FASHIONING TECHNOLOGY
Supported by Raine Square
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Introduction

Mariella Harvey-Hanrahan, FCWA Executive Board Member

Fashion, in the forms that we wear today, may soon become a thing of the past. I used to think that conductive threads, stretchable sensors and flexible circuit boards were hallmarks of the electronics industry, but in the hands of some of WA's most visionary designers, they are the raw materials for the most cutting-edge garments created today. These designers are active in the field known as 'wearable technology', and many collaborate with technologists and researchers around the world to design garments that are interactive, inter-connected and part of the Internet of Things.

While none of us can forecast exactly how the industry will evolve, we do know that future fashions will reflect the participatory, networked societies in which we live today. Tech-fuelled fashions make it possible to share experiences online and manage real-life meetings from a virtual platform. Not only are interactive technologies changing the ways in which garments are designed and worn, but also radically reforming the way fashion is manufactured and sold. I’m told that in future, some garments will be co-designed by their wearers and even manufactured by consumers themselves using 3D printing technologies at home.

Fashion is increasingly being recognised as one of the most innovative fields in the application of new technologies. To me, one of the most inspiring things about wearable technology is that the designs can make a profound difference to the wearer’s lives. Some garments can help treat illness by delivering medication through the skin, while others can monitor the wearer’s health or play an active role in pain relief. It is exciting to know that fashion will one day play a role in the wearer’s well-being, helping them lead healthier, happier lives as a result.

The Fashioning Technology exhibition is supported by Raine Square as part of the Telstra Perth Fashion Festival's calendar of events in 2016. As Fashioning Technology signposts fresh directions in fashion and showcases examples of research and development within the WA fashion industry, it also presents designs by some of the most visionary designers in the wearable tech field, placing fashion innovation from WA in an international context.

Thanks to support from Telstra, visitors can use tablet computers to explore the research and development that went into some of the garments exhibited and see how they work in practice.

I hope you enjoy your experience at the 2016 Fashioning Technology exhibition!

Mariella Harvey-Hanrahan launched the annual Perth Fashion Festival in 1999, having previously served the WA fashion industry as a writer, editor, stylist, buyer and agent. Mariella contributed to publications such as Daily Mail Australia and Western Mail and was a columnist for New Idea magazine. She founded the award-winning Bridal Options magazine in Perth, which was subsequently launched as a national publication. In 1997, Mariella established the WA Fashion Design Awards to pay tribute to leading designers and acknowledge new talent in the industry. Ten years later, Mariella founded Perth Fashion Concepts Inc (now Fashion Council WA) and continues to contribute to its growth and expansion as she leads the Telstra Perth Fashion Festival as its Creative Director. Today, Mariella works collaboratively with board members of Fashion Council WA and the Telstra Perth Fashion Festival to further develop WA's fashion culture, and enable local designers to reach new markets overseas.
‘Fashioning Technology’ brings together work by makers who are addressing the challenge for a more humanistic approach to the design of wearables; creating a new aesthetic enabled by the integration of digital technology to garment and exploring the potential for new materials to enhance end user experience and wearability.

Since Steve Mann first donned wearable wireless devices in the 1980s artists and designers have been fascinated by the possibilities for the integration of new emerging technologies into garment. The concept of ‘wearables’ developed in the late 1990s described the integration of digital technologies and new performance based materials into wearable forms. This was seen as the bright new future of fashion however according to Forbes magazine the failure of wearables to meet expectations and their full potential has been a design problem (Sharma 2014). A review of the current commercially produced wearables reveals a predominance of ‘gimmick’ based technical devices such as interactive watches, bio system monitors and glasses. According to Mona Bjoor, American fashion entrepreneur and CEO of JOOR, it is a market driven by the “popularity of exercise culture” with the majority of wearables limited to short term consumer value (Bjoor 2016). Designer Hartmut Esslinger who was responsible for the development of the ‘Snow White design language’ for Apple, believes that in relation to wearable technologies “designers have to think of humanistic concepts” (Borison 2014).

