techno textiles 2

revolutionary fabrics for fashion and design

Thames & Hudson

SARAH E. BRADDOCK CLARKE AND MARIE O'MAHONY

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Sarah E. Braddock Clarke and Marie O'Mahony

With 337 color illustrations

Thames & Hudson

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1 (half-title)
RYOKO YAMANAKA
Strata 2 (detail). 2001
see p. 23

2 (opposite title page)
SARAH TAYLOR
Rhythm & Blues (detail). 2002
240 (height) x 120 (width) x 15 (depth) cm

Interactive light-emitting material installation with sound. This is a sensor-activated piece which uses polymer optical fibre, coloured enamelled copper wire and polyamide monofilament together with sensors, a Midicreator © (York Electronics Centre), speakers, an amplifier and sounds (Immersive Media Spaces Ltd). Eleven woven optical fibre circles contain bundles of optical fibre. The main lighting creates pulsating polychromatic effects in blue, magenta and white. Interaction causes individual percussion sounds and illuminates the bundles. It is lit by two tungsten halide light projectors and light-emitting diodes (LEDs). This work was exhibited at the Jerwood Applied Arts Prize: 2002 Textiles at the Crafts Council, London.

3 (title page)
ANN RICHARDS
Pleat-Stripe. 2004

A softly pleated handwoven textile uses a yarn that is a blend of linen (87 per cent) and stainless steel (13 per cent) called Irony from Linificio e Canapificio. This is used with spun silk in the warp. The weft yarn is normal twist spun silk, but much finer than that used for the warp. The pleating in this fabric is caused by the weave structure, combined with the size relationships between the warp and weft yarns. Ann Richards uses a computer weave drafting programme to develop and visualize weave structures and then samples on the loom to assess the physical properties of various materials in different structures. The resulting textile has a unique texture and a temporary memory for further effects. It is intended for use in clothing and accessories.

5 (contents page)
SAVITHRI BARTLETT & KAREN SPURGIN
Detail of layers of laser-cut fabrics with sequinned embellishment
See p. 113

