textile futures

fashion, design and technology

BRADLEY QUINN

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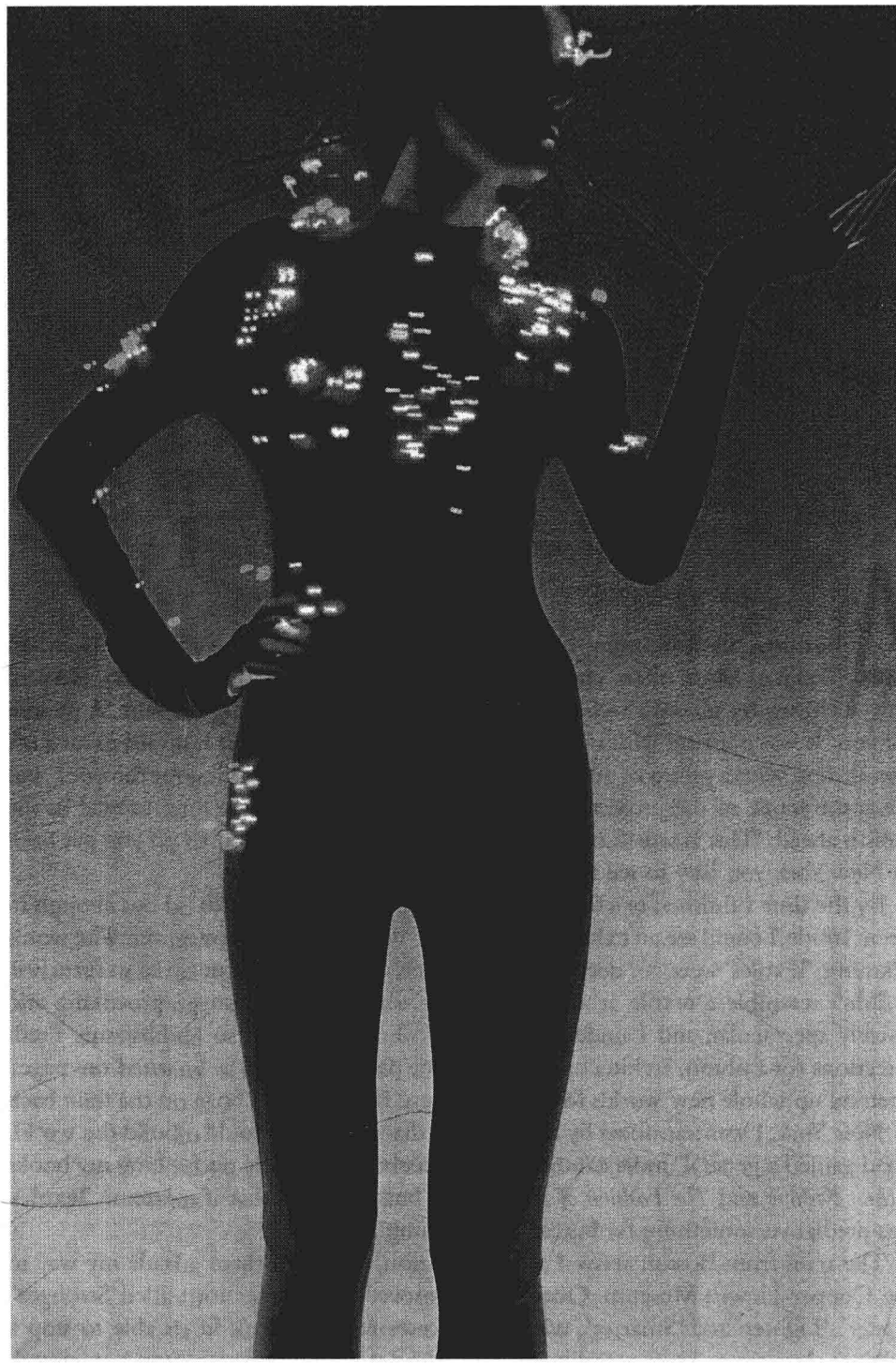
General Introduction