Designers and makers working at the cutting edge of innovation are early adopters of new materials and technologies. However these new media present challenges that require new approaches to design. Oscar Tomico and Danielle Wilde suggest that “[e]ngaging directly with materials, body and context to meet and recognise the challenges that come up as opportunities, and develop rich, unexpected responses” (2016, 15). ‘Fashioning Technology’ presents an international profile of some of the designers exploring new ways of working that meet the challenges and realise the possibilities of working with new materials and technology.

Sustainability

A key focus for many of today’s designers “is to critique the present fashion system with its consumerism and its excessive and barely sustainable production methods and to embrace new technologies, resulting in new ways of imagining fashion” (Teunissen et.al. 2014, 14) Investigations into sustainability, value and performance of wearables is presented in this exhibition through the work of Jasmine Neilson working in collaboration with Nanollose Microbial Cellulose (NMC). NMC is a Western Australian company producing one of the newest natural bio fibres developed from the waste materials from beer and wine production. While still a fashion student at Curtin University, Neilson has established a relationship with NMC and is working with them as part of her research into sustainable design.

Sustainability is also being investigated via the application of 3D printing technology. This medium not only presents new design potential but also the opportunity for significant reduction in manufacturing waste.
Craftsmanship and the Human Experience

In the essay ‘Materiality and Experience’, José Teunissen comments on how significant ‘craftsmanship, the way a garment is made, the quality of its construction and the physical experience of wearing it...’ has become part of contemporary fashion practice (2014, 23).

The University of Technology Eindhoven (UT/e) has played a key role in the establishment of research into wearables and is recognised internationally as a leader in humanistic design. Designers are looking to use technology to resolve real health issues for the wearer. Designers working at UT/e investigate therapeutic wearables to treat a variety of physical ailments, including pain, sports injuries, and bone density loss.

Craftsmanship has become even more important in the context of wearables designed to enhance health and well-being. Comfort and wearability are significant factors in garment design and construction with components and conductive threads requiring careful hand stitching into place. Works such as ‘Well-be’ and ‘Vigor’ and ‘Sun Smart’, demonstrate the importance of traditional craft practices in the creation of wearables designed to enhance the wearer experience.

Increasingly teams of designers and technicians are working closely together to ensure that function, comfort and aesthetics are all addressed while creating innovative market solutions to design issues.
Aesthetics of Technology

The integration of new materials and technologies into wearables has created challenges for designers that requires a diverse skill set to ensure that both technical and aesthetic requirements of the garment are met. A new kind of craftsmanship blending materials knowledge with technical understanding has been central to the establishment of a more refined aesthetic found in this new generation of ‘wearables’. Fascinated by the potential for the integration of circuitry into clothing, Clara Daguin explores the aesthetic potential of technical components themselves. A young designer who has already accrued experience working for major international fashion labels Margiela, Alexander McQueen, Hussein Chalayan and Iris van Herpen, her work signifies the establishment of a craftsmanship of working with new materials and technologies that was not evident in early explorations into ‘wearables’.

Montréal based artist-designer Valérie Lamontagne is owner of 3lectromode, a wearable electronics atelier. Her work in the exhibition Strokes & Dots [3S&D] have a series of embroidered LEDs and motion or light sensors that respond to the wearer’s movements, or to light fluctuations that create the potential for the wearer to manipulate the aesthetics of the garment.

Bradley Quinn and Marie O’Mahony are recognised for their investigations into the potential for design solutions for sport/fitness, work/safety wear and health/wellbeing through the application of integrated digital technologies and new materials. Both identified design innovation as the key component in the development of successful products for these markets. Fashioning Technology profiles some of the recent innovations from across the globe as evidence of new design developments in this field and evidence of a new design framework that is improving the design process, creating a new aesthetic and facilitating innovative sustainable design solutions.
Anne Farren is a Senior Lecturer at Curtin University and heads the fashion program. She is an educator, researcher and curator in the fields of fashion and textiles. Over the past twenty years Farren has been responsible for the development and curation of a series of textile and fashion projects and exhibitions exploring the relationship between garment, cloth and the body. Most significantly she was co-convenor of the Textile Exchange Project, thespacebetween Conference & Exhibition, and curator of Ruth Tarvydas and Beyond Garment. These projects have contributed significantly toward the expansion of fashion and textiles in Western Australia.