CONTENTS

PART 1
INNOVATIONS

1 The future of fibres and fabrics
Sarah E. Braddock Clarke
12

2 Electronic textiles
Marie O'Mahony
32

3 Engineered textiles
Marie O'Mahony
52

4 Textile finishes
Sarah E. Braddock Clarke
76

PART 2
APPLICATIONS

5 Fashion
Sarah E. Braddock Clarke
106

6 Design
Marie O'Mahony
136

7 Architecture
Marie O'Mahony
150

8 Art
Sarah E. Braddock Clarke
164

PART 3
REFERENCE

Glossary of Technical Terms
190

Biographies and Histories
192

Directory of Addresses
200

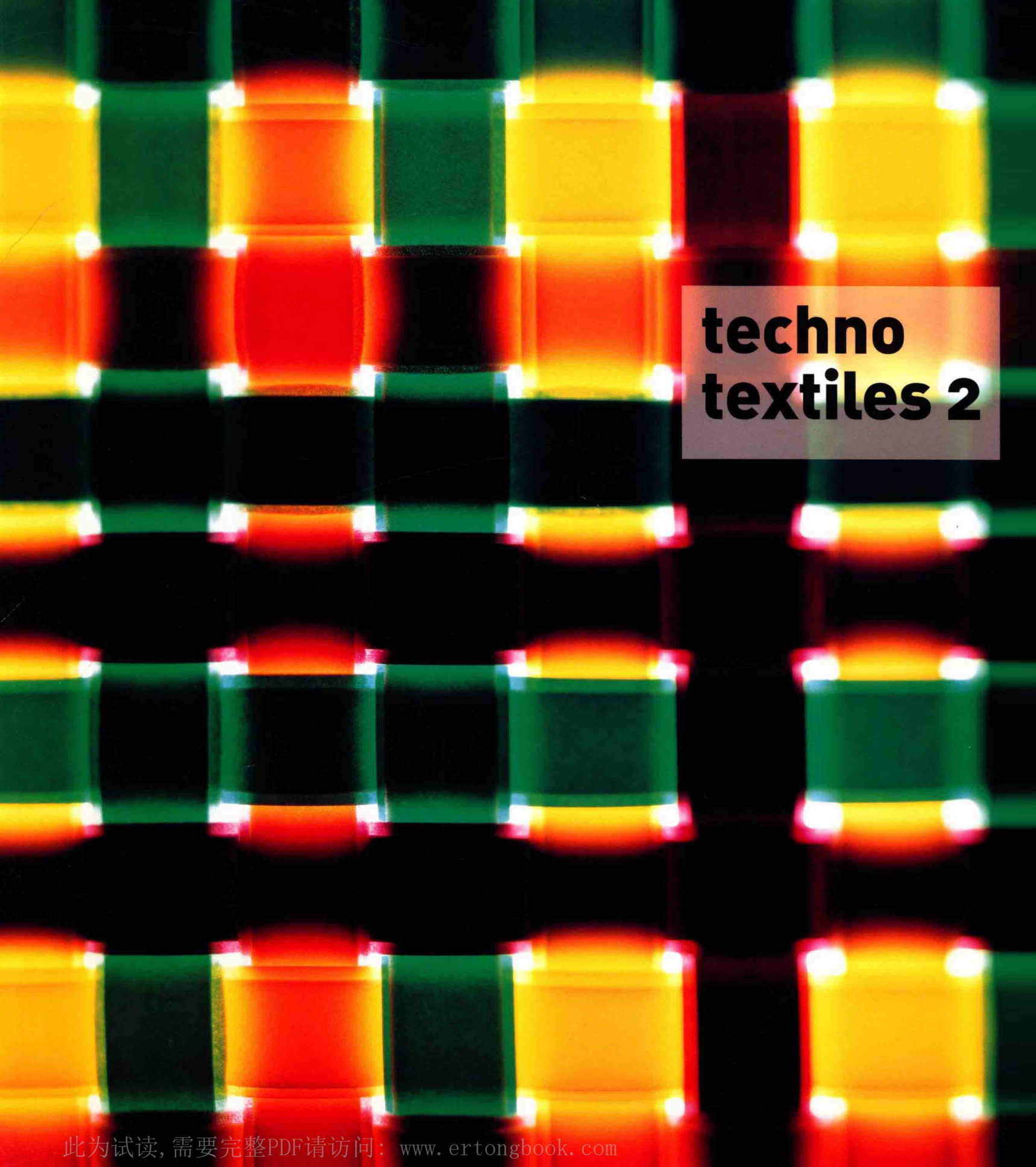
Exhibitions
204

Collections and Galleries
205

Illustration Credits
206

Bibliography
207

Index
208



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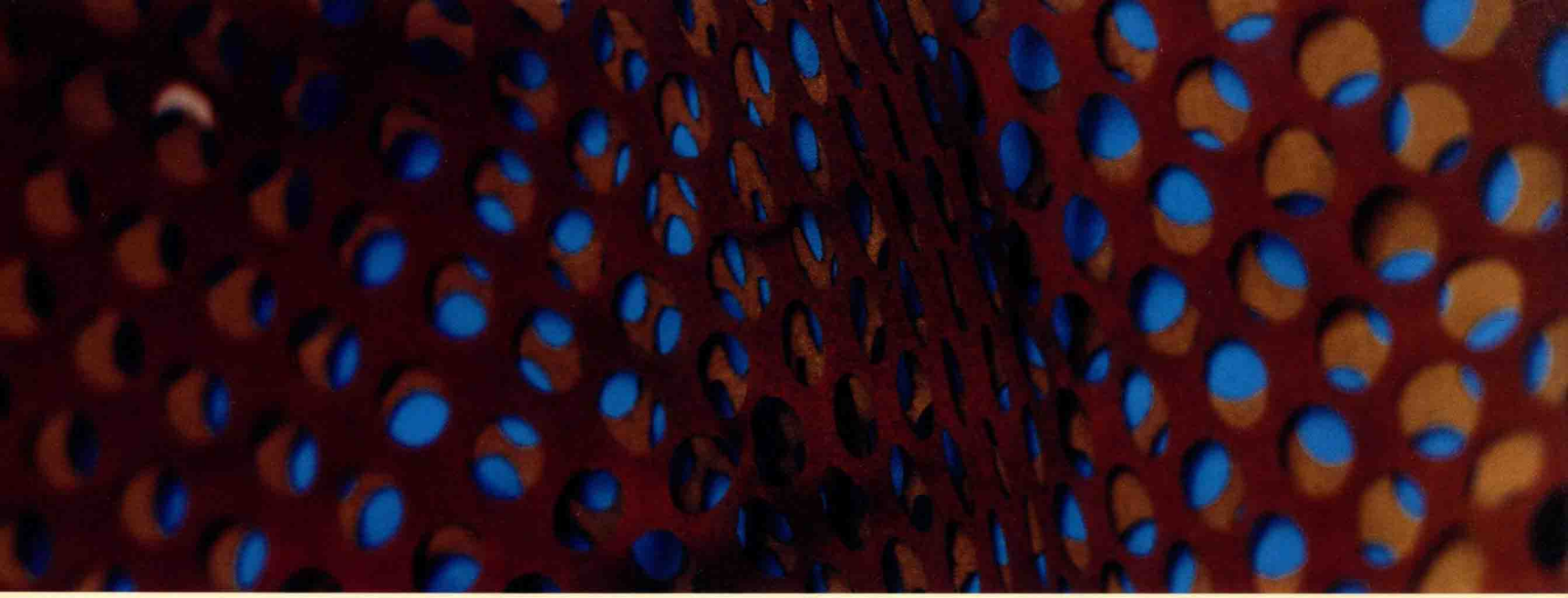
Bibliography
207

