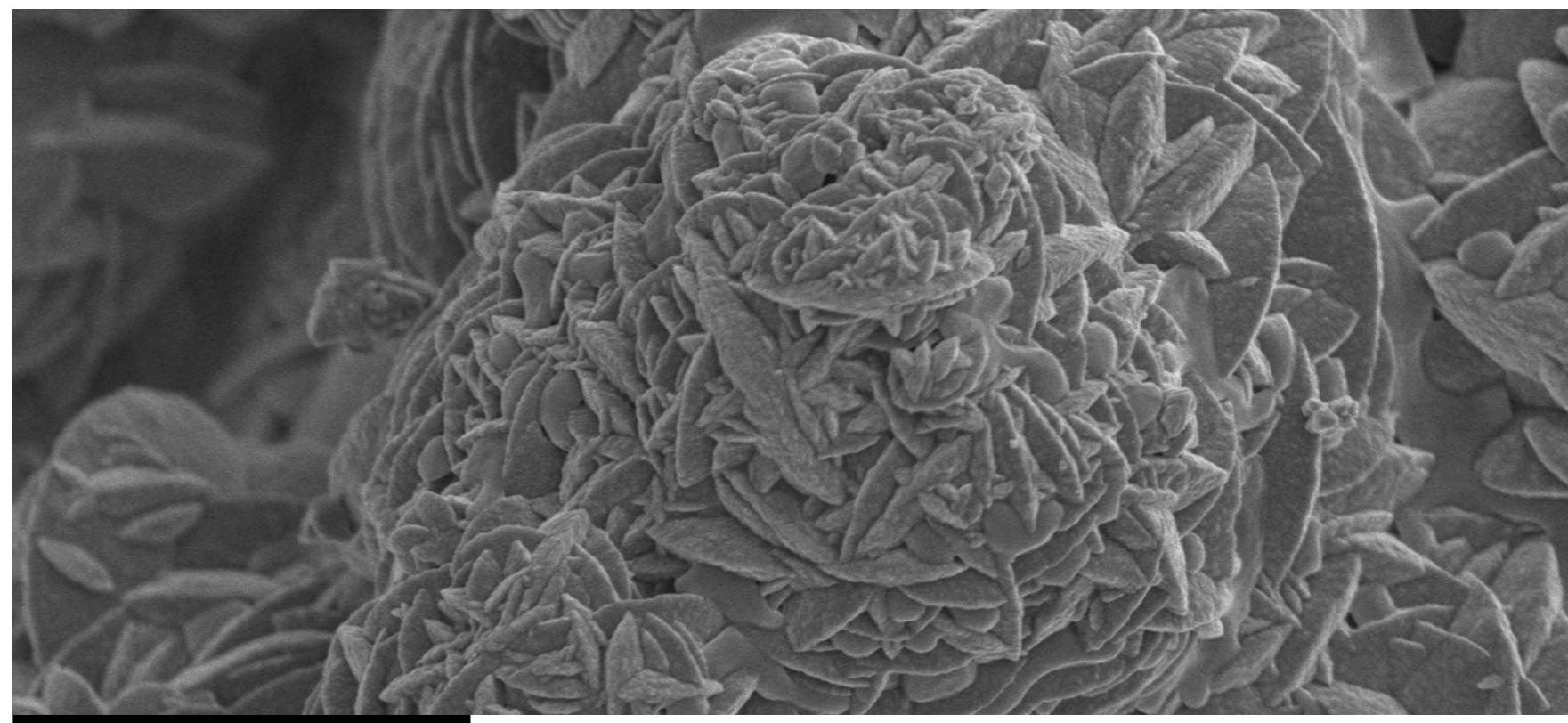
* (+ water and air and other stuff (no laws of conservation are violated))

bioHab process & impacts ©Redhouse Studio

“Whereas most materials are carbon emitters, MycoHab uses circular resources and regenerative biofabrication to provide food security, bolster water security, regenerate wildlife ecologies, provide low-cost shelter, and store carbon.”

Christopher Maurer, Principal, Redhouse Studios

Christopher Maurer, from Redhouse Studio showed how biology is an efficient solution for building in resource limited environments, both in space and here on Earth. ‘MycoHab’, a pilot project in Namibia has triple net benefits; transforming encroaching bush into food, building materials and carbon storage.



SEM of Biomaterialization ©Hub for Biotechnology in the Built Environment

Seeding Bio Innovations





Biorocket Interns in the Genspace lab, featuring Ivan - one of fabulous Biofabricate volunteers! (third from the right) ©Genspace

“Homogenous populations cannot design for a heterogenous world”.

As we look to biotech innovation to help solve planetary issues, how do we ensure that everyone has a seat at the table?