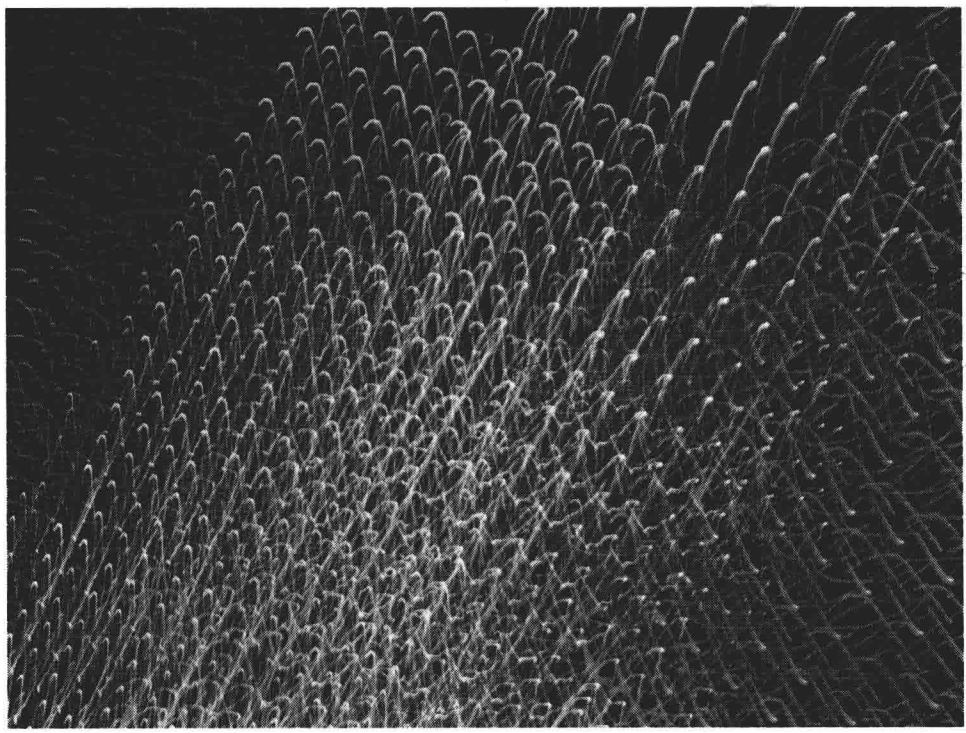
A burning, all-consuming interest in textiles was sparked in April 2005, when Toshiko Mori, then chair of the Graduate School of Design at Harvard University, placed a wet paper bag in my hands. 'It's a book,' she said. 'A present for you.' It was pouring with rain outside, and I had just arrived at Harvard to kick off a workshop with a group of architecture students. I thanked Toshiko for the book, but given the scope of the project, doubted that I would have much time to read in the month ahead. 'This is worth making time for,' Toshiko said. 'And when you get back to New York you *have* to see the exhibition.'

By the time I finished briefing the students, the paper bag had dried out enough to open. Inside, I could see an exhibition catalogue with a bright yellow cover. The words 'Extreme Textiles' were cut deep into the surface, spelled out in a material so futuristic it didn't resemble a textile at all. The subject was exciting, thought-provoking and visually spectacular, and I understood why Toshiko had been so enthusiastic. Fresh directions for fashion, architecture and interior design dawned as I turned the pages, opening up whole new worlds for textile design. By the time I boarded the train back to New York, I was transfixed by the thought that tiny fibres could rebuild the world. I had gained a general understanding of fibre technology while researching my books *Techno Fashion* and *The Fashion of Architecture,* but I realized that if 'Extreme Textiles' was predictive, something far bigger was looming ahead.

The train from Boston arrived at Penn Station, and from there I made my way to the Cooper-Hewitt Museum. Once inside, I moved through sections titled 'Stronger', 'Faster', 'Lighter' and 'Smarter', where showcases revealed sleek fibres able to stop a bullet at close range, hoist a satellite into orbit and withstand temperatures hot enough to melt steel. Lengths of shiny sailcloth cut sharply through the space, showcasing striking tri-axial weaves and criss-crossing strands of carbon fibres. The web-like,



Developed by Philips Design, the 'Frison' body suit uses biometric sensing technology to detect changes in the surface of the skin and trigger an LED visual output as a result.