Index
208



Introduction

above and opposite below
SAVITHRI BARTLETT
Detail of layers of laser-cut fabrics

Textile designer Savithri Bartlett hand-dyed and laser cut 45 metres (150 feet) of fabric (opaque habotai silk and translucent resin-coated paper nylon) in seven colour ways for a collaborative garment (see p. 113) made for the exhibition *Great Expectations* in New York, October 2001 hosted by the Design Council, UK. Collaborators were haute couture designer, Deborah Milner and textile embellisher, Karen Spurgin. Savithri Bartlett found that cutting a series of holes and lines in fabric and offsetting them by less than 30 degrees creates a moiré effect. Using two to three bright colours further confuses the eye.

Never has there been a more exciting time to work with advanced textiles. There have been periods of great creative output, and also times of important technical developments, but what we are seeing in these early years of the twenty-first century is a combination of the creative and scientific as never before.

Since the first edition of *Techno Textiles* was published in 1998, much has changed. Many of the examples used in the original book were then only at research or prototype stage; others were limited to small or one-off production runs. Now we can follow their progress into reality. Techniques such as thermo-forming and three-dimensional weaving and knitting have become more widespread. There are even examples of fabrics produced using nanotechnology, something that was only talked about at the time of the first edition, while the issue of sustainability deserves more consideration. Included here are several new practitioners using sophisticated technologies, whose research indicates the future for advanced textiles. We have tracked down a huge number of fresh images (over 80 per cent are new since the first edition) and the text has been updated and revised throughout.

Part 1 of the book examines innovations in the world of textiles: how the latest textiles are dreamt up and made. The whole lexicon of what is and what is not textile is subject to debate. Practitioners are increasingly using combinations of textile and non-textile; mixing hard and soft materials to invent hybrids; and developing composites, where two or more materials are brought together to create a new one with enhanced performance characteristics. The term 'textile' has come to be applied to a whole host of media – not only those that are flexible, but also some that are rigid or with strength to match steel. The use of new textile machinery and processes for metal and ceramic means that we now see knitted metal and ceramic foam.

Fabrics are bringing the worlds of art, design, engineering and science ever closer. Digitizing construction and imagery, laminating and coating fabrics have become

the tools of the artist as much as the fashion designer and textile engineer. The results are dramatically different and impact on one another. Silicone, to take one typical example, was originally used as a purely functional coating to provide protection against the environment. It was simply applied as a uniform covering at the required thickness and was usually colourless. The textile designer, however, now adds colour and prints directly with the rubber instead, instantly giving it a visual appeal as well as fabric texture. Industry takes note and we see them add an aesthetic quality to the functionality already provided. The result: blue, red and yellow coated glass fibre.

Synthetics can now be made to take on a variety of guises. They can be heat-set, using their inherent thermoplastic properties, to create subtle changes in relief surface or even dramatic three-dimensional forms. A chemical finish such as dévoré can deconstruct a cloth to create a new and interesting surface. Many of the new finishing treatments, such as water-resistant coatings and holographic laminates, stem from advanced research into high-performance textiles. These have now filtered down and become available for applications from product design to fashion and interiors. Such sophisticated fabrics are judged on their own merits, unlike the early synthetics that were often seen as cheaper alternatives to silk. The new pliant materials demonstrate the extraordinary breadth of application of textiles today and in the future.

Technology and tradition can work superbly well together. Textile designers are continually taking traditional techniques and updating them to offer a new aesthetic. Some designers have a different approach, working with the latest digital technologies, lasers and ultrasound. These techniques usually signify large-scale production. It is precisely with this in mind that designers and artists choose to work with them. By adding handmade elements such as stitch or appliqué, the subversion of both tradition and technology is emphasized. There is a strong interest in collaboration between industry and craft: a number of initiatives in America and Europe have fostered a mutual respect and eagerness to learn from each other's working practice.