How we support the next generation of innovators needs to be addressed from several angles. From **infrastructure** to **inclusivity**, **education** and **community** building, **investment** and developing **new business models**, even through to the **spiritual** dimensions of technological impacts..all need more consideration. The repeated mantra throughout the session: the power of including a diversity of backgrounds to supercharge innovation.

Where do you go if you have an idea for an innovation that involves biotech? For those that leave the relative comfort of academia, or don't come through that traditional route, there are few, if any, affordable spaces to do lab work.

On average it can cost a New York startup \$10,000 a month to rent a 1,300 sq ft lab space (Beth Tuck). This lack of affordable infrastructure fails early-stage innovators. The need is being addressed by a new model from OpenCell, along with spaces that have been around for longer - the DIY bio labs at Genspace.

OpenCell's latest venture, Bio Hotel, will open its first two locations this year in London. Genspace has proven these alternate lab providers can in fact yield



Genspace alumni OpenTrons's OT-2 Liquid Handler ©OpenTrons

unicorn companies: in 2021 OpenTrons, a Genspace alumni, was valued at over \$1 billion. Two of the companies at this year's Biofabricate summit also got their start at Genspace: Werewolf and Vader Nanotech.

It's not just lab space, but access to affordable tools, education, and spaces that foster a sense of inclusive community that are needed. The question '**who gets to participate in bio?**' (David S. Kong) is an important one with many of the founders of existing start-ups in this space not coming through an academic science route.

That's prompting accelerators like IndieBio to be background agnostic when they look at biotech entrepreneurs. Instead they are providing resources, investment, and working to understand what it means to cultivate '**a community that works with members not just for them.**' (Sabriya Stukes).

Increasing evidence of profitable innovation coming from people and spaces outside academe is prompting creation of new models to support and accelerate this. Newlab's innovation studios bring their deep tech community together with industry to solve global scale issues. While

global tech giant Google partnered with the educational organization the Biodesign Challenge to explore the future of electronics.

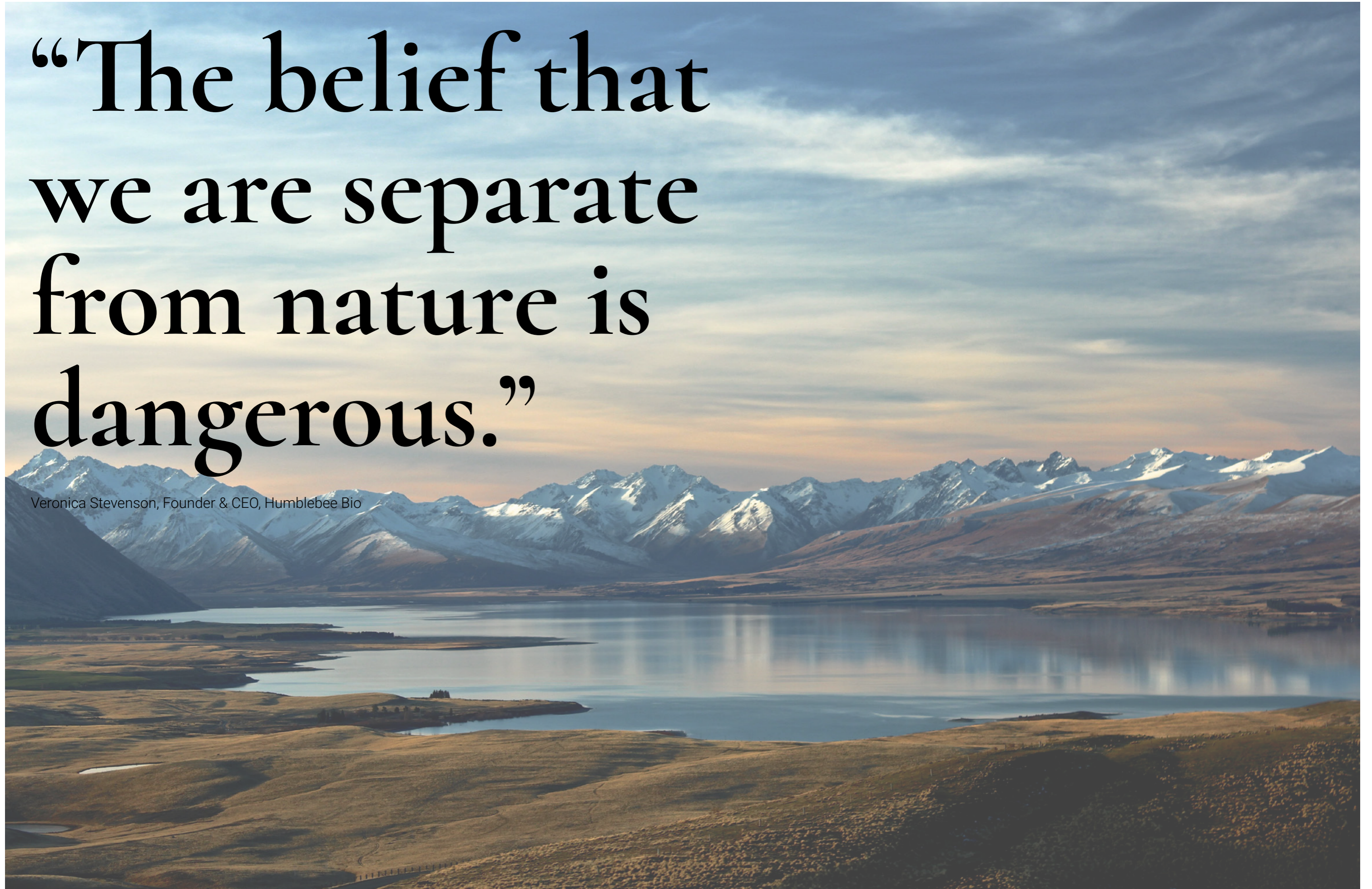
Finally, '**spiritual**' is a word not usually heard in relation to biotech but one that should be added to its lexicon; '**Our values and our world views are incredibly important. To me, our ability to design tools and technologies but with a framework where we're really looking at nature in a reciprocal way, in a mutualistic way, not just a source of resources or something we extract from, I think is critical to the future of all of our work.**' (David S. Kong)

