

## The ultimate in bespoke tailoring: a dress that can be any size you want it

Technology could revolutionise clothing and turn us all into fashion designers. But, asks *Olivia Gordon*, will fashionistas wear it?

Imagine your own personal fabrication machine. On waking, you programme in designs for a self-cooling t-shirt in a colour and texture of your choice, a Chanel jacket with built-in computer, Chloé jeans that will remould to your exact shape after a big lunch, and Jimmy Choo shoes with GPS tracking. By the time you're out of the shower, the clothes have been fabricated and are waiting for you.

This fantasy could be reality by the end of the 21st century. 3-D fabrication machines already in development would use nanotechnology to build objects atom by atom. Merely shopping for outfits will be rendered so ten minutes ago as a fabrication machine is installed in every home.

Smart clothing – intelligent garments that actually work for us in some way – is not new. From the invention of the waterproof Mackintosh in the 1820s to stretchy Lycra in the late 1950s, successive new technologies have gradually become taken for granted by fashion designers. In the past 20 years, we've come from Hypercolor t-shirts – which changed colour with heat but rarely survived a hot washing-machine cycle – in the late 1980s, to Marks & Spencer's 2007 iPod Suit with a control centre in the lapel.

Today, a huge range of technology is used – even electrical currents and nanotechnology are sewn into textiles. Cornell University researchers have designed self-cleaning garments that protect from colds, flu and air pollution (the fabric is impregnated with tiny, antibacterial particles). A US Navy-financed shirt monitors heart rate and body temperature. Solar-powered C.A.T.S. eye (Covert Tracking Asset Systems) clothing means the wearer will never be lost, and the No-Contact jacket sends 80,000 volts into assailants. But what's the next step? And how radically will the clothes of the future change the way we dress?

With smart clothing, trends will be dictated not by fashionistas, but by wearers controlling the way their clothes look and feel. Clothes will transmute

on demand: by brushing the fabric, at a verbal signal or a change of mood from the wearer. Instead of buying three skirts, we might buy just one that changes colour, size and shape at our whim.

But how does an industry built on disposability survive such a revolution? Francesca Rosella, creative director of London-based smart-fashion design company CuteCircuit, says: "One of my obsessions is to see garments coming out three-dimensionally from a machine. The fashion industry is really scared that users could take over. But there is a business model – you send people your designs and they just print them out at home."

Rosella believes that far from stifling fashion, smart clothes will be in tune with the rising global trend against over-consumption. She also thinks

**'The fashion industry is really scared that users might take over, but there is a business model'**

a growing number of people would rather spend more on a piece of intelligent clothing that has been lovingly and locally made by a reputable company, than get environmentally unsound bargains.

But we're nowhere near smart clothes appearing routinely on catwalks, let alone at TopShop. Sandy Black, professor of fashion and textile design and technology at the London College of Fashion, stresses that, currently, "the driving force that pays for the technology is military or medical. At the sports and wellbeing end, things are beginning to happen, but they're not fashion. They're clothing."

As the pace of scientific discovery accelerates, fashion designers need to be true futurologists – and inventors with a firm grasp of the latest technological possibilities when it comes to materials.

No matter how effective the technology, the design has to be simple, near-invisible, non-gimmicky and function perfectly for fashionable »

### The next generation

Fashion design students from the London College of Fashion imagine what we might be wearing tomorrow

### Mikael Persson

Bishopsleeve Dress  
"This outfit has a digitally printed under-layer of fine satin silk and a surface design that can change appearance."



smart-clothing to really take off, says Professor Black. That's just not happening yet: "People are very focused on the technology. It needs really good design input right from an early stage. So many things have to come together – technology, design, power sources – and everything's moving at different paces."

Designers stress the importance of aesthetics, but scientists want them to fully understand the properties of materials. Dr Sumeet Bellara works at the government-funded Materials and Design Exchange. "We've found there are a lot of designers needing materials information," he says. Designers, he believes, still need to grasp the full creative scope of developing technology. "They're doing it one stage at a time – 'here's a jacket with an iPod, a t-shirt that lights up.' Not enough people have grabbed the ideas together."