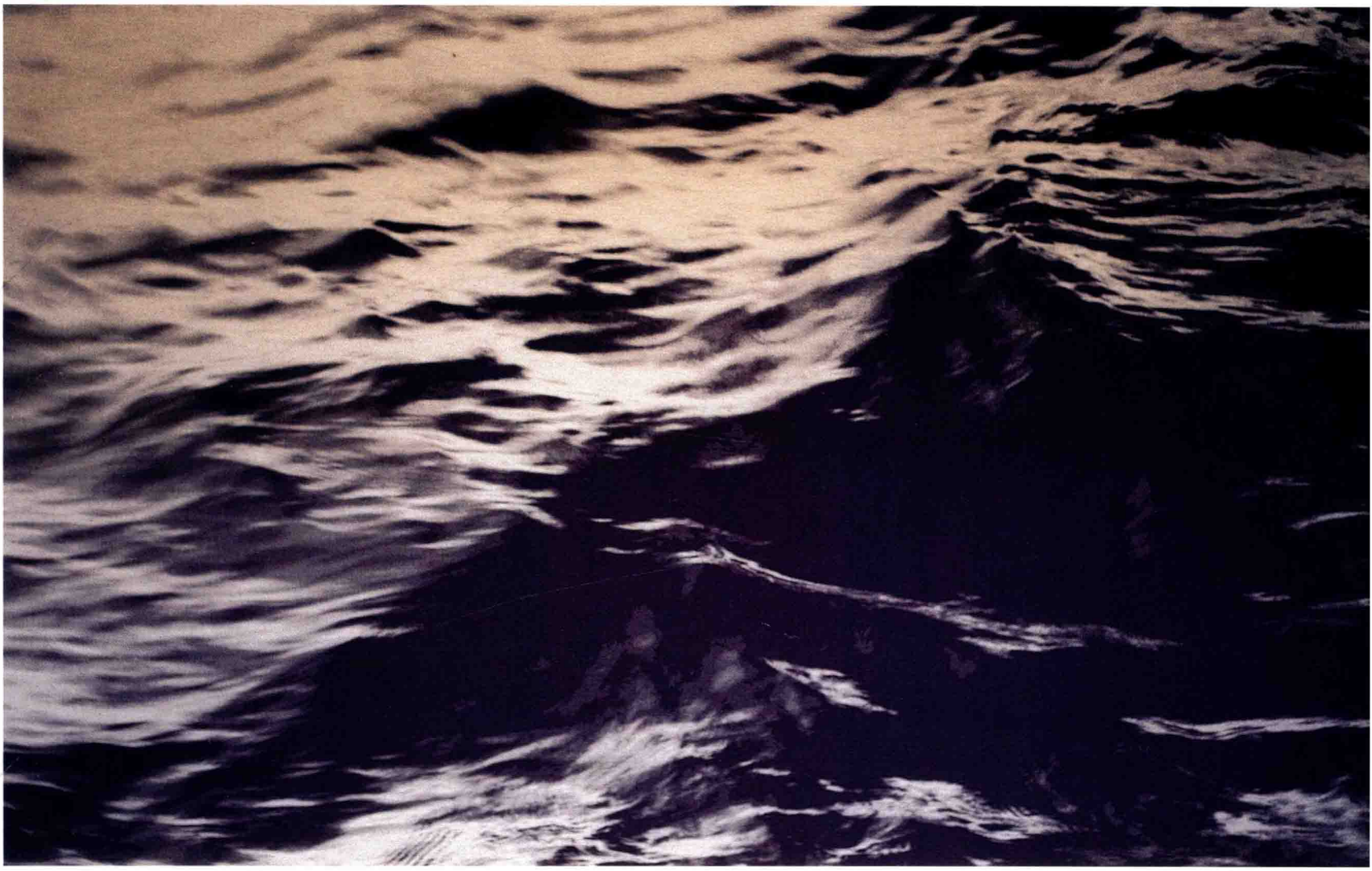
Part 2 of the book is devoted to looking at how fashion designers, product designers, architects and artists use these innovations. Most fashion designers are alert to the recent development in fibres and fabrics and the importance of the right choice for their collections. Techno textiles offer a look quite different to traditional, natural materials and do not work against them but alongside them instead. Many of the latest

right
PRADA WOMAN
Spring/Summer 2003

The drape and fluidity of cotton jersey is utilized here with a simple round-necked top and skirt with white applied plastic. The white-on-white theme emphasizes the textural effects and gives a sophisticated look.

developments have in-built performance characteristics desirable in professional sport; for fashion purposes, however, they will give a different look and expression of personal and contemporary style. Shown here is the work of several designers of fashion textiles and fashion designers who are known for their use of high-tech materials. It is increasingly apparent how interlocked the worlds of textiles and fashion are with many collaborations taking place.
Fashion designers might create the textiles themselves; others work closely with a textile designer who provides them with unique fabrics specially designed to be compatible with their ideas for clothing. Some might even have their collections sponsored by a large textile company. The shape of a garment is affected by the type of fabric chosen, and a pared down, contemporary silhouette can show the fabric off to advantage. The new ultra-stretch materials support, flatter and streamline the body and demonstrate their huge role in the world of fashion.

