

Would You Buy A Bag Made Of Mushroom Leather? A Jacket Made With Spider Silk? The Future Of The Fashion Industry Is Here And It's Made With Biology



Companies Evrnu, Bolt threads, Spiber, Modern Meadow, Mycoworks and Ecovative Design are biotech companies reinventing the fashion industry by introducing innovative materials and production methods.

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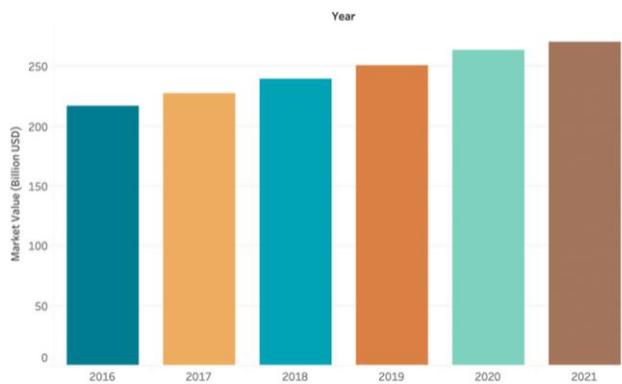
Synthetic spider silk? Leather brewed from mushrooms? These are just two examples of how synthetic biology is changing the fashion industry.

Second to the oil industry, the fashion industry is the world's [largest polluter](#). The major contributors to the fashion industry's pollution are water contamination and consumption, carbon emissions and harmful chemicals. As a result, consumers are in growing numbers asking for sustainable fashion items, putting pressure on the fashion industry and textile manufacturers. These recent demands are causing companies to search for solutions, and it so happens that synthetic biology has the answer. Six frontrunners, [Evrnu](#), [Bolt threads](#), [Spiber](#), [Modern](#)

[Meadow](#), [Mycoworks](#) and [Ecovative Design](#) are biotech companies reinventing the fashion industry by introducing innovative materials and production methods.

LEATHER INDUSTRY BREAKDOWN

THE PRODUCTION OF LEATHER HURTS
ANIMALS, THE ENVIRONMENT, AND
THE WORKERS WHO MANUFACTURE IT
- YET THE INDUSTRY IS GROWING



MATERIALS USED IN LEATHER PRODUCTION



A Breakdown of The Leather Industry

1. Brewing leather made from mushrooms

With their 100% biodegradable materials, [MycoWorks](#) is challenging the conventional leather industry by turning fungi and agricultural byproducts into leather. The process of turning skin into leather (tanning) dates back to [2200 BC](#) and has not evolved much since, except for in the [19th century](#), when chrome tanning, an alternative to the conventional vegetable tanning was invented in order to streamline the manufacturing process. Today the leather industry has a huge negative impact on our environment through its massive energy consumption and the effluent of harmful chemicals and byproducts. In the production of livestock, tremendous amounts of fossil fuels are consumed and leather derived from cows has nearly [three times the negative environmental impact](#) in comparison to synthetic alternatives, including polyurethane (PU) leather. With MycoWorks' technology leather production can be done in a fraction of the time, with a fraction of the resources in a sustainable, customizable and natural way.

2. Biofabrication: Building materials with biology

Today In: [Business](#)

From 3D-printing human tissue for medical use, to biofabricating new sustainable materials, the possibilities of synthetic biology appear limitless to CEO and co-founder Andras Forgacs. After raising approximately \$54 million, [Modern Meadow](#) is tapping into nature's toolkit to create biologically advanced materials that signify a new era: The Biofabrication Age. The company's Zoa technology allows for the possibility to customize structural and aesthetic properties of materials through the editing of DNA, resulting in the production of distinct characteristics. The biofabrication process consists of engineering the DNA of yeast to produce collagen protein which is then fermented and eventually assembled into materials. In 2017 Modern Meadow proudly demonstrated their biofabricated [prototype T-shirt](#) featuring leather made from yeast.