It's Not ALL About You



“The belief that we are separate from nature is dangerous.”

Veronica Stevenson, Founder & CEO, Humblebee Bio





Partnering to go faster

A new generation of startups is looking to collaborate with technical partners from the beginning.

Building your own cell engineering and prototyping platform, consisting of the latest computation and robotics tools, is capital intensive. And trying to partner with academic institutions who move at a 'glacial pace' is challenging for time-sensitive, resource constrained founders.

Rather than building in-house from scratch, startups such as Humblebee and Huue are choosing organism companies like Ginkgo Bioworks to do the backend work allowing them to focus on their product partners.

'Our unusual R&D strategy has meant we didn't raise a lot of money,

and we didn't hire a lot of technical people. We didn't build our own labs. We were intentionally international and virtual from the very beginning.' (Veronica Stevenson) Collaboration is at the heart of Humblebee Bio.

'Partnering with Ginkgo Bioworks allows people to conserve their resources, conserve their time, and focus on commercialization.' (Cas Smith)

Rather than hire one scientist to process a few dozen strain variants, Veronica Stevenson commented partnering with Ginkgo, who can do 4,000, was 'a no-brainer'.

Meanwhile Mylium is working with 3 external partners on fermentation, polymer chemistry and process engineering.

This agile approach often includes leveraging contract manufacturing organizations (CMOs) to scale fermentation to commercial volumes, and with brand partners to perfect product development and expedite innovations to market.



Bench scale fermentors in the Ginkgo Bioworks labs (top left) Ginkgo Bioworks labs (above) ©Ginkgo Bioworks

Fashioning Nature's Blueprints



Engineered Performance

The instructions needed to produce high performance, functional materials can all be found in nature's DNA library - these start-ups are learning from it.

Many of the current innovations grabbing headlines are biobased leather alternatives, but outside of these there is a host of workhorse petrochemical based performance materials for which we need replacements. The likes of nylon through to adhesives. After all, once you've grown the biomaterial for your sneakers what are you going to glue them together with? These materials may not be as 'sexy' as alternatives to leather; adipic acid anyone (!), but are all the more vital to solve for due to their pervasiveness and the huge scale of their consumption.



Silk & mussel adhesive ©Silk Lab Tufts University



Werewool yarn ©Werewool

'Nature's organisms have evolved to produce proteins with amazing functionality'

Chui-Lian Lee, Co-Founder & CEO,
Werewool

This session focused on a number of early-stage innovators learning from the code of life to engineer performance at the protein or molecular level. The solutions presented included; a biobased adhesive using silk and mussel ingredients that outperforms petrochemical counterparts whilst also being water based and completely compostable (Silk Lab Tufts), a fermented protein found in squid ring teeth being used to create a biodegradable elastic fiber or a coating that prevents microfiber shedding (Tandem Repeat), a biologically produced building block for nylon 6.6 created via an emission negative process (Ozone Bio), through to carbon negative cellulose production (Azolla) and the creation of structural fluorescent color that requires no dyeing (Werewool).