References


The Wearable Future

Bradley Quinn

For those who are ready to embrace the future, the prospect of wearing technology is as exciting as it is terrifying. From the moment computing revealed its potential to become a wearable commodity, the seemingly disparate worlds of electronics and fashion collided. Scientists and technologists began embedding garments with hardware, and created fibres made from conductive materials that could transmit data digitally. Early technologised garments were bulky and uncomfortable to wear, and often powered by unsightly battery packs that were too big to conceal within clothing. The fashion world took one look and backed away, leaving the IT geeks to fend for themselves. So when the techies designed portable devices instead of clothing, carrying technology rather than wearing it became the norm.

This unofficial stand-off gave way around 2010, when the consumer electronics industry woke up to the fact that colour trends, fashion styles and seasonal production cycles could make their devices more desirable. Computer companies initiated collaborations with designers with the intention of shaking off the geekie hardware look, paving the way for tech start-ups to make electronics look sexy, stylish and comfortable to wear. By the beginning of 2015, the fashion-tech start-up scene was booming, and beginning to launch products that bridge the gap between the two industries.

Right now, technology is sparking revolutionary, earth-shattering changes in every aspect of the fashion industry. Parametric design programmes, evolutionary algorithms, advanced imaging technologies and artificial intelligence can radically disrupt clothing design, while 3D-printing, synthetic biology and biotech have the potential to create a new production paradigm.
Surface technologies are enabling garments to light up, change colour and display data, while biometric sensors, bio-ink and haptic devices monitor health and detect emotional states, and can even share them with other wearers.

Hi-tech accessories, such as smart watches, wristbands, activity trackers and sensor-enhanced shoes are quantifying our every movement and cuing us to move closer to our goals, giving new meanings to everyday routines. Technologised eyewear can retrieve data, take photographs and display images and films, providing a practical 'hands free' alternative to touch screens. Immersive media such as Augmented Reality and Virtual Reality are migrating from clunky headsets to sleek eyewear, merging virtual worlds and real life experience.

Technology will even change our relationships with the brands we wear. Many consumers connect with their favourite labels by using social media, but in future, they will use avatars to interface with the brands online. These digital counterparts will join fashion shows, travel to virtual destinations and try on virtual clothing. Avatars will relay data to haptic feedback loops embedded in real-life garments, enabling consumers to feel how they fit as their personal avatars try them on.

As wearable technology offers the possibility of interactions such as these, fashion will assume compelling new forms. While the wardrobe of the future promises to facilitate a wide range of utopian ideals, it is likely to lead wearers into a dystopia of unlawful surveillance and intrusive social control.

**Sensory Skins**

The human body has an array of biological sensors to process information about how we feel and relate to the world around us. Sensors embedded in fabric function similarly, converting pressure, temperature, speed and movement into signals that can be read by software. Integrated into clothing, sensors provide the body with a layer that mimics some of the performances of skin. As they monitor our vital signs and actions, sensors can detect emotional states such as fear, happiness and anxiety, or recognise actions and movements.

Wearable biometric systems are comprised of sophisticated sensors, accelerometers and GPS trackers that record weight, activity levels, exercise and work habits. Sportswear brands, such as OM Signal, have made biometric technology wearable, washable and rechargeable.

Biometric technology will eventually filter into the everyday wardrobe, making the recording and analysis of personal data easier than ever. When that happens, our relationship to fashion will change dramatically.
Today, the choice of garments typically reflects the wearer’s identity, reflecting body shape, social status and personal style. But as they become a source of data that can be analysed and compared with others, consumers will expect clothing to validate their lifestyle choices in new ways.

Motorola’s customers can now wear a digital device resembling a transfer tattoo that is recognised by the wearer’s smart phone and unlocks it. The popularity of the device shows that consumers are comfortable with wearing an electronic film against the skin for weeks at a time. Researchers at MIT’s Media Lab recently designed a more sophisticated version of the digital device in the form of the DuoSkin temporary tattoo. The researchers created five models made from conductive metals that can interact with electronic circuitry, giving wearers new ways to control smartphones, computers and other devices without actually touching them.