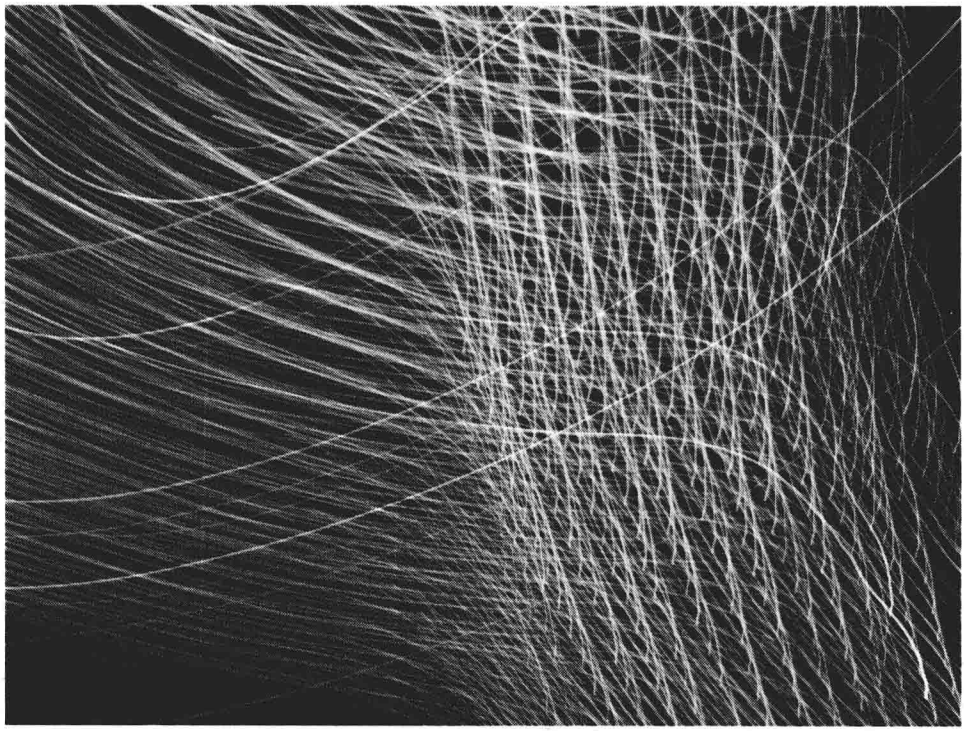


Electronic textiles rely heavily on fibre strength to create structures with specific architectures and properties. Strands of glass and polymer fibres are often used to transmit light and colour.

gossamer fabrics made to propel satellites took my appreciation of textiles to new heights, while car parts, industrial composites and ski helmets revealed that fibres are found in surprising places. Best of all were the medical implants—although normally sickened by the sight of blood (and terrified of needles), I gazed at these hand-stitched, embroidered body parts for a long time, and didn't feel ill at all.

By the time I left the exhibition, I could sense that my newfound passion would lead me to wider horizons. I was right. Margaret Helfand stepped forward to design the exhibition based on *The Fashion of Architecture,* which opened later the following year. As she and her team threaded steel cables throughout the galleries and wove them into display structures, I got to witness exchanges between textile techniques and cutting-edge architecture firsthand. Conversations with materials scientist Andrew Dent introduced me to some of the fibre forms and textile techniques revolutionizing product design. Chance meetings with 'Extreme Textiles' curator Matilda McQuaid and a lunch with Lars Spuybroek whetted my appetite for more knowledge within this exciting area.