Alongside employing the building blocks of nature to create new performance materials, start-ups are also looking to utilize biology's adaptability when it comes to feedstocks. Californian based Azolla are aiming to develop bacteria that can feed off carbon emissions and produce pure nanocellulose in

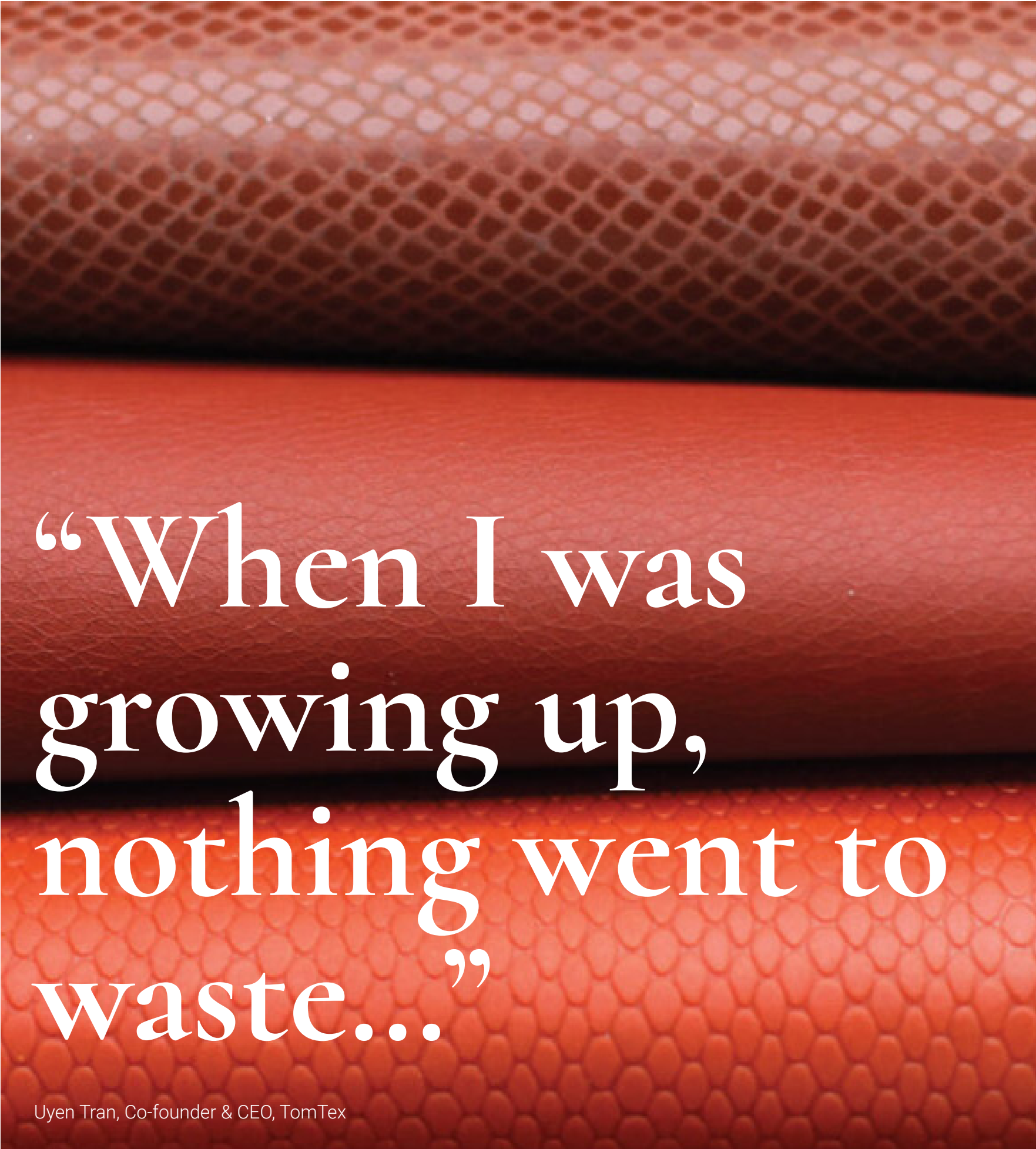
photobioreactors. While Canadian Ozone Bio have created 'zombie cells' that use pulp and mill waste as a feedstock converting it into adipic acid. Their process side steps many of the cost intensive aspects of industrial fermentation representing an economic as well as environmental benefit.

Others are looking to the opposite end of the spectrum; how can we harness nature's ability to bioremediate and breakdown the problematic chemicals/materials created using petrochemicals? New York native, Vader Nanotech, is developing high throughput screening technology to find useful microbes. Their first target is those that can feed on, and break down, the harmful class of PFAS chemicals, known as 'forever chemicals'. The final company of the session, Maverick Bioworks, is creating a robot that can be used for the directed evolution of enzymes. They're currently exploring bacteria with the power to break down PET into its individual monomers for low cost recycling and developing two organisms that could be used in the biomining of lithium for markets like the electric car battery industry.

While the fashion industry may be the initial customer, many of these solutions have applications across multiple industries.

Post-Animal





“When I was growing up, nothing went to waste...”