It is not only fashion designers who are making great use of the latest fabrics. Taking advantage of their higher performance and improved aesthetic, with greater accessibility to these materials, a new way of working means the designer is no longer an isolated individual, but one who calls on the input of manufacturers, engineers, craftspeople and artists as needed. The scientific community in Britain is also utilizing fibre and fabric expertise to demonstrate the potential of their technologies, in an ongoing relationship between textiles and science that is altogether appropriate in a country whose Industrial Revolution began in the textile mills. Today's architectural membranes are expected to be as reliable as conventional roofing structures, yet also be capable of innumerable variations. The challenge faces architects, engineers and membrane manufacturers. Single-skin temporary and mobile structures have given way to inflatable and more permanent examples. Artists are starting to use fabrics on a monumental scale



and work with architectural engineers to realize these ambitious new works.

Textile artists are experimenting widely with the latest technologies and using them as tools to make powerful comments on the world in which we live. Whether used towards an appreciation of nature or social comment, the concepts are as varied as the individuals: all the works shown here are engaged with new textile materials or textile techniques in various ways. Some embrace the latest materials, while others look to the processes to best communicate their ideas. Digital technology is especially favoured, either as a construction process with computer-aided weaving and computerized knitting machines or in the creation of a futuristic surface with digital printing. Since imagery can now be easily imported, manipulated and recreated, there are possibilities for an entirely new approach to materiality. The physicality of textiles is still a crucial element in the creative process and cannot be replaced with screen-based technology, but a real understanding of 'textile' together with comprehensive knowledge of computers is a potent combination. The recent methodologies are suggesting that we rethink our aesthetic criteria. What is beautiful? What is real? This book shows some of the newest ways of thinking, working and communicating.

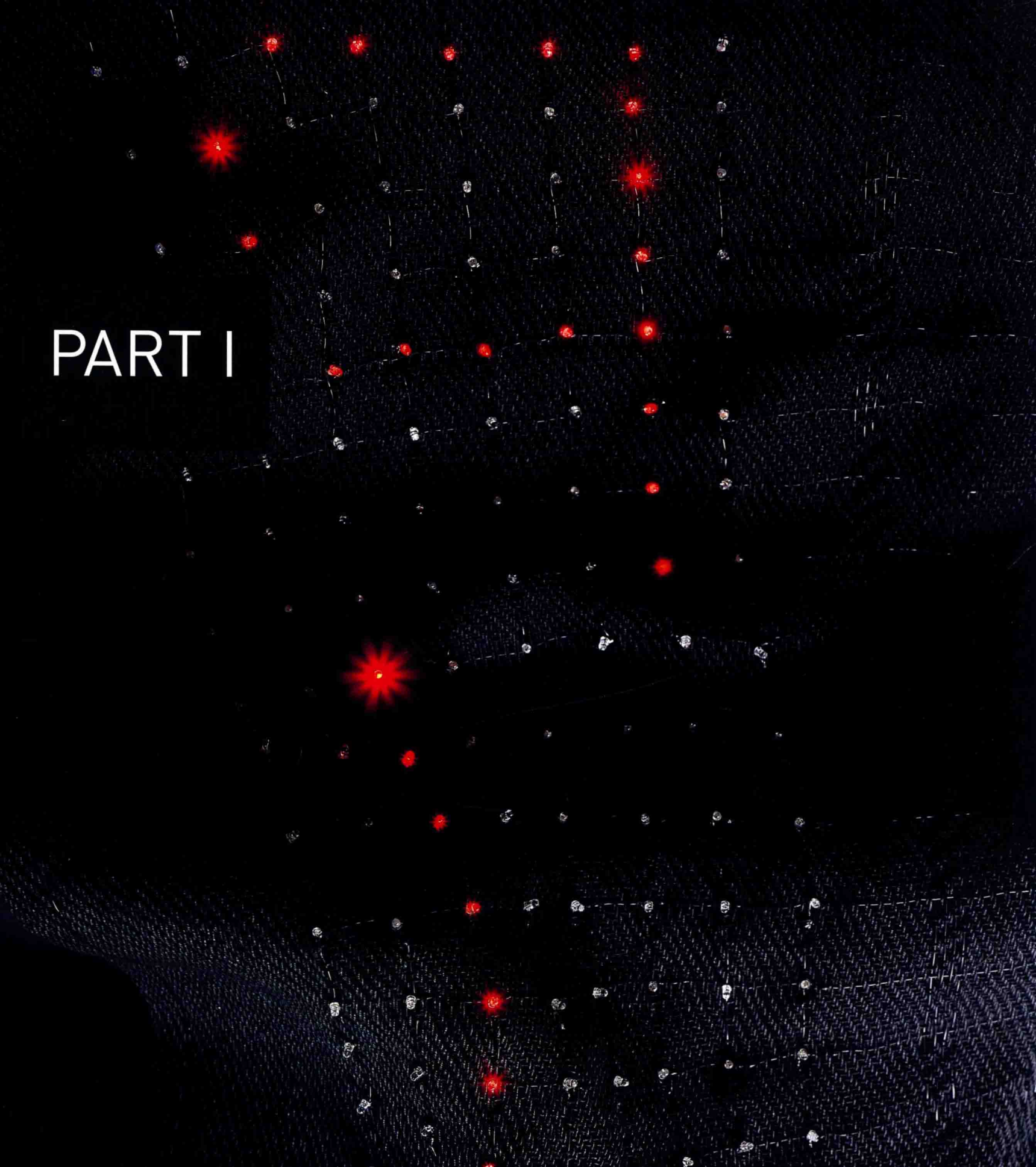
opposite top
ANISH KAPOOR
Installation in the Turbine Hall, Tate Modern, London. 2004