Data and the Digital Self

Wearables bring technology closer to the body, creating a peculiar intimacy between the human and the machine. The biometric technology that sportswear manufacturers are beginning to incorporate into garments and footwear is already creating a new dimension of self-awareness and wellness tracking. Similar sensor networks could be incorporated into everyday clothing, using biofeedback to detect when the wearer is agitated, frightened, needs assistance or rest. As they recognise personal stress triggers, they may be able to help the wearer cope by cuing them to modify their behaviour.

Researchers and developers claim that wearable technology can be taken a step further, attaching to the surface of the body to become a part of it.
Google unveiled a tech-enhanced prototype contact lens that tracks blood glucose levels in the fluid around the eyes. While the device is designed to provide diabetics with a method of monitoring blood glucose, it reveals the potential to wear micro-circuitry in the eye. Californian start-up BiteBite created a wearable device that tracks and analyses eating habits, using sensors to measure bite count, number of calories consumed, and the speed and quality of chewing. Fashioned into a device that resembles a hi-tech hearing aid, it is worn inside the ear.

Electronics manufacturer Intel sponsored a project to develop sensor-enhanced artificial fingernails, which could give female consumers new levels of interaction as they engage with touch screens. The appeal of devices like these, along with those worn in the eye and ear, reveal that consumers are open to wearing technology in proximity to the body in potentially disruptive ways. Some researchers believe that implanting microchips beneath the skin may be the next step, and claim some consumers would consider implants to be less intrusive than contact lenses or artificial fingernails.

Today, technology is advancing at an incredible pace, innovations that seem out of reach right now may take hold much sooner than we think. The processes and materials required to make technology wearable bring risks and uncertainties, potentially causing serious health issues and compromising the wearer’s right to privacy. These concerns and others need to be addressed by practitioners in both fields, and eventually regulated by a public authority. Body-based electronic systems need to be tested and assessed, and once they have, designers will finally have the green light to create the tech-fuelled wardrobes of the future.
Bradley Quinn is an author, academic fashion industry strategist and is an expert on wearable technology and emerging trends. His work introduces fashion and sportswear brands to advanced materials, new product types and long-ranging trend concepts. Bradley directs his own consultancy in London and carries out research projects with laboratories and specialist institutions. He has written 15 books, including Techno Fashion, The Fashion of Architecture, UltraMaterials, Textile Futures, Design Futures, Fashion Futures and Textile Visionaries, each presenting inspiring visions of fashion’s emerging future. Bradley has previously curated exhibitions at the Museum of London and Docklands Museum in the UK, and at the Center for Architecture and the Pacific Design Center in the US. Bradley also lectures at universities around the world, including the University of Linz (AT), Sandberg Institute (NL) and Shenkar College of Engineering and Design (IL).

References


Wearable Tech

Wearable technology will enable the garments of the future to be more in tune with the environment, and will allow the senses to play a greater role in everyday experience than they do today. Humans perceive the world through sensory input, and future garments will have the ability to heighten our perception of our bodies and the environments in which we live. Tech-fuelled fashions enable the wearers to communicate, share experiences, monitor their health and light up the world around them. The designs featured here showcase some of the new directions shaping fashion’s future.

Phototrope
Pauline van Dongen

The Phototrope sports top automatically illuminates to compensate for decreasing light levels. Flexible prismatic foils (made of thermoplastic polyurethane) sewn onto the garment refract the light emitted by LEDs embedded in the fabric, casting a shimmering glow as the athlete moves. As a result, the sports top improves the visibility of the athlete, increasing their safety and boosting their performance when training at night. Each sports top can be individualised, enabling a trainer or coach to assign a specific light pattern to each member of the team, making it easier to monitor their performance in the dark.