Uyen Tran, Co-founder & CEO, TomTex

Nature recycles everything

Instead of exploiting nature's resources, innovators at the Biofabricate summit aim to preserve the living world by finding alternatives that can deliver the qualities brands seek.

Waste food resources, fermentation and tissue engineering represent some of the approaches being pursued for alternatives to animal leather. The benefits of these alternatives include substantial resource reduction. Less land, water, and chemistry are required to manufacture these materials. While animal hides come in awkward shapes, these materials are delivered on a roll or as standardized sheets reducing cutting waste.

Some of these materials intentionally mimic animal materials and employ nature's building blocks; structural proteins, such as collagen and chitin. Others, such as Modern Synthesis,

envision a post-animal future which doesn't reference animal materials but rather seeks to displace leather with a novel bacterially grown cellulose. At VTT, mycelium is seen not just as a potential leather alternative, but as an ingredient that can be harnessed for a whole range of new materials.

Looking to nature, Spiber presented **'biosphere circulation - a new path to upcycling'**. It is committed to using only materials that can be recycled in the biosphere in a circular process. For example, a cotton t-shirt is reduced to cellulose and then glucose, or protein materials broken back into amino acids. Spiber will be releasing a set of design standards for brands so they can design products compatible with this system.



Hide Biotech's process (top) Hide Biotech prototype debuted at the summit (bottom) ©Hide Biotech

65 million tons of fish waste annually

Plastic-free materials can exist within a 'biocycle' offering brands a biodegradable end of life option



Spiber's pilot plant in Thailand is scaling structural proteins for customers in the fashion industry and beyond. Production has risen from single digit tons in 2021, to hundreds of tons in 2022, rising to thousands of tons as early as 2023.



Brewed Protein™ fashioned into powders, fibers, yarns and sheet materials (top) Spiber's pilot plant in Thailand (bottom) ©Spiber