opposite below
MAHARISHI
Gorscuba Futura jacket.
Autumn/Winter 2001/2002

Maharishi Gorscuba, Futura jacket, in the reflective 'Fu Splinter' camouflage pattern. From Hardy Blechman, *DPM: Disruptive Pattern Material, an Encyclopaedia of Camouflage*, 2005.

above
SONJA WEBER
Untitled. 2003
185 (height) x 290 (width) cm

Cotton warp and viscose weft. Inspired by nature and here by the constantly changing appearance of the sea, artist Sonja Weber takes photographs and then reworks and elaborates upon her imagery in a textile CAD programme. She then interprets the imagery by weaving the textile on an electronic Jacquard loom. This can achieve a photographic realism due to its ability to control the lifting of each individual thread. Light, dark, shade, depth and movement are all beautifully captured in her poetic work.



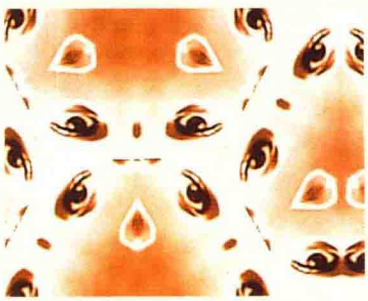
PART I

INNOVATIONS

1

The future of fibres and fabrics

Sarah E. Braddock Clarke



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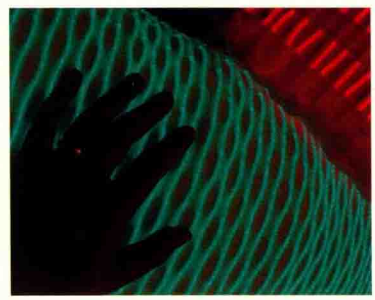
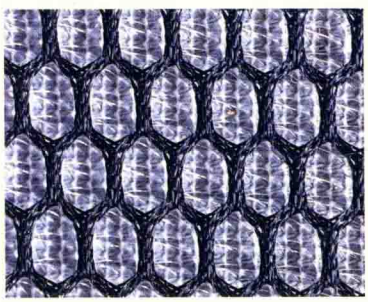
Electronic textiles

Marie O'Mahony





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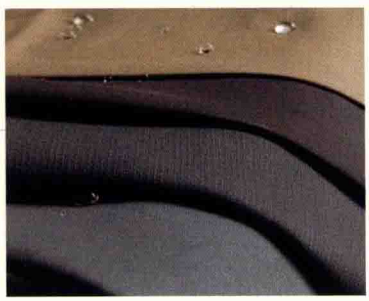
Engineered textiles