On average, Americans throw away 81 pounds of clothing every year. Close to 95% of used textiles can be recycled, 85% lands in the trash

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3.From discarded clothing to fibers to new clothing

On a mission to make single-use textiles into multi-life resources, [Evrnu](#) is introducing a new kind of engineered fiber with extraordinary performance and environmental advantages. On average, Americans throw away 81 pounds of clothing every year. Close to 95% of used textiles can be recycled, [85% lands in the trash](#), meaning that 21 billion pounds of recyclable clothing ends up completely unused each year. In a simplified five-step process Evrnu's NuCycl technology turns discarded clothing into new material through gathering, disassembly/breakdown, material/fiber engineering, spinning into yarn and finally weaving into fabric. In a joint effort to make sustainable sportswear, Evrnu, BoltThreads, [Adidas](#) and fashion giant [Stella McCartney](#) launched an eco-conscious hoodie and a tennis [dress prototype](#). With the technology of synthetic biology, companies such as Evrnu are able to demonstrate the possibility of creating new products using materials that are made with nature, which, at some point, can also return to nature in a sustainable manner.

4.Synthetic spider silk, a material 340 times tougher than steel

For the first time in the world, Japan-based [Spiber](#) succeeded to develop the technology required for mass production of synthetic spider silk. The material has about the same strength as carbon fiber but has 40 times the toughness making a material with unlimited possibilities. The technology behind such a product? Synthetic biology, of course. Through analyzing the spiders silk-producing DNA, scientists are able to identify genes and with genetic engineering synthesize a new optimized gene, with greater strength and elasticity, thereby allowing for more industrial applications. In collaboration with [The North Face](#), Spiber released the [Spiber Moon Parka](#), the world's first coat made with synthetic spider silk (this parka is up for grabs in a lottery ending at the end of October). Spiber believes that in the future, proteins will be widely used as a basic industrial material, just as metals, glass, and plastics are used today

5.Developing materials for a better future

[Bolt Threads](#) are using nature as an inspiration, cutting-edge biotechnology as a tool and endless innovative ideas to make sustainable materials for a better world. With their spider silk, mushroom leather and silk proteins the company is tackling the problems of our resource-constrained world. With the global fashion industry valued at approximately [\\$3 trillion](#) and consumers asking for sustainability and higher transparency there is much to gain in the synthetic biology biomaterials industry. With their [Mylo technology](#) bag their collaboration with Evrnu, Adidas and Stella McCartney the company is already taking the fashion industry by storm.



Mycelium is the thread-like vegetative part of a fungus. It is being used in many ways to create biosustainable materials

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6.Fungus for a sustainable future

Bacon, packaging materials, skincare and sustainable foam, these are some of [Ecovative Design](#)'s innovative Mycelium products. Mycelium is the thread-like vegetative part of a fungus and using Ecovative's technology it can be grown into designed forms to make a sustainable product. The process of growing mycelium yields very little (mostly compostable) waste, it is fast growing and it uses limited energy consumption making it a promising solution to current materials. The biodegradable material comes at a cost however, a square foot of mycelia material costs about [\\$50 to make](#) whilst other materials such as plastic, wood and cork can be produced at a much lower price. But with Ecovative's [MycoComposite™](#) material being flame resistant, hydrophobic and biodegradable it provides additional advantages that conventional packaging materials cannot. Ecovative also has a textile platform in which they make sustainable "leather". Bolt's Mylo technology is licensed non-exclusively to Ecovative in a partnership with the aim to commercialize this textile application. Ecovative's products are sustainable, biological alternative to plastics and animal agriculture, the key drivers in the world's pollution.

There is no doubt that synthetic biology has endless possibilities. The pressure on our planet's resources is giving innovators the opportunity to pave the way towards a more sustainable future. So far, we have only uncovered the tip of the iceberg. With more cross-disciplinary initiatives and globalization, now is the time to critically examine our current ways. Synthetic biology is a facilitator in allowing nature to help us solve our problems on earth.