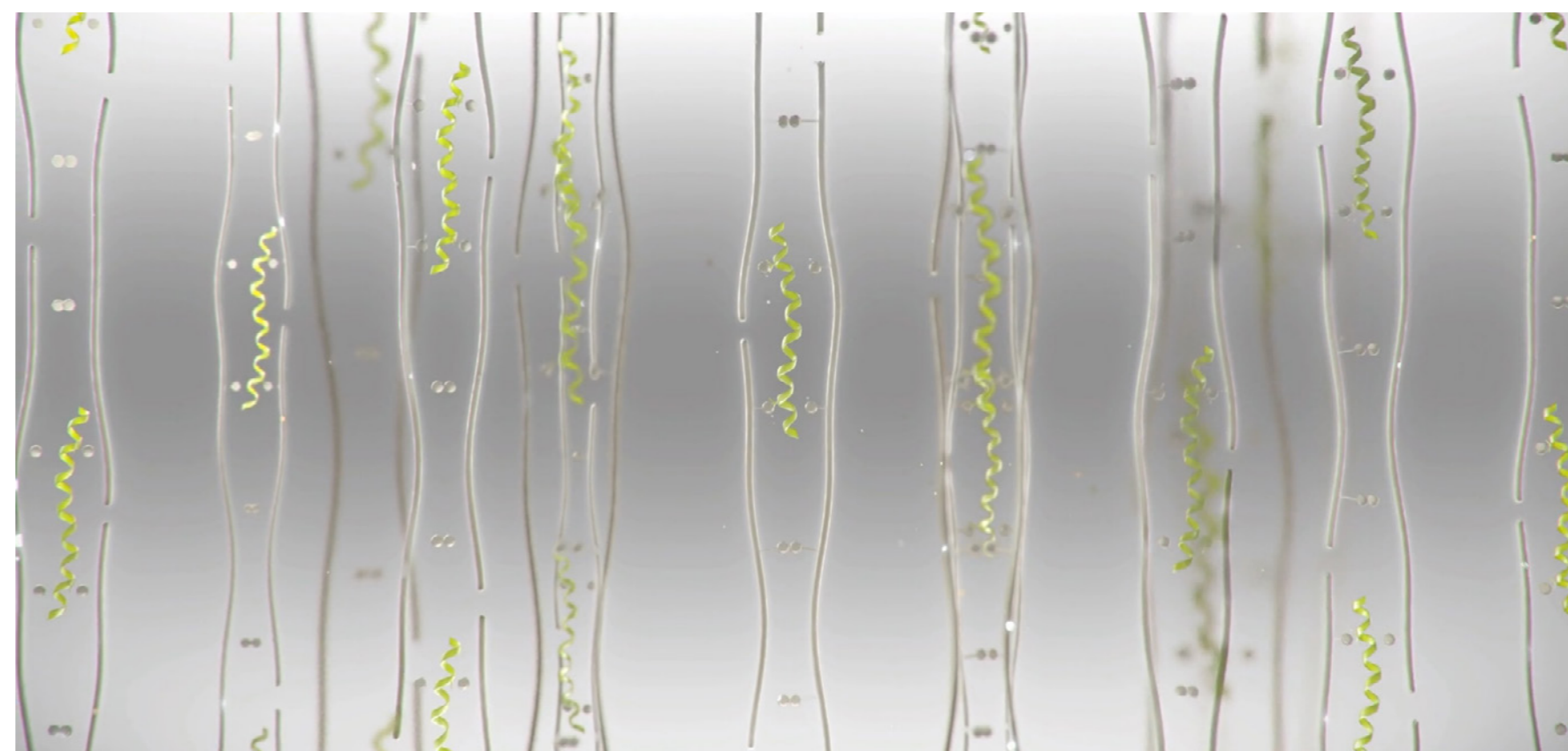
The Nature of Beauty



Geltor's HumaColl21™ & Elastapure™ ©Geltor

This is the first time we've shone a light on the beauty industry as a compelling opportunity for biotechnology. Beauty makes sense at the Biofabricate summit for several reasons, not least because the fermentation of some products for materials can also yield potential co-products for personal care.

Hi-value ingredients for beauty may indeed be a lower hanging fruit for some biotech startups. Materials require not just the production of, for example, a complex protein, but that protein also needs to be formed into a 3D structure that delivers on performance as well as look and feel. Because so little of an effective 'active' is required in a beauty formulation, margins can be significant and require lower product volume at scale.



Rendering of K18's Peptide ©K18

Suveen Sahib, founder and CEO of K18, opened this session sharing their journey to create a game-changing hair product. Having used computational methodologies to map the entire keratin genome, they spent 10 years scanning, testing, assembling, re-assembling, and optimizing their peptide for delivery into the hair where it works to repair damage **‘to near virgin state elasticity’**. He was joined on stage by one of his first customers, Christine Thompson, owner of the Spoke and Weal chain of salons. The conversation focused on the transformational performance that can be delivered by biology. **‘There hasn’t been anything in my lifetime that is this revolutionary... Our industry is ‘cosmetic’ - it works on the surface, whereas this actually goes in and builds from the inside out’**. Thompson explained it expands what is possible creatively whilst also saving precious time enabling her to see more clients. Sahib views synthetic biology as a powerful tool for creating new molecules that can re-define functionality as we seek ageless beauty. Embracing TikTok, which delivers both education and entertainment, was key to the evolution of the brand - the 2022 #K18hairflip produced **10.8 BILLION** hashtag shares.

Our all female panel, moderated by Celia Ellenberg, Beauty Director at Vogue, featured deep expertise across both beauty and biotech industries. Sonia Renac, the new Chief Commercial Officer at Geltor, and a chemist by training, sees a greater landscape of product opportunity with their biotech

platform. She believes products need to be better performing than current market benchmarks, with a focus on innovation, efficacy, sustainability and animal free alternative proteins. She shared that the carbon footprint of the products Geltor is currently scaling is 45-70% reduction on land, CO₂, and water, with line of sight to further improvement as they go into millions of liters in 2023.

Tellingly, Catherine Roggero-Lovisi, an executive with deep roots building brands in the beauty industry, is the new CEO of Modern Meadow. More known for its materials developments, she was clear that the company has pivoted to focus on protein application across beauty, biomedical and biomaterials. Their 100% human collagen replacement has use in dermatology and topical skincare, followed by orthopedics for regenerative medicine making joints and bone replacements more biocompatible.

At Arcaea, founder and CEO, Jasmina Aganovich, explained how they are using biology as a design tool; **‘tapping into new parts of the tree of life... we have an opportunity to create products that perform in ways we’ve never known...because biology can do things chemistry can not’**. While the industry at large is looking for plant-based alternatives (to petrochemicals or animal derived ingredients), Aganovich is excited to go beyond, unlocking new types of ingredients and experiences.

Finally Shara Ticku, co-founder and



C16's fermented palm oil substitute in various beauty formulations on display in the Design Lab

CEO of C16, pioneering a replacement for palm oil, spoke to how supply chains are central to their work; **‘What’s interesting about biotech is it can make shorter supply chains, and more predictable supply chains’**, eventually with the opportunity to locate biomanufacture next to product manufacture. She also highlighted the intention behind choosing an organism that is both robust but also feedstock agnostic, **‘so it will accept every primary carbon source, including waste streams.’**

At Vogue, Ellenberg noted consumers are more comfortable with the idea of **‘soil-to-bottle’** than **‘lab to brand’**;

‘there’s been this fetishization of natural ingredients, really come up in last 10 yrs, “they’re wholesome, they’re safe”, people understand them, the idea of eating organically has transferred over from the food space.’ She posed the question; **‘How do you shift that narrative so people feel comfortable with some of these ingredients?’** We’ll be tracking this as we dive deeper into this space next year.