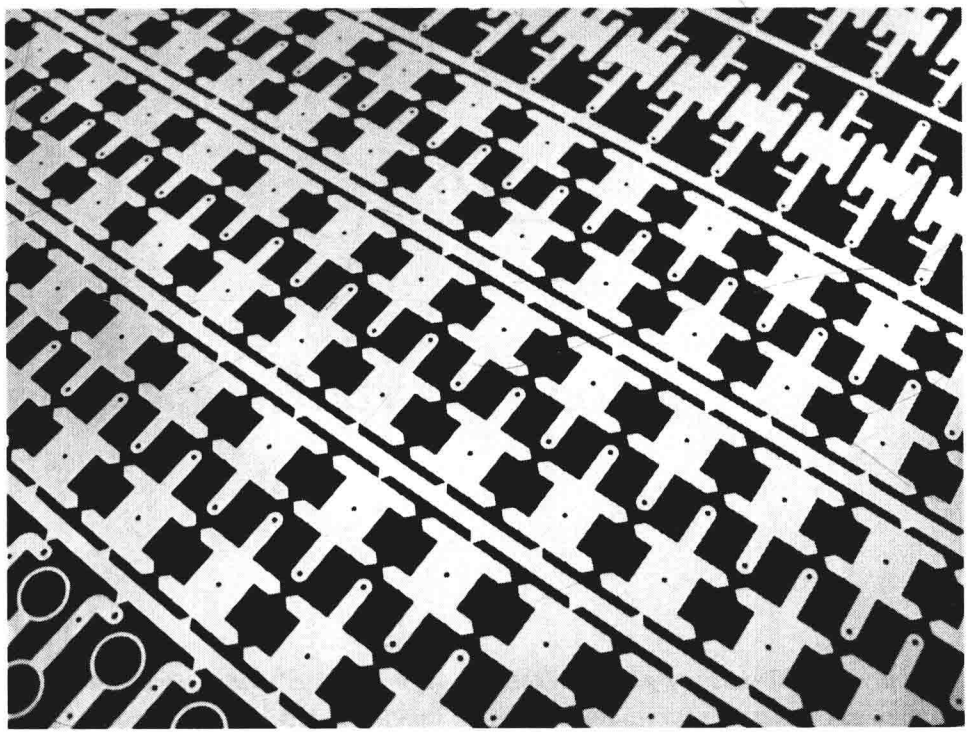
Luckily, some of the magazines I contribute to shared my enthusiasm, and as they published my articles, invitations to speak publicly about textiles began trickling in. In 2006, a project undertaken with the United Nations High Commissioner for



Technical fibres are designed to be electrically conductive, lightweight, flexible and strong. Their uses range from aerospace applications to computing devices, but they are gaining ground in fashion textiles too.

Refugees to write a report on the role of textiles and apparel in emergency relief enabled me to reflect on textiles' role within the emerging field of humanitarian design. Later the same year, Andrew Dent invited me to contribute to the book we called *UltraMaterials,* which challenged me to grasp the scientific and quantum mechanical principles underpinning fibre technology. In 2007, an invitation to contribute to *Contemporary Textiles* enabled me to explore recent textile practices in contemporary art. A proposal submitted to Laurence King Publishers resulted in *Textile Designers at the Cutting Edge,* a book that took me into the studios of leading professionals throughout the world.

Textile Futures reflects the research conducted for these articles and publications but also takes account of the feedback I received at my workshops and speaking engagements. It became apparent that designers and researchers wanted to voice their views, so I included interviews in the book to enable them to communicate with readers in their own words. Other texts survey textiles' changing roles in fashion, interior design, art and architecture and chart recent developments in material science, technology and medicine. Although readers are likely to have a general awareness of technical textiles, the book does not intend to alienate any who may not.



Metals such as silver, copper and nickel can be combined with technical fibres to create flexible, wearable substrates that conduct electrical signals.

Textiles are transcending their traditional functions, and *Textile Futures* centres around my conviction that they are morphing into uniquely tactile interfaces through which broader sensory stimulus can be perceived. Because fibres, fabrics and textile techniques are becoming seamlessly integrated with technology, textiles represent an interconnected collective that links many disciplines. Our world seems polarized around sensory extremes: hard and soft, protection and exposure, intransigence and tactility. As textiles embrace new types of fibres and fulfil new roles, they bridge these polarities better than any other material. Fibres are dramatically transforming the world around us, and as they do so, they also inspire radical new visions for the future.