Phototrope has been developed within the ‘Crafting Wearables’ research programme, an initiative established by SLEM Waalwijk, ArTEZ University of the Arts and Eindhoven University of Technology with support from Phillips Lighting, Schoeller Textiles and bywire.net

Sporty Supahero
Wolfgang Langeder

This award-winning sports jacket was designed to make the wearer more visible when cycling at night. The jacket contains a wearable electronics system, which includes LEDs, sensors and a rechargeable battery. The jacket also detects the wearer’s movements via sensors and responds by cueing the LEDs to flicker to signal left or right turns. The electronic components were specifically engineered to be lightweight and flexible, stretch with the fabric and flex with the wearer’s movements. Each component is encapsulated to render it moisture-resistant, making Sporty Supahero easy to launder.
Be-tween
Leonie Tenthof van Noorden, Pauline van Dongen and Troy Nachtigall

This 3D-printed shoe is part of an outfit designed with generative design software such as Rhino’s Grasshopper editor, Cinema 4D, MeshMixer and Meshlab. The software uses algorithms to generate patterns and structures, which the designers combined with a body scan of the wearer to create a made-to-measure outfit. The digital files were then sent to a 3D printer, where the shoe was produced by building layers of flexible filaments fused together into a seamless structure. 3D-printed accessories like these can be produced with conductive materials, making it simple and easy to produce Internet of Things-enabled fashions.

Be-tween has been developed with the support of the ‘Crafting Wearables’ research programme, an initiative established by SLEM Waalwijk, ArtEZ University of the Arts and Eindhoven University of Technology.

Clavicle
Clara Daguin

This elegant, illuminating ensemble entwines textiles and tubes, is embroidered with conductive thread and powered by soft technological components. Clavicle was crafted in Paris, where couture techniques were used to connect electronic circuits with luminous tubing integrated into the sleeve. A groundbreaking garment, Clavicle is one of seven sensory fashion designs made for the acclaimed Body Electric collection. Some of them position integrated sensors near the collarbone (hence the name ‘Clavicle’) where they monitor the heart and cue the illuminating materials to pulsate in sync with the wearer’s heartbeat.
Strokes&Dots
Valérie Lamontagne

Inspired by the representations of speed depicted by early Modernist artists and designers, Strokes&Dots is a five-piece capsule collection created with digitally-printed silk textiles, embedded sensors and colourful LED arrays. Each garment explores different elements of pattern-making, juxtaposing colourful prints with panels that produce light effects. The sensors are programmed to respond to the wearer’s gestures by triggering the LEDs to flicker as the fabric moves on the body. The LEDs light up in a variety of patterns, which either spiral around the wearer’s body, or zigzag across the garment’s front.

The Strokes&Dots collection was created with the financial support of the Canada Council for the Arts and the Concordia and Concordia University Part-Time Faculty Association with assistance from Isabelle Campeau (seamstress) and Hesam Khoshnevis (programming).

Phem
Angella Mackay

Digital technologies are dawning a new horizon for fashion, creating fresh potentials for individual expression, customizable patterns and moving motifs. Phem shows how Augmented Reality technologies can overlay computer-generated graphics, animations and patterns onto a dress’s surface, blending physical and virtual experiences to create a dynamic garment. Phem heralds a new approach to pattern design, revealing that technologies are changing the way garments are experienced and seen.

Phem was developed at Philips Lighting and is part of the ArcInTexETN research program.
Agent Unicorn was created by the designer while an artist-in-residence at Ars Electronica's Futurelab in Linz, Austria. Anouk decided to explore the extent to which wearable technology could assist children suffering from attention deficit hyperactivity disorder. By teaming up with therapists, neuroscientists and other experts, Anouk created a technology-enhanced accessory that monitors the wearer's observations in real-time. Embedded sensors are triggered by EEG brain-wave activity, which cues a built-in video camera to record what the wearer is looking at. As a result, therapists can improve their understanding of what kinds of stimuli capture the wearer's attention and how they impact on the wearer's well-being.

Agent Unicorn was created using Intel technology in collaboration with 3D printing partner Shapeways, industrial designer Igor Knezevic and g.tec medical engineering. The project was funded by the Sparks Project as part of the Ars Electronica artist residency program.

Well-be
Eunjeong Jeon, Jesse Asjes, Kristi Kuusk & Martijn ten Bhöhmer

This knitted garment is designed with touch-sensitive fibres and programmed to activate circuits that vibrate to stimulate selected acupressure points on the upper body. Wearers can interact with Well-be to control the intensity and duration of the vibrating circuits, or allow a healthcare practitioner to programme the garment to treat a specific condition, alleviate rheumatic pain or rehabilitate an injury.