Right now, the technology is too bulky and expensive to make smart clothes marketable. Some haute-couture designers have shown an interest in designing hi-tech clothes – Hussein Chalayan is famous for his 'airplane' dress. Crafted from raw aircraft materials, the dress uses a remote control to change shape. In his 2007 collection, a 'video' dress used 15,000 LEDs to depict a rose opening and closing. But the video dress took a highly skilled team months to make. It isn't designed to be worn regularly or washed – and like all too many smart clothes, the only thing it adorns is a gallery.

There is much talk of integrating computers seamlessly into clothing – a development that will make MP3-playing jackets look prehistoric – but the first hurdles are battery power and weight. Dr Bellara says: "A lot of these things are getting lighter, but they only last a few hours and people get annoyed." These hurdles may be overcome. Australia's Commonwealth Scientific and

Industrial Research Organisation announced in November 2007 that it is working on fabrics that harvest energy from the body.

Will there ever be a commercial fashion market for electronics-filled clothes? Sales of performance-based clothes soared by 25% in 2006, according to NPD, a New York retail research firm. But will they ever adorn the front cover of *Vogue*?

Man-made fibres, from polyester to acrylic, have previously sold well because of their cheapness and resilience, but they've been looked down on by couturiers and their customers, who prefer natural, simple threads like cotton and wool. Fashion-conscious women have embraced the trend for organic authenticity: won't they find hi-tech too complicated and synthetic? And given the chance to be reachable at all times with a wearable phone, might not people prefer to preserve some privacy in an over-connected world?

Dr Bellara thinks not. "We already have BlackBerrys which people carry around a lot, so I can't see it being a problem having that stitched into a piece of clothing."

Jemima French, creative director of fashion label FrostFrench, thinks consumers do prefer simplicity and organic, natural materials. "High-end design will always steer towards natural fabrics – I haven't seen any hi-tech synthetic fabrics that drape or cut as beautifully as natural fabrics. [Smart] fabrics can be restrictive, which will obviously frustrate designers." But, she adds, "I'm sure new fabrics will start to rival interest in natural fibres, and fashion designers are likely to embrace the functional potential of revolutionary materials."

Still, smart clothes will have to shed their boy's toy, military/medical gimmick image if they are to appeal to women. "The majority of women I know would always choose a better-designed jacket over »

'Sales of performance-based clothes soared by 25%, but will they ever adorn the front cover of *Vogue*?'

#### Russ Hindmarch

Nylon sportswear jackets  
"I wanted non-rigid, lightweight garments that still resemble conventional styles of menswear cutting techniques."



#### Yoonhyung Bae

Laser-cut top  
"This is designed to challenge the discipline of cut-and-sew fashion."

#### Sustainable shopping

Retailers at the cutting edge

#### Adili

An eco-shopping pioneer, Adili gathers certified brands under one online roof and brings high style to the moral high ground.

#### Albam

Sources wearable, durable staples – 'closet classics' – and supports UK manufacturers.

#### Traid

This charitable chain stylishly remodels items that couldn't otherwise be resold and invests its profits in the developing world.

#### Marks & Spencer

Has introduced fleeces made from recycled plastic and hopes all its polyester will be made from recycled materials.



#### When is the body not a body?

When it's a "platform for electronic functionality", says a leading fashion technologist.

Clive van Heerden (left) is senior director of Design Probes at Philips Design; his role is to examine future trends. Two recent 'probes' have been SKIN: Dresses, which integrate emotional sensing into fashion, and SKIN: Tattoo, which create electronic tattoos that 'move' and alter their appearance.

"There was an initial surge of interest in wearable electronics that soon died, but I firmly believe fascinating things will happen. The entertainment applications – having your iPod embedded in your shirt – won't materialise in the short term, because the technology is not ubiquitous.

"We've tried to look at how technology can turn fashion into drama capable of evoking emotions. Emotional sensing is a statement against turning the human body into an automaton. I'm fascinated by how mood and state of mind can inform the products around us – how your PC could be made to behave differently depending on whether you are relaxed or stressed. This kind of technology will turn fashion into an expressive industry.

"Clothes can overcome so many of the functionality problems of computing. It is perfectly feasible to think about the body as a platform for electronic functionality."