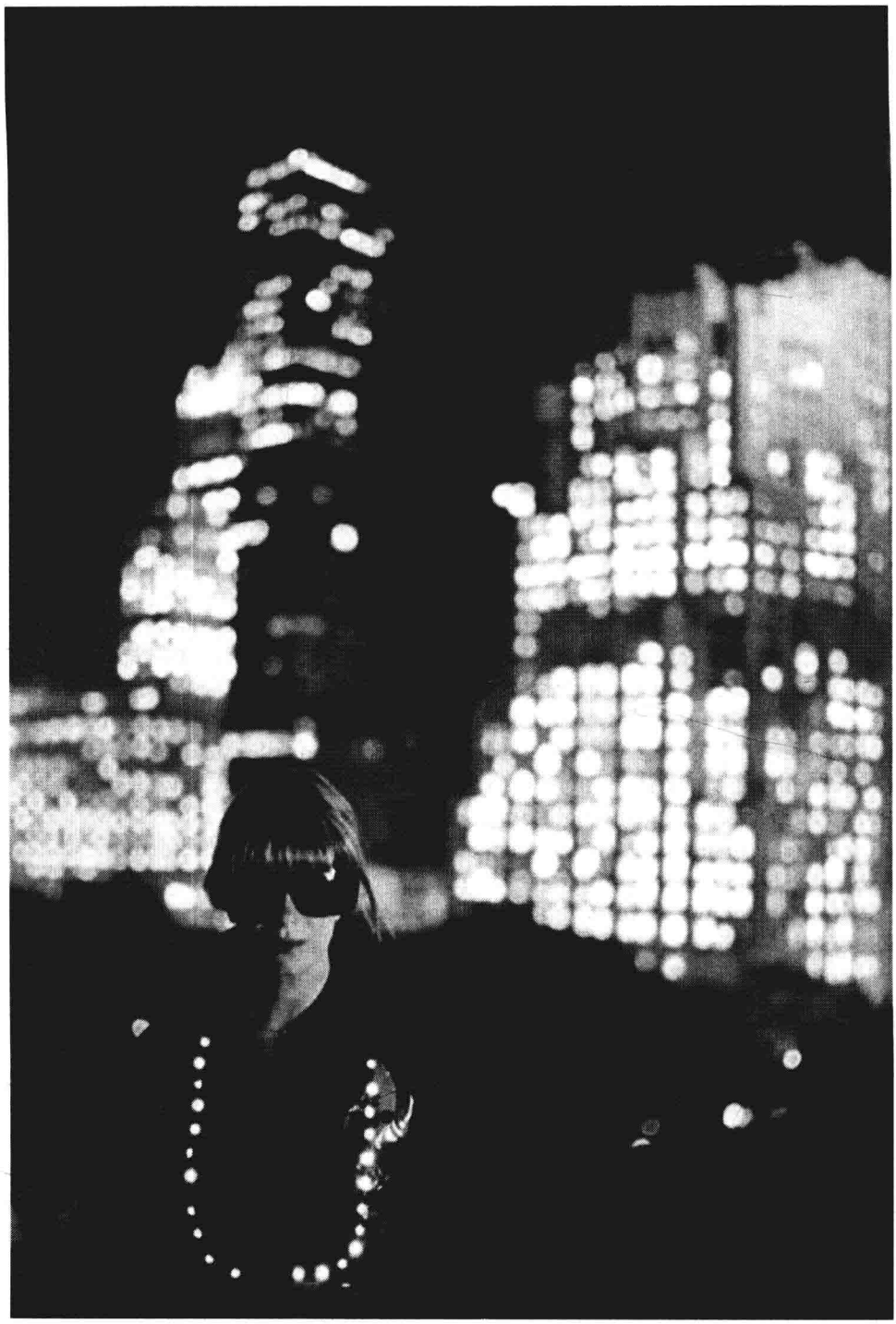
one

Body Technology

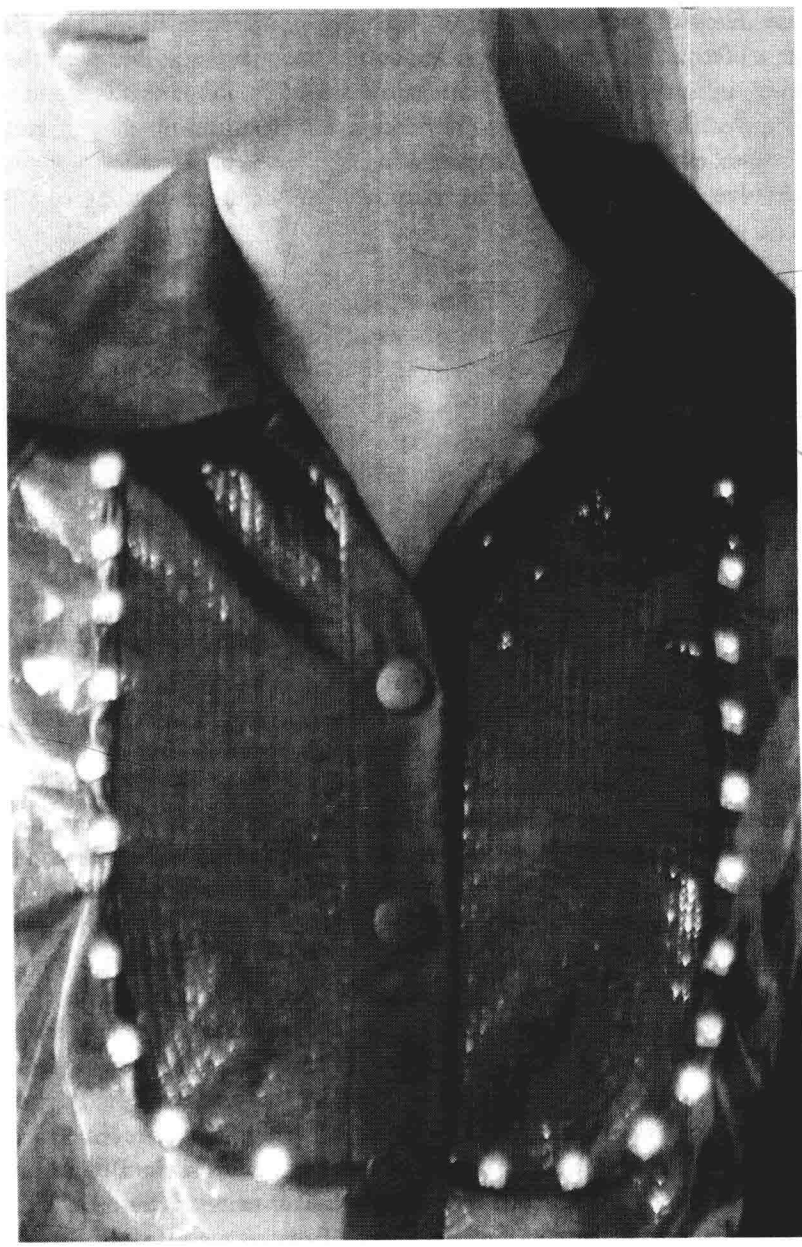
Visionaries know that the cutting edge of technology is not sharp, but sensuous and soft. As fashion textiles embrace technology, they give it a sleekly sculptural silhouette that fits the body like a second skin. Textiles are transforming information technology into wearable interfaces that integrate software, communication devices, surveillance systems and haptic sensors into fibre form.[1] New textiles are changing how the body interacts with its surroundings and how designers and architects are fashioning the built environment. And as textiles move forward now more dramatically than ever before, they reveal their capacity to transform the human experience more than any material ever has.

At first, integrating textiles and technology seems riddled with problems. Fabrics are usually perceived as flammable, vulnerable to water, impermanent and weak, while technology is equated with resilience, electricity and hardware parts. Although heavy-duty hardware and delicate fibres may seem irreconcilably diverse, technological advances are making each of them lighter in weight and sleeker in appearance. Fibre technology is one of the most advanced areas of material science today, resulting in high tech filaments refined enough to craft the couture garments of Parisian fashion yet strong enough to hoist a satellite into space. Twenty-first-century fibres are strong enough to create rigid, architectural components yet still soft enough to cradle a baby's skin. And while some of them look more like space age materials than conventional fabrics, many recreate the look and performance of traditional textiles.

Despite the high tech allure of futuristic fabrics, the appeal of natural fibres promises to endure. New generation textiles may surpass them in performance, but the fibres that have dressed the human race for several millennia have a feel-good factor that is likely to persist. Natural fibres are almost as ancient as the earth itself, and inextricably linked to humanity's long history. Fibres are nourished by the earth and



Angel Chang collaborated with engineers and interactive designers to develop a vinyl raincoat hand embroidered with conductive wire and battery-powered LEDs.