Well-be was developed with the support of the 'Smart Textile Services' research project in collaboration with Dutch consumer electronics developer Metatronics, TextielMuseum TextielLab and Eindhoven University of Technology. Jesse Asjes participated as a knitwear designer and fibre technician and was part of the TextielMuseum TextielLab during the project.
Vigour
Martijn ten Bhömer & Pauline van Dongen

Vigour is designed as a physical therapy tool for geriatric patients, enabling medical practitioners and carers to gain insight into the rehabilitation of upper body injuries or ailments. The cardigan is knitted with integrated stretch sensors that monitor the wearer’s activity and relay real-time data about their range of movement via an app. As a particular sensor is stretched, the sounds emitted via the app become higher in pitch or louder in volume. The resulting metrics record how successfully the wearer is recovering from injuries, or managing pain caused by rheumatism, muscle strain or musculoskeletal disorders.

Vigour was developed with the support of the ‘Smart Textile Services’ research project in collaboration with De Wever, Metatronics, Unit040, Savo BV, TextielMuseum TextielLab and Eindhoven University of Technology.

GER Mood Sweater
Kristin Neidlinger

The GER (Galvanic Extimacy Responder) Mood Sweater is embedded with smart sensors that detect the wearer’s emotional states. Based on the classic lie detector test, the sensors recognise the increasing temperature, accelerating heartbeat and rapid breathing triggered by excitement or anxiety. Both of these emotional states are shown by coloured LEDs integrated into the cowl-neck collar, emitting red light to represent excitement or blue to reveal melancholy. The inside of the collar is designed to illuminate to provide the wearer with visible biofeedback, while the outer surface projects light outward to communicate the wearer’s mood to others in a process known as ‘extimacy’ (externalized intimacy). As Kristin pioneers discreet technologies, she gives garments the capacity to transform physical and emotional data into real-time communication.
**Tangible E-Motion**
Eunjeong Jeon

The form is created from layered tulle and felted wool that trap air and embedded LED lights. The textile, is designed to morph, change colour and reconfigure its position on the body in response to the wearers’ expression of emotion through movement. The garment is designed to provide feedback on the relationship between emotional state and physical movement and contribute to the wearers’ physical and emotional wellbeing. LED patterns are programmed via an Arduino unit and an acceleration sensor detects the angle of tilt when the body moves.

Work created in collaboration with Aichi Isamu Yu, Kosei Miura, Makino Mitsuru Hiroshi and Lee Jaeryoung at the Department of Robotic Science and Technology at Chubu University in Japan.

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**Open-Source Strides**
Alex Murray-Leslie

Open Source Strides were made for the international art group Chicks on Speed, and they showcase the role that wearable technologies can play in performance art. The shoes were worn by performers in the Artstravaganza performance held in conjunction with Karl Lagerfeld’s ‘Modemethode’ exhibition at the Bundeskunsthalle in Bonn, Germany last September. The shoes are designed with Arduino sensors and actuators, and powered by integrated lithium batteries. They interface with audio-video systems on stage and relay data to technologies integrated into other parts of the performance arena. Open-Source Strides’ functionalities and performances can be seen in Chicks on Speed’s FOOTwerk video (2016).

Open Source Strides were worn by performers Alex Murray-Leslie and Kroot Juurak in the Artstravaganza event. The FOOTwerk video was commissioned by the NTU Centre for Contemporary Art, Singapore, and made in collaboration with filmmaker Kenneth Feinstein. Alex Murray-Leslie would also like to acknowledge Jeff Hong, Sam Ferguson, Creativity and Cognition Studios, University of Technology Sydney and support from the Australian Council for the Arts.
Sound Steps
Ricardo O’Nascimento

This pair of multi-tech shoes interacts with the wearer’s steps to create sounds and music through their movements. The shoes were designed to democratise the creation of music, enabling anyone to synchronise their foot movements to create sounds and broadcast them through the inbuilt speakers. The wearer can use the app to change the sound and the amplification of the steps.

