

For a true war on waste, the fashion industry must spend more on research

August 16 2017, by Mark Liu



A model wears one of the author's original zero waste designs.

The rise of fast fashion in Australia means 6000 kg of clothing is dumped in landfill every 10 minutes. The [ABC's War On Waste](#) visualised this statistic by piling a giant mound of clothing waste in the middle of the city. So what to do about it?

Sustainable fashion experts advocate abstaining from buying [fast fashion](#), promoting clothing swaps and repairing old clothing. Others suggest

buying organic and ethically-sourced clothes or designing clothing using zero waste techniques. The hope is that greater transparency in supply chains will lead to an end to sweatshops and unsustainable fashion practices.

These are admirable initiatives, but they only reduce wastage or delay garments from ending up in landfill. They do not address the fact that the scale of fast fashion is so massive it can easily eclipse other sustainability initiatives. Nor do they address the wastefulness of existing technologies and the urgent need to research new ones.

Even if we could magically stop the global production of all garments, we would still need new, green technology to clean up the waste we have already created. There are long-term strategies for green technologies such as electric cars, but where are the major companies and research institutes developing the next generation of sustainable fashion technologies? The development of new synthetic biology technologies may be the key.

From catwalk to research

I would like to share my journey from zero waste fashion design pioneer to trans-disciplinary fashion researcher to highlight the challenges faced by sustainable fashion and the need for more research.



A scene from the ABC's War on Waste. Credit: ABC

Ten years ago, I presented my ["Zero-Waste" Fashion collection](#) at London Fashion Week. I and other sustainable designers at the time took the waste streams of other industries such as scrap materials and leftover fabric and created our collections from them. I was selected for "Estethica", a new initiative created by sustainable fashion gurus [Orsola De Castro](#), Filippo Ricci and Anna Orsini from the British Fashion Council. Sustainable fashion was shown on London catwalks next to luxury fashion - a revolutionary step for the time.

I pioneered a way of creating tailored, high fashion garments so that all the pieces of a garment fitted together like a jigsaw puzzle and no waste was created. Conventional pattern cutting creates about 15% wastage of

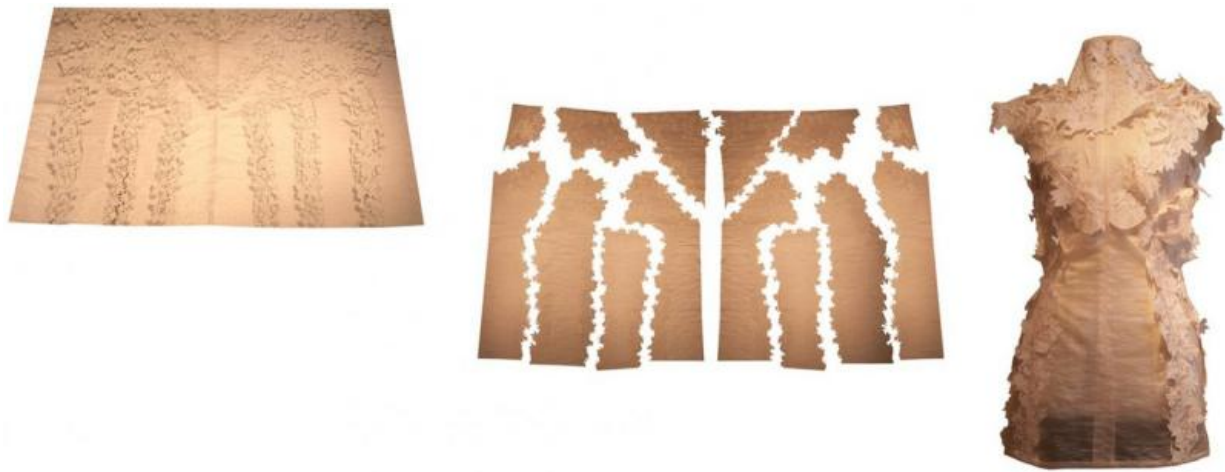
material, even if the pattern has been optimised by a computer. I wanted to systemically change the way clothing was made.

