GENEVIÈVE DION

# Q&A Genevieve Dion
# The digital knitter

*Genevieve Dion works at textile engineering's cutting edge at Drexel University in Philadelphia, Pennsylvania. Ahead of the Smart Fabrics conference in San Francisco, California, she talks about knitting robots, permanently pleating silk and charging mobile phones from shirts.*

**How did you start out in fashion?**
Studying industrial design in San Francisco, I took a class in *shibori*, a Japanese technique where you bunch up a cloth and soak it with colour, like tie-dye. I had to develop my own equipment to fold the fabric so it resisted and absorbed dye in particular geometric configurations. This led me to explore fabric sculpting and seamless garments using woven silk from Japan. Seeking new modes of manufacturing became almost more interesting than the clothing itself.

**How did you begin to pleat silk?**
There are many industrial machines that produce perfectly pleated textiles such as the ones used for Issey Miyake's Pleats Please range of clothes. Inspired by the *shibori* process, I developed my own method of chemically scoring silk so that it retains texture without stitches. It is a trade secret, and labour-intensive, like giving silk a perm. Unlike the silk-pleating technique used by early

twentieth-century fashion designer Mariano Fortuny, our method is permanent. If the pattern relaxes, you throw the dress or scarf in the dryer and it comes out pleated again.

**What inspired you to make 'smart garments'?**
Haute-couture designers such as Hussein Chalayan along with some crafty do-it-yourself designers have incorporated electronic components into their clothes, turning them into expressive wearables that transmit, emit and communicate. But mass production hasn't been fully worked out. Issues such as the integration of flexible circuitry and adequate power sources have to be resolved to make wearable technology reliable and marketable. I wanted to rethink smart garments from scratch.

**Tell me about smart garments for health care.**
I came to Drexel for its fashion programme, but its medical and engineering programmes also wanted to design smart garments. I now work with a team of engineers and scientists. We have learned to speak a common language, although sometimes I

just have to make a prototype and give it to the engineers to analyse. The garments we are working towards will include wearable sensors to measure breathing, heart rate and other vital signs for easy monitoring of patients, or sensors that can detect potential hazards such as obstacles or harmful chemicals. The sensors will have to be almost invisible to allow people wearing them to blend in. This technology has the potential to convey critical information, including written and spoken reminders to a patient. We are also working on carbon-coated, conductive textiles for flexible energy storage, which might allow wearers to charge their cellphone from their shirt.

**And you've taken up industrial knitting?**
Knitting is versatile, and machines are already knitting clothes on an industrial scale. With a single piece of string you can make a garment in any shape. You can do rapid prototyping. There are carbon-fibre yarns, stainless-steel yarns, coated yarns, yarns incorporating LEDs: if we can knit the high-tech yarns into garments, we can mass produce these. And because knitted garments are made one at a time, there is the possibility of mass customization. A mechanical understanding is necessary, as with any craft, but the software gives you the power to visualize the resulting garment before it is made.

**What is next for you?**
I'm working with engineers to replace the metal and plastic shells of robots with protective, abrasion-resistant knitted fabrics. We call it 'soft robotics'. Knitting could also be a new form of industrial fabrication for internal components for machines. If my machine can make a glove with five fingers, or a dress with pleats and sleeves, then I can make many topological shapes with that same equipment. I did think at some point, wouldn't it be nice to knit heart valves? But when I saw that people were experimenting with 3D bioprinting them, I gave up the idea.

**Do you miss making clothes by hand?**
In the past I enjoyed making unique, intricate garments and accessories by hand, including commissions for the performers Tina Turner and Elvis Costello. Working with a knitting machine is a similar process, just using different tools. Despite automation it is still not possible to produce good work without a thorough understanding of the equipment and a feel for the materials. If we want, we can make limited runs of a given textile or colour, or engineer 'one of a kindness' into each garment's manufacture. So we can find new ways of using machines to offer the exclusiveness of handmade work. ∎

**INTERVIEW BY JASCHA HOFFMAN**