Chang used conductive X-Static silver fibres to make the raincoat illuminate, adding an unexpected element to the decorative trim.

nurtured by the sun, and their growth reflects the processes that sustain human life. Water, nutrients, sunshine and oxygen transform dry seeds into rich fields and sustain whole forests of fibres. Natural textiles bring nature's bounty to the artificial environments of man, where they provide reminders of our connections to the earth.

Because many of our earliest haptic experiences are fibre based, a single textile can evoke a lifetime of memories and sensations. Identifying a fibre with the fingertips provides unique physical and sensorial information about surfaces and textures. Touch is one of the earliest senses to develop, and its relationship to the development of other senses, especially vision, is generating new areas of research. As haptic technologies evolve, textile researchers are gaining a deeper understanding of why fibres hold eternal appeal.

Reverence for the natural has formed the basis for modern movements to slow down and rediscover low tech, Luddite approaches.[2] Advocates of such movements sometimes wear natural fibres and hemp-heavy fabrics to symbolize an alterative approach, or perhaps antidote, to modern technology. At a time when the textile is virtually indistinguishable from technology, making it a cipher for analogue forms is paradoxical. Technology pervades every aspect of the fibres' growth, harvest, production and manufacture, and the drive for efficiency continues to govern the wearer's experience also.

It is inspiring to discover that movements to slow down have impacted on textiles in unexpected ways, such as by encouraging people to be more aware of how they feel. As we begin to care more about feeling good, we seek the means to gain control over our emotions and boost our mood. Advanced textiles promise to do just that, by becoming somatic interfaces that can alter the wearer's emotional mood in a number of ways. Textiles promise to monitor mood and heighten awareness, administer medication, broadcast our feelings or dampen them, and transmit information about our well-being to the environments around us. Classifying textiles in terms of their emotional, sensory and empathic capabilities shows how far forward they have moved in a relatively short time frame. As the texts in this chapter reveal, textiles are moving beyond notions of embedded and electronic, and, subsequently, terms such as techno fashion, e-textiles and i-wear already seem out of date.

Electronic Textiles

Wearable technologies promise to transform the fashioned body forever. As technologized textiles redefine garments as mobile, networked environments, they anchor the cerebral world of intelligence to the intimate environments of the modern human. The exchanges between them are facilitated by fabrics woven from fibres capable of conducting electrical impulses and transferring information. Known as electronic textiles, the new generation of fabrics are fibrous substrates into which microelectronic components and connectors have been seamlessly integrated. As technical hardware and tactile textures become one, the fabrics that result are free from the bulky external components that make earlier generations awkward to wear.

Like computing devices, electronic textiles can relay information via conductors, switches and sensors and exchange signals with remote systems via transistors and woven antennae. Threads coated with metals such as silver and nickel make excellent

German designer Moritz Waldemeyer embedded thousands of LED lights into jackets for each of the four performers in the rock band OK Go. The illuminating jackets were among the first technologized garments seen in menswear and nearly stole the show.

conductors, and ductile fibres made from materials such as carbon, polymers and finely drawn copper sit snugly on the body. Advances in wire-bonding technology have resulted in electrically isolated wires encapsulated in polyurethane to eliminate bodily contact or friction with other fibres. Minute silicon chips and sensors can be downscaled to fibre-size and interwoven with plastic-threaded chip carriers and tiny flexible circuit boards. Like most types of programmable hardware, the networks created by these parts can sustain a range of software applications and easily adapt to changes in the computational and sensing requirements of an application.

Although high street fashion and high tech devices may seem irreconcilably diverse, electronic textiles were developed in order to integrate garments and technology. They have the drape, flexibility, and resilience of most fashion fabrics, and like conventional textiles, they can be engineered for desired resistance, thickness, density, weightlessness, porosity, surface texture and flame resistance. Whether sewn and stitched, bonded together or simply draped around the body, electronic textiles can be worn for everyday use. As fashion designers and technologists create garments from electronic textiles, they reconceive clothing as a system of active materials that has the ability to change colour, form and texture over time. At the same time, collaborations like these forge a uniquely neutral space as the traditionally feminine-gendered practices of garment making meets the previously male-dominated worlds of technology and material science.

The process of integrating textiles and technology isn't just surface deep; it actually begins at a molecular level. Fresh developments in molecular templating processes