There is much promise here. The tunability of proteins will enable products which are ‘biologically aligned’, with the ability to repair, not just mask damage, as demonstrated by K18s success.

Key take-aways are that biotech can future proof beauty at multiple levels:

1. **purity**
2. **efficacy and biocompatibility**
3. **sustainability and innovation**

Lastly, Ellenberg drew attention to the elephant in the room: packaging. The majority of the billion+ containers sold annually go straight to landfill. If anyone has an innovation that could address this particular challenge we’d love to highlight it at our 2023 summit!

Scaling Biology



We're sure the vast majority of people who have been following this field for a while would express a certain amount of prototype fatigue. While it's important to see innovations manifested in product form, there has been a pattern of lack of follow through to scaled commercial launches. It leaves many asking; what are the main barriers to scale? And prompts the million dollar question - how do we make scaling go faster?

Key answers for how to speed scale-up that emerged from the session included:

1. **Money** - not just in the form of investment, but also agreements like joint development where partners put resources behind a project. (We told you it was a million \$\$\$ question!)
2. **Commitment** - brands need to be prepared to get involved and champion these innovations through to market by supporting innovators wherever possible. That will likely include everything from liaising with their supply chain to help navigating coming legislation.
3. **Time** - the thing no-one wants to hear! For those that are achieving scale, and particularly where this requires putting steel in the ground, this simply takes time. For example, LanzaTech, who have 7 plants coming online in the next year, were founded in 2005.



“Prototypes are easy, making stuff at scale is hard!”

Eben Bayer, Co-founder & CEO, Ecovative



PANGAIA FLWRDWN™ puffa jacket ©PANGAIA

“How do we make a corporate structure that can deal with the organic nature of academic research and start-ups, and be flexible and nimble while also having a brand presence?”

Amanda Parkes,
Chief Innovation Officer, PANGAIA

For innovators in this space there is complexity at all scales. There is a need to understand the demands from lab to product: ‘The challenge for us is navigating what are really complicated networks; from the metabolic engineering networks, to the specs and requirements of textiles and fabrics, to the entire logistics of this enormous industry.’ (Orr Yarkoni, Co-founder & CEO, Colorifix)

Developing a strong understanding of the logistics and needs of the industry they’re entering allows a start-up to smartly scale their technology. For example, Polybion has deliberately developed their process to create half

cow-sized pieces of Celium™ (their bacterial cellulose leather alternative) so that the material can drop into existing supply chains and be used on standard equipment. Colorifix has also worked hard to understand the needs and nuances of the dyeing industry. It has created a process that can be situated in a dye house, and developed equipment that can be operated by dye house technicians. The fermentors the company has designed and made for installation at their partners’ facilities are much more affordable than the standard models from traditional biotech suppliers. Colorifix’s 300 litre fermentor costs the same as a traditional 30L version, and it is keen to make its equipment available to other start-ups facing similar needs for affordable hardware.

The decision to develop new equipment, build pilot plants, or indeed to vertically integrate is driven by multiple factors. It can simply be that there is no existing infrastructure to leverage, or even if standardized equipment is being used, there is a need to prove out a scaled process which can then be transferred to a CMO, or the technology licensed. Vertically integrating can also be about capturing more value, but for many it’s done at pilot scale in service of capturing key learnings that can be fed back through the process in quick iterative loops.

Some have chosen to go further than pilot plants and are engaging with the end consumer. Checkerspot’s co-founder and CEO, Charles Dimmler, learned the importance of engaging

with the end customer at his previous startup Solazyme. Checkerspot launched a D2C brand, WNDR Alpine, creating skis using its algal oil based urethanes in service of ‘ultimately, accelerating the adoption by third parties.’ The usefulness of proving early market traction was a sentiment echoed by another industry veteran Jens Klein, founder and CEO of Origin Bio, and has been proven via launches such as the LanzaTech x ZARA capsule collections.

In the face of mounting urgency for innovations that help mitigate the climate crisis **‘those that are best positioned to have the most significant impact, most quickly, are risk averse, don’t have the ability to change on a dime - and that responsibility in my opinion lies with start-ups. And one of the things that we have to our advantage, that’s a benefit, is the ability to move quickly, is the ability to take on that risk, and if we can do that say, through a consumer brand that we create and therefore make it frictionless, we make it easy for a customer or a partner [...] to adopt our technology.’** (Charles Dimmler). Being agile, and able to move quickly to prove out new solutions in the marketplace, is the raison d’être for challenger brand Pangaia. The ‘material science company that manifests as a fashion brand’ has been developing a business model that is uniquely their own: **‘How do we make a corporate structure that can deal with the organic nature of academic research and start-ups, and be flexible and nimble while also having a brand presence?’.** (Amanda Parkes)

Citing companies like Intel or Apple, who are actively involved in shaping the future of their industry, Pangaia recognised a gap in the market where a fashion brand could behave in this way - actively innovating, iterating and releasing new technologies. Even more interesting is the lack of exclusivity, Pangaia is developing both D2C and B2B pipelines for its own innovations.