But the problem with zero-waste design is that it is very difficult to create. It requires a skilled designer to simultaneously imagine the garment as a 3-D item and a flat pattern, while trying to fit the pieces together like a jigsaw. It is easy to make an unfitted or baggy garment, but creating something that looks good and fits the body was a real challenge.

Even after all these years, most contemporary zero-waste fashion is still not tailored to the body. I practised this technique for years to master it. It required breaking all the rules of conventional pattern-making and creating new techniques based on advanced mathematics.

These were exciting times. Our fabrics were organic, we made everything locally and ensured everyone was paid an ethical wage. The press loved our story. But problems started to emerge when it came to sales. We had to sell more expensive garments, using a smaller range of fabrics - our materials and labour costs were higher than those of companies that produced overseas. Often fashion buyers would say they loved what we did, but after looking at the price tag would politely take their business elsewhere.

As a sustainable fashion designer, my impact was limited. It was also impossible to teach zero-waste fashion design without explaining how advanced mathematics applied to it. It was time to try a new approach, so I decided to apply science and maths to traditional fashion techniques.



To design a garment with zero waste requires new patternmaking techniques, based on advanced mathematics.

[My PhD research explored the underlying geometry of fashion pattern-making.](#) Combining fashion with science allowed the traditional techniques and artistry of making garments to be explained and communicated to scientist and engineers.

In the meantime, fast fashion companies rapidly expanded, with Zara, Topshop and H&M reaching Australia by 2011. [They produced massive amounts of cheap products making low margins on each garment.](#) Consumers quickly became addicted to the instant gratification of this retail experience. The size and scale of their production produced hundreds of tonnes of garments every day.

The limits of fashion technology

Fast fashion companies such as H&M have developed recycling initiatives in which [consumers can exchange old clothing for discount vouchers.](#) This is supposed to prevent clothing from going to landfill,

instead recycling it into new clothing.

However, there are those who are sceptical of H&M's recycling process. In 2016, investigative journalist Lucy Siegle crunched the numbers and concluded that ["it appears it would take 12 years for H&M to use up 1,000 tons of fashion waste"](#). This, she said, was the amount of clothing they produce in about 48 hours.

[A 2016 H&M sustainability report reveals that only 0.7%](#) of their clothes are actually made from recycled or other sustainably-sourced materials. In the report, [H&M acknowledges](#) :



Credit: AI-generated image ([disclaimer](#))

Today, this is not possible because the technology for recycling is limited. For this reason, the share of recycled materials in our products is still relatively small.

In fact, their 2016 annual [report states](#) that more research is needed:

if a greater proportion of recycled fibres is to be added to the garments without compromising quality, and also to be able to separate fibres contained in mixed materials.

Sustainable technologies strive for a "circular economy", in which materials can be infinitely recycled. Yet this technology is only in its infancy and needs much more research funding. [H&M's Global Change Award](#) funds five start-up companies with a total of 1 million Euros for new solutions. Contrast this with the millions required by the most basic Silicon Valley start-ups or billions for major green technology companies such as [Tesla](#) or [SolarCity](#). There is a dire need for disruptive new [fashion technology](#).

Many of the promising new technologies require getting [bacteria](#) or fungi to grow or biodegrade the fabrics for us - this is a shift to researching the fundamental technologies behind fashion items.

For example, it takes 2700L of water and over 120 days to grow enough cotton to make a T-shirt. However, in nature, bacteria such as "acetobacter xylinum" can grow a sheet of cellulose in hours. Clothing grown from bacteria has been pioneered by [Dr Suzanne Lee](#). If a breakthrough can be made so that commercially grown cotton can be grown from bacteria, it may be possible to replace cotton fields with more efficient bacteria vats.

But why just stick with cotton? Fabrics can be generated from milk, seaweed, crab shells, banana waste or coconut waste. Companies such as

[Ecovate](#) can feed fabric fibres to mushroom spore called mycelium to create bioplastics or biodegradable packaging for companies such as Dell. Adidas has 3-D printed a [biodegradable shoe from spider silk developed by AM silk](#).

Although I began my journey as a fashion designer, a new generation of materials and technologies has pulled me from the catwalk into the science lab. To address these complex issues, collaboration between designers, scientist, engineers and business people has become essential.

To clean up the past and address the waste problems of the future, further investment in [fashion](#) technology is urgently needed.

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