Sound Steps was developed in collaboration with Phonotonic and Stephane Gontard and received support from the Worth Project.

FUTURE RELIC
Erica Gray

Future Relic utilised computer driven (digitally) printed 3D objects, freehand driven (analogue) extruded componentry and woven (imagined) elements. Textured and structured forms dominate the work, as does the incorporation of synthetic materials and 3D printed elements. Through this work Erica explores a future, in which wearables are an expression of exaggerated personality, layered characterisation and heightened individualism.
Smart Materials

Advanced materials provide ‘the nuts and bolts’ that integrate technology into fashion. They are used to create electronic components that are flexible and comfortable for wear on the body, and durable enough to withstand laundering and everyday wear-and-tear. Considerations such as sustainability are key, resulting in new types of fashion materials made from organic matter or recycled waste. In future, use of organic materials will be widespread, even making it possible to compost whole garments when they are discarded.

Nanollose

Nanollose Microbial Cellulose (NMC), is a new natural fibre that has been developed in Western Australia. With the rapid reduction of the world’s arable land and fresh water for irrigation, present-day global production of plant and protein based fibres is unsustainable. While the structure of NMC is chemically similar to cotton, it is produced from a sustainable bioprocess that utilizes the ability of Acetobacter xylinum, a non-hazardous bacterium, to produce nanocellulose microfibers. The Acetobacter bacteria simply convert a liquid solution into fibres that are harvested as a very dense, tightly packed non-woven material. The liquid solution used can include, but is not limited to, the waste products of beer, wine and other foodstuff such as coconut water and sugar.

nanollose.com

Bleached

Jasmine Nielson

With the ever-growing production and consumption of resources in the fashion and textile industry, it has become more important than ever to focus on the development and application of sustainable textiles. The garments have been developed using Nanollose Microbial Cellulose materials, laser cutting technology and free hand embroidery. Jasmine Nielson’s work contributes to the reinstatement of slow fashion through the use of sustainable fashion practices. The aim of this work is to merge the principles of sustainability and contemporary high fashion.

Garments have been developed with the support of Nanollose Pty Ltd Microbe Cellulose Materials through the supply of their bio materials.

COOLCORE

Coolcore’s technology is free of chemicals, polymers, gels, crystals or phase changing materials. The fibers used to create our technology are all biologically safe, presenting “Earth Friendly” performance fabrics. Coolcore’s cooling material innovation has undergone over four years of lab and field testing and recently became the first US Company to receive the “Innovative Technology” recognition from the world-renowned Hohenstein Institute recognized globally since 1946 for its market leading testing systems serving the textile industry.

www.coolcore.com
Street Smart: keeping cool
Curtin University Fashion HUB

Environmental factors such as UV exposure levels and increasing temperatures in Australia present a significant garment design challenge. Street Smart is a design development collaboration with fashion student Beth Moseley working with Coolcore fabrics and a design brief presented by industry partner ArmaCool to address these two issues through garment design.

Coolcore fabrics were provided by ArmaCool for this project with further development of garments carried out by fashion staff.

FLEX

Previously known as Flextronics, Flex is an American supply chain solutions company that designs, manufactures and distributes a wide range of electronic products and components. Flex is pioneering a new era of intelligent products that will help the world live smarter. Flex produce smart materials such as rigid-flex and multi-layer flexible printed circuits, which are used to make sensor-enhanced sports shoes, smart watches and technology-enabled garments. Wearable tech designers use Flex’s components in garments developed for fashion, healthcare, performance and handheld devices. Flex’s subsidiary company Multek has developed a unique patented technology called Ripstop that protects electronic components, making them easier to clean, more durable and safer to wear on the body.

www.flextronics.com

Multi-layer Flexible Printed Circuit for Smart Watches
Flex

Smart watches, activity trackers and computer-enhanced wristbands contain FPCs (flexible printed circuits). FPCs may have up to eight layers to route out the HDI (high density interconnect) areas. When the number of layers is reduced to two or four, the circuit becomes flexible enough for wearable applications. Flexibility is further increased by forming air gap build-ups between the layers.