For larger incumbent brands who want to be first movers it’s about shouldering some of the risks with startups and working to implement new materials with as few barriers as possible.

“Biomaterials are like the internet in the 80s, the best is yet to come.”

Axel Gómez-Ortigoza, Founder & CEO,
Polybion



Skis made with Checkerspot’s algal oils ©WNDR Alpine

Design Unbound



The promise of biomaterials is still in the making. Working with biology enables us to reveal an entirely new landscape of aesthetics and performance. We're excited for the brave innovators and brands who will embrace this creative opportunity and question what is possible. Only by challenging these creative boundaries will we encounter what is possible when design is unbound.



Nike t-shirt printed with Living Ink's carbon negative Algae Ink™ ©Living Ink



MycoWork's 'Freedom of Creation' pop-up experience (March 2022)

Increasingly, we see material startups not just experimenting with cultures in their labs, but also with their people. As Sophia Wang at MycoWorks pointed out: **'We're a biotech startup founded by artists'**. TomTex and Modern Synthesis are others. Building a company that fully embraces cognitive diversity to include both the data-driven scientists and touchy-feely designers is leading to the creation of roles like Wang's 'Chief of Culture': **'My mission at MycoWorks is to be a model for how diversity and inclusion in how we work together really steers innovation.'**

Scott Fulbright, co-founder and CEO of Living Ink, talked about a paradigm shift; from industry trying to reduce the use of toxic chemicals, to replacing them with ones where the more you use, the better for the planet. 'Carbon Black', the ubiquitous pigment that's used in everything from cars to shoes and beauty applicators, is on the Prop 65 list in California, and like many other fossil derived chemicals, may be heading towards restrictions in Europe too. For brands seeking immediate drop-ins that can demonstrate a shift away from fossil resources, Living Ink matches performance and delivers a 200% reduction in carbon emissions compared with carbon black. Every kilo of carbon black emits 3.75kg of CO₂, if you substitute Algae Ink™ you remove 4.16kg of CO₂. Over 10 million units across multiple categories have now sold using this algae replacement, including all of Patagonia's hang-tags and, mostly recently, Nike t-shirts.



Bananatex® fibers drying in the sun ©Bananatex

In contrast to fast fashion, the ‘more product = more positive planetary impact’ concept, re-surfaced in the conversation between Cyrill Gutsch of Parley and Hannes Schoenegger, CEO of Bananatex™. Another company founded by designers delivering material innovation, not just for their own brand, but also B2B. Bananatex is currently scaling to millions of square feet per year. The trees they harvest from are not cut down, only side branches are used, supporting permaculture efforts and reforestation, bringing new jobs and stability to indigenous communities as production scales.

The designer founders at MycoTex aim to put technology to work for their ‘New Fashion Factory’ (NEFFA). Products such as footwear, that traditionally relied heavily upon sewing for construction, are outsourced to Southeast Asia where labor is cheap. With supply chain instability and raw material concerns front of mind, NEFFA proposes re-shoring production by bringing together locally grown biomass and stitchless construction through automation. The process offers a parametric design approach, a vision for zero waste, and better end of life options for brands.



Balenciaga coat featuring SQIM's EPHEA™ mycelium material ©Balenciaga

Sqim, with its Ephea™ mycelium material and luxury launch partner Balenciaga, is leading the way on material design. In working with local tanneries, a deliberate choice was made to explore treatments that celebrate the material's natural textures, rather than using embossed patterns that mimic animal skin. Maurizio Montalti, co-founder and ‘Chief Mycelium Officer’, affirmed the company benefits significantly from being located in Italy with close proximity to generations of leather and textile know-how. The Ephea™ / Balenciaga trench coat is in stores at the time of writing; a major milestone for a series A stage company.

The final hat tip goes to Haute Couturier, Yuima Nakazato, and his ongoing exploration with Spiber's biomaterials. In an exclusive interview for Biofabricate, Nakazato explained through energetic experimentation, driven by passion, he was able to apply print to master the natural shrinking tendency of their brewed proteins and innovate a novel 3D technique he terms ‘biosmocking’. **‘I believe this is the kind of material that stirs intellectual curiosity for creators’.**

“I’m very excited that in the future an unimaginable material will be born.”

Yuima Nakazato, Founder & Creative Director

Save the date:

October 4-6, 2023 Biofabricate Summit travels to Paris!

We're excited to announce the summit is coming to the heart of Europe, headquarters to so many celebrated global brands. It's indicative of the progress being made as more innovators partner with European brands



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