

THE SUSTAINABLE CATWALK

Fungal footwear and orange peel fabrics

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the most polluting branch
after the oil industry”



Our wardrobes have a massive environmental impact. Scientists and creatives are designing sustainable clothing and shoes, making them out of fruit waste, discarded fibres or fungi. 'If we work with the big fashion labels, innovations can be fine-tuned and scaled up.'

TEXT RENÉ DIDDE PHOTOGRAPHY SVEN MENSCHEL

At the State of Fashion exhibition in De Melkfabriek in Arnhem last summer, there was a jacket on display made out of the skin of the pirarucu, one of the largest freshwater fish in the world. There were also sandals with straps made of fungal threads, bags made of processed green tea leaves, and a dress made of orange peel.

'We are not setting out to make existing fashion more sustainable, but to develop totally new materials that are "acceptable" from the word go,' says Kim Poldner, who leads the Circular Fashion Lab at Wageningen University & Research. 'Materials that use hardly any water or environmentally harmful chemicals, and are biodegradable when discarded.' The exhibition, a slimmed-down version of which will be on display in Wageningen in September and early October, starts where conventional fashion, including the use of biocotton, hemp and flax, leaves off. Poldner, who works in the Management Studies Group and is fascinated by sustainable entrepreneurship in fashion, organized the Arnhem exhibition in collaboration with the local University

of the Arts, ArteZ, as part of the WUR centenary.

'A lot of things are still under development and not ready to go into production yet, but if we work with the big fashion labels, innovations can be fine-tuned and scaled up.' More than 80 Wageningen MSc students collaborated on the exhibition, says Poldner, developing the materials together with fashion and textile designers. 'They researched things like whether you can dye materials with plant and bacterial pigments, or the potential of fruit waste. During the opening weekend, the students were walking around in lab coats to talk to visitors about their research.'

FUNGAL FABRIC

Iris Houthoff, who has a Wageningen MSc in Biotechnology and now teaches Bioprocess Engineering part-time, has been involved in the exhibition. 'Hides from the leather industry travel great distances and the tanning process produces a lot of wastewater. I am aiming at a new type of leathery material that can be produced locally, does not pollute, and is completely biodegradable once it is written off,' >

Jeans producer G-Star, one of the major fashion chains participating in the State of Fashion exhibition, exhibited new, sustainable dyeing processes.

‘We want to develop materials that don’t harm the environment’

explains Houthoff. To this end, she founded a Wageningen-based company called Mylium.

Thanks to a student competition for inventing new, valuable products using regional waste flows, she identified fungi such as Reishi mushrooms that grow on waste timber. ‘Fungi are nature’s circular motor, and it is high time we tapped into that force. They break down waste material and convert it into a strong fruiting body and mycelium. At Mylium we are studying different production methods for producing ‘lengths’ of mycelium, but we can also get the mycelium to grow directly into the form that is required.’

After harvesting and drying, the mycelium needs to be conserved with a coating to prevent it drying out, keep it flexible and scratch-free, and make it durable. ‘It doesn’t have to last 30 years like leather, as

long as it is completely compostable and leaves the soil healthy.’ For the exhibition, Houthoff made the straps for sandals by designer Luc Arts. ‘A lot of people think the material feels nice, and resembles both cork and cotton,’ says Houthoff. ‘I don’t know where Mylium will be in five years, but we should be able to produce shoes, watchstraps and car furnishings.’

100 BILLION GARMENTS

Conventional fashion companies are increasingly aware of the massive environmental impact of the fashion industry, says Poldner. Cotton, for example, is a water-guzzling crop on which huge amounts of artificial fertilizer and pesticides are used. And the pollution and generation of waste is only increasing thanks to the ever faster rate at which fashion trends change. According to figures

from the Ellen MacArthur Foundation’s report *A New Textiles Economy*, the number of garments sold worldwide doubled between 2000 and 2015, going from 50 billion to 100 billion.

According to a study by the Amsterdam University of Applied Sciences, the average Dutch person’s wardrobe contains 173 items, 50 of which have not been worn for over a year. More than 70 percent of that clothing soon gets cast off and is then burnt or – even worse – dumped in landfill. The Ellen MacArthur Foundation calculated that the fashion industry’s annual total CO₂ emissions are equivalent to those of all the world’s aeroplanes and ships.

‘The fashion industry is the most polluting branch in the world after the oil industry,’ says Poldner. ‘But the branch has now drawn up a lot of guidelines for reducing the environmental impact and promoting



PHOTO: GUY ACKERMANS

Louise Fresco, WUR Executive Board president, in a vegan dress of dead-stock silk printed with waste ink.



Left and above: designs using recycled material. Below right: sandals with straps made of Wageningen mycelium (Luc Arts).





better practices such as the use of biocotton. And the accident in the Rana Plaza factory in Bangladesh in 2013 opened the broader public's eyes to the labour conditions in the fashion industry,' she says. The disaster cost 1134 people their lives and left over 2000 seriously wounded. In the aftermath, more than 200 international fashion brands signed an agreement on safe factories.

VIKTOR & ROLF

As well as students, creatives and scientists with an out-of-the-box attitude, there were multinational fashion chains and established designers present at the exhibition. Viktor & Rolf, for example, made a series of garments out of the online store Zalando's unsold remnants (deadstock). African designers developed new fashion out of cast-off clothing shipped from Europe to Africa. Jeans company G-Star exhibited new, sustainable dyeing processes. The exhibition covers the recycling of textiles too. This issue is coming in for more and more attention in the conventional fashion industry. Beside direct reuse through exchange of clothing, second-hand shops and clothes libraries, there are more and

more initiatives targeting the reclaiming of worn-out textile to spin it into second-hand yarns. 'At the moment, if you recycle cotton you always need some "virgin" cotton on which to spin the short, weaker second-hand cotton fibres,' explains Martien van den Oever of Wageningen Food & Biobased Research. 'We are now researching whether hemp and especially flax fibres are suitable substitutes for virgin cotton fibre. Hemp requires no water and no pesticides. Flax does require a few chemicals, but on the other hand the fibre is naturally much finer than hemp.' Van den Oever is helping to improve the cultivation of hemp for fibres, too. 'We have realized we need to harvest it earlier. The yield per hectare is then smaller, but the hemp fibres are much better suited to use in textiles.'

MIXED FIBRES

Another tricky issue for recycling cotton is the fact that cotton is rarely used in its pure form these days. It often contains elastane, polyester and polyamide. 'Because we don't have techniques for separating the fibres, these mixed fabrics currently get rejected for reuse. But once we can separate the cotton fibres from the

synthetic ones, we can spin them into new yarns and make high-value textiles from them.'

Kim Poldner applauds these developments. But her dream is for her research on business models in fashion to lead to a breakthrough with innovations in areas such as fungal fabric and fruit leather, both in startups and in big chains. 'I hope that in 10 years' time we shall be wearing more clothes we have designed ourselves, made of plant material we grew ourselves: clothing that fits perfectly, thanks to 3D body scanning and printing, and which can be thrown in the organic bin when we discard it.'

At the opening of the academic year in September, WUR President Louise Fresco gave a good example by wearing circular-economy fashion. Fresco wore a vegan dress made of deadstock silk and printed with waste ink. Her scarf was dyed with the help of bacteria and she sported one of Iris Houthoff's mycelium watchstraps. ■

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Until mid-October, part of the State of Fashion exhibition is on view on Wageningen campus.