



## Can this dress save the world?

By Elektra Kotsoni 07 July 2025

Iris van Herpen's Autumn/Winter 2025 couture show included a dress made from man-made protein fibres, the brainchild of Japanese firm Spiber. CEO Kazuhide Sekiyama explains why he hopes it's the breakthrough fashion needs.



Dutch couturier Iris van Herpen is no stranger to material innovation. Over the years, she has presented couture collections featuring dresses made of banana leaf and cocoa beans, while she was one of the first designers to experiment with 3D printing. The collection she just showed, titled *Sympoiesis*, features a series of dresses made of alternative fibres, including a "living dress" made of 125 million bioluminescent algae. There are also two wedding dresses, one of which is constructed from a man-made bio-based protein by Spiber, a company with big ambitions to curb the fashion industry's impact.

The Japanese biotechnology firm was founded in 2007 by Kazuhide Sekiyama and Junichi Sugahara, after they managed to successfully grow spider silk in a lab at Keio University. Today, it specialises in *Brewed Protein™*, a fibre made from fermented sugarcane, which the company says is biodegradable and recyclable because it can be broken down into nutrients and reused as feedstock for the production of new protein through the fermentation process.

The broader uptake of biomaterials has been held back by challenges including higher costs, longer lead times and a lack of accessibility. Over the years, Spiber has collaborated with fashion brands including Burberry, The North Face and Sacai, but it hasn't been immune to these challenges, nor the trend of material innovators getting stuck in the pilot phase. When Burberry used *Brewed Protein™* in a scarf last October, it had to be blended with 62 per cent wool and 8 per cent cashmere. More than 15 years in, Spiber is only just getting ready to take *Brewed Protein™* out of the lab and into the mass market. In 2022, the company began operations at the world's first commercial protein polymer production plant in Thailand, and last year it established its first overseas branch, Spiber Europe, to accelerate business development and sales in the region.

It sounds exciting, but it can all be difficult to understand if you aren't a biochemist. I spoke to Spiber CEO Sekiyama about this fibre, the collaboration with Iris van Herpen and how his company plans to strengthen fashion's supply chain and "help keep the peace".





Kazuhide Sekiyama, CEO of Japanese biotechnology firm Spiber. Photo: Courtesy of Spiber

Vogue: How exciting to have a dress made of Spiber's bio-based fibres in the Iris van Herpen show. But what is Brewed Protein™?

Spiber is a Japanese biotechnology company, and we make a man-made protein called Brewed Protein™. As you know, everything about you is made up of DNA. DNA is composed of 20 different amino acids. The order these amino acids come into — as well as their length — defines the difference between features like your muscles, skin and eyes, and any other protein. Silk, cashmere — they are also protein-based materials. So we have come up with a way to produce a protein-based material in a lab through what we call a microbial fermentation process, which is basically how you also make yoghurt or cheese.

Vogue: How did you get the idea and found the company?

I met my mentor, Professor Masaru Tomita, who is the founder and general director of the Institute for Advanced Bio Sciences at Keio University, when I was a senior in high school. He told me the interdisciplinary advances between the life sciences and computer sciences are changing the world. He said this is where the solutions for all the world's problems — like food, energy, the environment — can be found. So that inspired me, and I entered his lab in 2004 and started my own research at the same time, together with my co-founder Junichi Sugahara, where we looked to reproduce the spider silk protein through microbial fermentation. We analysed about 1,000 species of spider and their threads. In 2007, we succeeded in replicating a very small amount of spider silk completely in the lab. And that's when we established the company.

Vogue: So that's why it's called Spiber. Why spiders?

Indeed, spider fibre. We were talking with some colleagues in the lab, and someone mentioned that spider silk is a really tough and good material — hence Spider-Man. Its toughness per weight is, I think, seven times higher than [heat-resistant synthetic fibre] Kevlar. However, a few years after we founded the company, we found that the spider silks have a physical property called super contraction. That means that when it touches water, it shrinks a lot, which isn't really helpful when you are trying to make clothes. Imagine getting caught in the rain and your jacket begins to shrink. So we had to go back to the DNA design and work on creating a new type of DNA that could actually be used in the apparel industry. So even though the company started with a mission to replicate spider silks, the protein that we produce now is not that — it's our own unique DNA design, which is suitable for apparel products.

Vogue: The collaboration with Iris van Herpen is not your first fashion collaboration, but is it the first couture collaboration?

We've actually been working with Japanese couturier Uma Nakata since 2018. But we feel it is really time now to accelerate our business because we strongly believe our protein can serve as a solution for many issues the apparel industry is facing.

We are finally now able to commercialise the material, too. It took us over 10 years to release the very first Spiber product called Moon Parka, which was in collaboration with The North Face and came out in 2019. But back then, we were not able to produce Brewed Protein™ in big quantities. We just established our first commercial production plant in Thailand, which allows us to provide the materials to a wider range of brands and companies. So we really hope to expand our business in







Europe and globally. As of February 2025, the plant has produced approximately 200 tonnes of protein polymer, with plans to scale up production to 500 tonnes per year in the coming years. And we have collaborations in place with international yarn and textile manufacturers, which have helped develop the fibre (some can produce 100 per cent Brewed Protein™ textiles) and expand our reach.

Vogue: How did the collaboration with Iris van Herpen come about?

We sought her out as she is an outstanding couturier who, much like us, is inspired by nature and led by a philosophy of sustainability.



A sketch of the wedding dress featured in Iris van Herpen's SS26 couture collection titled Symposium, constructed from a man-made bio-based protein by Spiber. Photo: Courtesy of Iris Van Herpen

Vogue: What are you looking to get out of this alignment with high fashion?

I believe that biotechnology has the potential to diversify and strengthen the global supply chain, which is important to keep peace in the world. But that takes a long time. Take, for example, petrochemical fibres: it took over 100 years for them to be industrialised. But we don't have much time left. Seeing all these environmental problems coming up and the global conflicts... So given that situation, we want as many companies as possible to use Spiber in a short time frame. And we believe that working with high fashion brands helps in that mission to penetrate the supply chain.

Vogue: How do you propose to strengthen the supply chain?

When we talk about strengthening and diversifying the global supply chain, we're referring to Spiber's broader vision of creating a sustainable, decentralised production ecosystem for Brewed Protein™ materials. This includes sourcing untapped biomass, such as bagasse [the fibrous residue left over after sugarcane stalks are crushed to extract their juice], agricultural waste and used bio-based textiles, from various regions around the world, and using that as feedstock to produce Brewed Protein™ polymers.

We estimate there are several billion tonnes of under-utilised biomass resources worldwide. By leveraging these efficiently — without needing to expand farmland or increase livestock production — we can scale Brewed Protein™ for use in textiles, food ingredients and more. Because protein is a high-value product with wide-ranging applications, and because microbial fermentation is highly efficient when optimised with our proprietary technology, we believe this approach can support the development of an entirely new sustainable industry.

In addition to our existing production and spinning operations in Thailand and Japan, we're exploring the establishment of polymer production and spinning facilities outside of Japan. This will help shorten lead times, reduce reliance on any single location and make our materials more accessible globally.