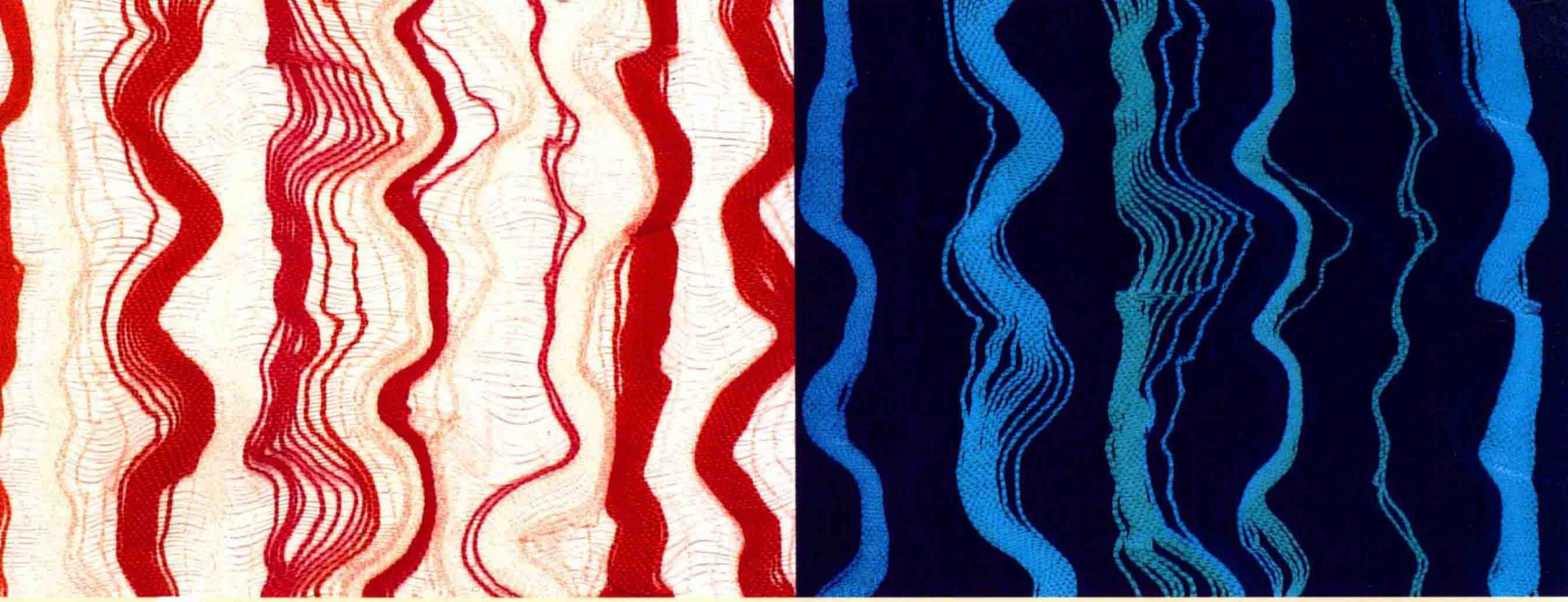
Marie O'Mahony



4

Textile finishes

Sarah E. Braddock Clarke



1 The future of fibres and fabrics

Sarah E. Braddock Clarke

SOPHIE ROET
Wandering Lines – Red. 2001
above left: in daylight
above right: glowing in the dark

Sophie Roet uses phosphorescent yarn (polyester/polyamide) in stripes together with brightly coloured silk in the warp. The weft is densely packed polyamide monofilament which gives an attractive crinkly texture. The look of this warp-designed fabric is very contemporary with its clashing colours. When shown to an intense light source for approximately two minutes, the phosphorescent yarn will absorb the light and glow in subdued lighting and gradually fade. Collection of the Victoria & Albert Museum, London.

right
PRADA WOMAN
Spring/Summer 2003

This top has a wonderful embossed shiny surface. It is teamed with shorts, both are trimmed with a technical material inspired by wetsuits. Accessories are a large plastic necklace and silver pointed flat shoes.

The future of textiles lies in the development of new fibres and fabrics. Recent advances have been truly innovative where aesthetic is as important as performance. Research into synthetics is crucial and there has been a huge change in the way these materials are perceived. Early synthetics often clung unattractively to the wearer due to static electricity, which also made the fabric collect dirt and pollution. The first chemically produced textiles were often uncomfortable as they did not allow the wearer's body to breathe. In comparison, highly sophisticated synthetics have none of these disadvantages and can create efficient barriers to rain, wind and snow while being totally breathable. Today's synthetics can be renamed to distinguish them from former inventions – for example, polyamide is often the preferred name for nylon.

Once developed to imitate natural fibres, synthetics with their unique characteristics are now being considered in their own right. The latest compare well with the best quality naturals, both in look and handle, and also bring with them super-enhanced performance. Synthetic filaments are produced by the extrusion of the chemical through fine holes. They are incredibly versatile and capable of being moulded into many different forms during the liquid stage of their manufacture. This flexibility means that fibres can be made to exact specifications. Some are ultra-lightweight and high-stretch, others are thin and light-reflective, while hollow fibres trap air to retain heat. A wide range of visual and tactile effects can be achieved. However, even when super-fine, transparent and fragile-looking, the new synthetics are still very strong, durable and easy to care for.

