Material gains

In the future, biofabricated materials could be an essential raw material for tanneries and leather goods manufacturers. Jim Banks speaks to **Andras Forgacs**, CEO of Modern Meadow, about how the technology behind them is being refined.

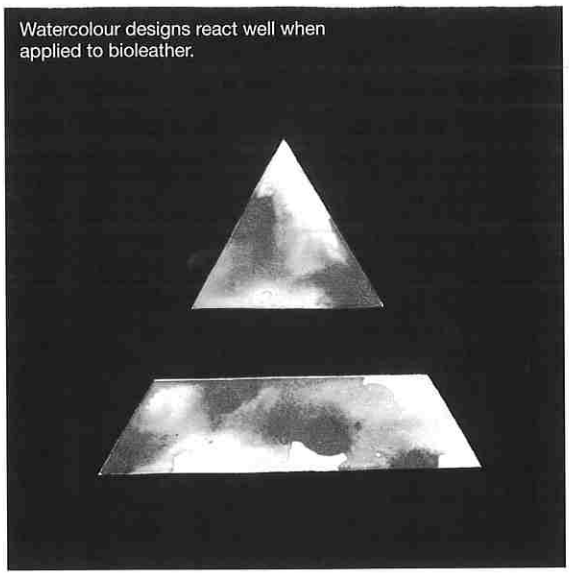
For almost 50 years, the World Economic Forum (WEF) has helped to drive entrepreneurship and recognise breakthroughs that will shape the future. It is noted for its intellectual rigour and strategic view of global trends, so when it bestows an award on a compay, the relevant industries take note.

In the past few months, WEF has garlanded Modern Meadow, a company based in Nutley, New Jersey, that has become a pioneer in biologically advanced materials. It works by using groundbreaking techniques to produce the world's first bioleather, Zoa, which has the potential to be a vital raw material in the coming years.

WEF has welcomed Modern Meadow into its Technology Pioneer community, which comprises early-stage companies across the world that are designing, developing and deploying technology that could have a significant impact on business and society. In the past, WEF has selected companies such as Airbnb, Bloom Energy, Google, Kickstarter,

Mozilla, Twitter and Spotify, so Modern Meadow is in illustrious and relevant company.

"The award is great recognition for us," says Modern Meadow's CEO, Andras Forgacs. "The World Economic Forum is a very thoughtful community about industry and about how transformational technology can be for the world. It is a great group and the award drives us into a global conversation about what manufacturing will look like 20 or 30 years from now, as we enter a world in which there is pressure on resources, and consumption patterns are changing."



Watercolour designs react well when applied to bioleather.

Essentially natural

Modern Meadow is a small company with big ideas. Its team of 70 people includes experts in molecular biology, material science, engineering and design, who have the backing of investors such as Horizons Ventures and Iconiq Capital. Zoa is the result of their combined efforts and it is the company's first generation of materials created with nature's essential protein, collagen, without the use of any animal derivatives.

The biofabrication process involves growing living collagen cells, which are found in animal skins, which can then be assembled into materials with customised structural and aesthetic properties.

These qualities are defined by editing DNA molecules to produce distinct characteristics in the collagen as it is grown into a network of fibres.

This bioleather – created to match the distinct needs of Modern Meadow's customers – can then be tanned and finished to create a bespoke raw material for brands to use in finished goods. Modern Meadow is already partnering with luxury and consumer goods brands to create products made from Zoa.

In October, the company displayed a product – the Zoa bioleather T-shirt – at the Museum of Modern Art (MOMA) in New York as part of the 'Items: Is Fashion Modern?' exhibition. The T-shirt has now become the first biofabricated product to become part of the museum's permanent collection. The aim was to demonstrate the versatility of Zoa, which the company certainly achieved, but it was not intended as a way to bring the material to the wider consumer audience. Instead, the key for Modern Meadow is to look at biofabrication as a broader concept and to bring it into the spotlight so that it can be further developed in all of its applications.

"The conversation that needs to be had, and into which the WEF award propels us, is about biofabrication and what it can do," says Forgacs. "This is an opportunity to engage with other established and emerging companies to talk about how the different pieces of the puzzle can come together. It is about bringing solutions to solve questions.

"The WEF award allows us to contribute to a level of dialogue that matters. Business development and fundraising happen anyway, but this is now about being part of a long-term conversation. Biofabrication is a big idea – bigger than Zoa – and it is about creating a world where we can make transformational materials from proteins, which is a process that can be applied in many different ways in many different industries."

Biofabrication is already a key area of research across many industries. In the development of pharmaceuticals, chemicals, consumer products, cosmetic and agricultural products, for example, extensive testing is often required to ensure that they are safe for the environment and for consumers. Due to this testing on animals, problems can arise.