### "People may not be content to be human"

Leading futurologist and author Michio Kaku (left) says that internet-surfing glasses are just the start. Before long, we'll be remodelling our bodies and being outdone by super-intelligent robots.

#### The future will see you now

"We're heading for a world where knowledge is everywhere, for free. Your glasses will have full internet capability. You'll download videos and teleconference in them. The glasses will recognise people and things: any time you see an object you don't understand, your glasses will tell you what it is. When you see a face, you'll see a biography as well."

#### Beyond the body

"We already have mechanical enhancements of the body, but in the future more and more components of humans will be part-cyber, part-organic. People may not be content to be human – they may want to be superhuman."

#### Rise of the robots

"Engineers wax lyrical about humans becoming obsolete and being put in a zoo, with robots throwing peanuts at us. Computers are as intelligent as a cockroach right now, but I can see a time when they'll be as intelligent as a monkey. That's when they become dangerous and we need a shut-off mechanism for them."

a lesser style that incorporates a gimmick of some sort, and men would be more likely to opt for a self-repairing jacket than women," French believes. But she does stress that women are interested in technology and will become intrigued by the idea that their clothes can work for them.

If Rosella's experiences are anything to go by, British women are especially likely to pick up on the smart clothing revolution. CuteCircuit launched in Italy, but it was only after they moved to London that the company was taken seriously. "Italy's very fashionable," Rosella says, "but it's conservative and classic. There's no room to experiment. Here in London, there is an amazing vibe... and society at large is more engaged with trying something new."

Even if the consumers are ready, many higher-end fashion houses aren't. Rosella once proposed a GPS purse to a high-street fashion chain and was rebuffed. Fashion and technology were never going to get together – just forget about it.

Undeterred, she and her business partner Ryan Genz launched CuteCircuit, whose most famous invention, a 'hug shirt', has taken off massively. Using Bluetooth technology, sensors in the shirt deliver the feeling of being hugged – the physical sensation can be sent via SMS message. *Time* magazine voted it one of the best inventions of 2006, prompting three million sales enquiries.

Such demand has given the company enough confidence to sell the shirt on a serious scale. Having made it washable and wearable, it will go on sale from CuteCircuit's website for less than £300. "It's not going to be really cheap like a gadget, it's more couture," says Rosella. "We use very nice, soft materials. We want the technology to work, but we want the look and feel to be smooth and charming."

Rosella says that fashion companies are far more reactionary than the public. "We are bringing it to market ourselves because when we tried to propose these ideas to other fashion companies,

they said: 'Oh no, no – that's not going to happen, because we pay £2 to get a t-shirt assembled in three minutes in China. If you insert electronics, who's going to be skilled enough to do that?' But once the workforce is trained, it will be as simple as building a normal garment."


Certain corporations have found that smart products can sell. Nike, for example, has rolled out the concept of its Nike Plus trainers, which use a sensor to measure your mileage and display the information on an iPod, to all its new trainer designs.

French says her label, and others, will look into smart clothes once the market becomes stronger. "Smart clothes are currently more function than beauty. As concepts evolve, I'm sure we will see elements of smart clothing on the catwalk. They

### 'Top designers are now working with hi-tech clothes, so the high street won't be too far behind'

would need to be incorporated into beautiful designs to be taken seriously, but any good designer wants to keep pushing boundaries."

Usually, it's only designers at the high end who can afford to experiment with new, expensive fabric technologies. But their creations are imitated on the high street, where economies of scale bring down the cost. So the fact that designers such as Hussein Chalayan are working with hi-tech electronic clothes does suggest the high street won't be too far behind.

Over the next 30 years, Professor Black says, "we'll expect clothes to do more things for us. It's not all new technology: some of it's old with new things behind it. Now people understand more about the natural performance qualities of fabrics such as wool." But, she stresses, "it won't work unless it's simple. Gadgety things work very well for things that are gadgets: clothes have to perform like clothes. That's what people want." 



#### Walter Buchholz

Hooded drinking jacket (above)  
"The jacket has a vacuum space between the inner and outer layers so liquid moves freely down the sleeves and around the body."

#### Mikael Persson

FLATLITE® outfit (right)  
"This takes the idea of motion and light a step further by being part-made from electro-luminescent lamps."