Natural fibres are often blended with synthetic to improve on performance qualities such as strength, crease-resistance and easy-care. Various combinations and percentages of blended fibres are tried: at least 50 per cent synthetic must be used if its properties are to be fully utilized, and in practice the percentage is often higher.

This chapter looks at some of the recent developments in the world of textiles and explores many in depth. From the latest ultra-microfibres and regenerated textiles to combinations of textile and non-textile materials, the new techno textiles are all designed to perform well, feel good and look beautiful. They offer excellent potential for sophisticated applications.

TRADITION AND TECHNOLOGY IN JAPAN

The world of textiles has a huge tradition and heritage from which to draw with inspiring examples from diverse cultures. Many textile practitioners think it is important to acknowledge this while also looking to the future. In Japan, where many exciting technological advances are taking place, an aesthetic pared down to its essence and a complete understanding and reverence for materials is intrinsic to Japanese craft. Unlike the West, the applied arts in Japan enjoy a high status equal to that of the fine arts. There, craft techniques, which enjoy an active rural tradition, are of major importance in developing and applying the new textile technologies. The result is that the traditional and the super-advanced co-exist in harmony.

Kyoto, once the imperial capital of Japan for over a thousand years (794–1868), has been famous for its textiles for centuries. Nishijin, an area of Kyoto, is particularly known for its woven fabrics, kimonos and obi. Following this tradition, today's fabrics from the Kyoto region combine handcraft with sophisticated materials and techniques. In this way textile traditions are perpetuated and often labour-intensive methods can be updated and their potential extended by using technology. Japanese textile designers are often pioneers in the creative and scientific field of textiles; they push the aesthetic and practical boundaries of physical materials with their experimental fabric technology. Respect for tradition and the appreciation of materials is reflected in their textiles by strong avant-garde fashion and expressive textile art.

Reiko Sudo is the main designer and director of Nuno Corporation, a textile company based in Tokyo. The word *nuno* means functional textile, and their aim is to create beautiful fabrics for the contemporary world. Nuno respect the craft traditions of textiles while simultaneously developing the latest technologies. The design team use computers and industrial methods to produce designs that often look hand-woven. Layered-weave structures made on computer-assisted Jacquard looms allow for intricate constructions and reversibles. The fabrics are unique and innovative, with a quality superior to most of those that are mass-produced. Yarns are selected which are often rough, slub or highly twisted for interesting looks and handles. Most Nuno fabrics are woven, a process which lends itself well to the creation of abstract visual patterns and due to the use of character yarns, the tactile interest is often integral to the structure. Diverse materials are employed, such as metals and papers in combination with silks and polyesters. Nuno textiles often combine textile and non-textile

below left
NUNO CORPORATION
REIKO SUDO (design)
Stainless Steel Sparkler. 1998

Stainless steel, cotton, polyamide and polyurethane. The stainless steel fibre was developed by a Japanese tyre manufacturer in 1996 to increase the strength and durability of their product. Here it is woven with cotton and polyamide to create a soft and flexible cloth. The small polyurethane content enables a stretch metal textile with sparkling highlights.

below right
NUNO CORPORATION
KEIJI OTANI (design)
Copper Quadrata. 1998

Cotton, copper, polyamide and polyurethane are combined to create a wonderful metallic surface. Polyurethane is used to coat the copper in order to prevent the metal turning green and brittle through oxidation.

Previous pages:
page 10
BARBARA LAYNE
Light-emitting diodes (LEDs) embedded in handwoven linen. 2004

The LEDs woven into the textile present changing patterns and are programmable with interactive capabilities that can be controlled through sensors. Barbara Layne draws parallels between circuitry and the warp and weft of weaving, as x and y co-ordinates. She is mainly interested in them being used in creative arts practice and while she recognizes their commercial potential, sportswear and medical use, for example, she envisages them as interactive costumes for dance, theatre and expressive gallery textiles. See also p. 27.

page 11
Chapter 1
(left) **NUNO CORPORATION**
REIKO SUDO (design)
Waterglass. 1997 – see p. 25
(right) **JAKOB SCHLAEPFER**
Luminoso – see p. 28

Chapter 2
(left) **VIBEKE RIISBERG**
Digital print – see p. 37
(right) **INTERACTIVE INSTITUTE**
Pillows – see p. 48

Chapter 3
(left) **HYBRIDS AND FUSION**
Spacer fabrics – see p. 71
(right) **HEATHCOAT**
Military knit – see p. 66

Chapter 4
(left) **SCHOELLER TEXTIL AG**
3XDRY finish – see p. 96
(right) **EUGÈNE VAN VELDHOVEN**
Laser cutting on acetate. 2000
– see p. 83