Some of these problems are ethical, while others are technical. Animal models may not, in some instances, provide accurate predictions of how a product might affect humans. The focus, therefore, is increasingly turning towards biofabricated – or biomimetic – tissues that could be used to provide safer and more effective testing paradigms for new drugs, chemicals and products.

A future built on partnerships

Zoa is a groundbreaking technology with the potential not only to influence the leather industry, but also to redefine how people view biofabrication. It will undoubtedly play a big part in bringing the process further into the public eye and encouraging the innovation that will bring about a step change in many industries. For now, Modern Meadow is firmly focused on building relationships that will take its idea further, because Forgacs and his team understand that success cannot be achieved in isolation. ››

Modern Meadow has already partnered with consumer brands to create products made from Zoa.

Bioleather is set to take a central role in the development of industries going forward.

"As a company, a lot is happening behind the curtain at Modern Meadow," he explains. "We are a business-to-business company working with technology partners, brands and materials companies to integrate Zoa into their products or to scale up production."

The latest partnership the company has formed is with chemicals specialist Evonik. Its expertise in microbial fermentation is vital to Modern Meadow's ambition to mass produce Zoa. The long-term agreement between the two companies sees Evonik become a worldwide development partner not only to industrialise collagen production, but also to improve the fermentation process and to optimise the yeast organisms used in the creation of Zoa to increase the yield of collagen. There is also a possibility that the partnership will lead to further collaboration in the development of other proteins.

"The partnership with Evonik is very significant, as it is a key technology partner that can bring value in scaling up the production of protein," remarks Forgacs. "Our business is growing yeast to produce collagen, which needs large brew tanks for specialised fermentation. Evonik gives us the know-how and helps us get to scale with greater confidence and higher quality.

"Then we take that collagen and make that into the material, which is what we do at our headquarters in New Jersey. Eventually, we could do that around the world but the next step is to really get the process and R&D right. Ultimately, we will do that near to our customers rather than just at our headquarters."

Bright future

Partnerships are essential to further the science and the production processes that underpin Zoa, but Modern Meadow is keen to forge other relationships, particularly within the leather industry itself. On the surface, it is easy to see Zoa as a challenger to the incumbents in the leather industry. It could easily be cast as a competitor to the traditional supply chain, but this would be an oversimplification. In fact, Zoa represents a complementary and nascent technology – an alternative raw material that relies on the same infrastructure and knowledge to go from a known biofabricated material to a component of finished products.

For this reason, Forgacs is keen to engage in a discussion with tanneries and product companies to show the versatility of Zoa and to help Modern Meadow find its place in the supply chain in order to deliver mutual benefit for all of the parties involved.

"The WEF award helps us to open discussion with potential partners and established manufacturers of leather," he stresses. "We want to talk about how to use existing know-how in the tanning industry to develop Zoa, which is another raw material for them. Tanneries currently rely solely on hides. Through WEF and other fora, we can engage in discussion with the industry about how to make better use of the knowledge that tanneries and others in the leather industry already have."

There is no doubting the ingenuity that has led to the creation of the world's first bioleather material, and it is clear that biofabrication in all its forms will play a central role in the development of many industries in the years ahead. What is less certain is how the leather industry will respond to Zoa, but there is never a bad time to look ahead and embrace what comes next. Biofabricated alternatives to animal hides are here to stay, and a partnership between the established industry players and the innovators could hold great promise for the future.

Before you go... with Andras Forgacs

What discussions have you had – or expect to have – about collaborating with tanneries?

Andras Forgacs: Having strong partnerships with the top tanneries is high on our list of priorities here at Modern Meadow. In time, we envision partnering with tanneries, as they have the capability and know-how to process our materials in the best possible way. However, as we are still in the research and development phase, these conversations are ongoing.

How active are these discussions, and have they led towards any concrete development plans for forming partnerships?

Discussions with product companies are active and ongoing. We do have development partnerships in the works and our current strategy is to launch a product sometime in the next year or so with one of our established partners in the luxury sector.

How is Modern Meadow and its product Zoa viewed by the leather industry? Is it regarded with interest or is it seen as a challenge to the status-quo, and how can you ensure that there is a positive working relationship between the traditional leather industry and the company?

I do believe that Modern Meadow is regarded with interest; by bringing biotechnology together with leather chemistry, we have the potential to help expand the reach of the market. Importantly, in the long run, we do not look to replace traditional leather. Rather, we are looking to create an entirely new range of materials that sit alongside traditional leather, with their own unique properties. We have sought a positive relationship with the leather industry early on by engaging with industry conferences, leather chemists and academic centres of excellence. We are also excited about the potential to engage with leading tanneries, especially as our technology matures.