Serpentine Flexible Printed Circuit for Smart Shoes
Flex

Sports shoes have dense, durable and flexible soles, which provide protection and reinforcement for the sensors and circuits embedded within them. Conductive materials and technological components such as FPCs (flexible printed circuits) enable smart shoes to compile data about the wearer’s movements and transmit it wirelessly to a smart phone or computer.

Rigid-Flex Multi-Layer Flexible Printed Circuit & High Density Interconnect
Flex

Rigid-Flex materials consist of firm and flexible substrates laminated together into a single component and electrically interconnected by a plated through holes (PTH) process. Rigid-Flex materials and components are found in a wide variety of wearable applications, including performance sportswear, protective garments and entertainment costumes designed for wear on stage.

Digital Tattoo
Flex

This digital device, which resembles a transfer tattoo, was developed by Flex exclusively for Motorola. The sensors and circuitry inside recognise the wearer’s smart phone and unlock it. The popularity of the device revealed that consumers were comfortable with wearing an electronic film – a form of wearable technology - against the skin for weeks at a time.
INDUO®

French fabric company INDUO® was born out of Le Lab, a ready-to-wear fashion brand with a mission to revolutionise menswear. Le Lab combine advanced fibres with cutting-edge textile technologies to create a range of self-cleaning, wrinkle-free, breathable and stretchable cotton textiles. The technological innovation improves the fabric without affecting its texture or feel, resulting in a new type of ‘invisible technology’ that improves garment performance while remaining unseen. INDUO® are further developing these technologies in order to create self-cleaning, wrinkle-free, silk. Together with Le Lab, INDUO® are making invisible technology part of the everyday wardrobe.

induo.co.uk

Invisible Technologies

Hi-tech fabrics can be created by new fibre technologies, nanotechnology and advanced polymers, boosting the performance and durability of the clothes they are made into. These wearable technologies are lo-tech, and not visible to the naked eye, but the active networks form effective barriers against moisture and dirt. The INDUO® brand of invisible technology gives garments the ability to become self-cleaning and remain wrinkle-free.

Future Vision

W230 Studio: Simone Leonelli & Michela Paolucci

This 3D printed dress is made from synthetic polymer and illustrates the possibilities of combining handmade manufacture and 3D printing process. The flexible nature of the material allows the 2-dimensional structures to be printed and then assembled together, like puzzle pieces. The pattern was digitally split and distorted into 28 panels, each made less than one millimetre in thickness to produce the flexible structure and ensure wearability.
Research Projects

**Beijing Institute of Fashion Technology (BIFT)**

The Beijing Institute of Fashion Technology (BIFT) mainly focuses on arts and crafts, but also offers courses in arts, engineering, economics, management and other disciplines. Producing two generations of research in academic dress design, the Institute undertakes a lot of work for society. For example they designed garments for the 2008 Beijing Olympic and Paralympic games. They have also designed shoes and clothing for the Shenzhou Space Program amongst other initiatives.

Works in the exhibition explore the application of newly emerging technologies in fashion, and life, specifically sports wear and shoes. Utilizing wearable technologies, the design of these works references words such as GPS, solar power, music, modularization, security outdoor sports and fashion.

**Elderly Sports Jacket**
Wei Song

![Elderly Sports Jacket](Photo: © BIFT)

Especially designed for the elderly, the jacket has audio parts built into the vest to enable the wearer to play music and is able to support radio broadcasting, and mobile phone technology. The garment uses the transmitting and receiving of FM to allow an immersed group music sharing experience in public spaces.

**Lightap Smart Music Shoes**
Tianhang Liu

![Lightap Smart Music Shoes](Photo: © BIFT)

These shoes are designed for listening to band music. A vibration module built into the back of the shoe connects via a smart phone to synchronize the band beat. Built into the shoe strap an EL cold light module/app can receive the music’s rhythm to enhance the whole band experience.

**Wukong-Dismountable Basketball Shoes**
Jingmin Zhang

![Wukong-Dismountable Basketball Shoes](Photo: © BIFT)

These basketball shoes have been designed to expand to allow for foot swelling during play and therefore enhancing comfort.
Curtin University of Technology
UVear: Towards Motivating SunSmart Behavior, Fashionably
Steffen P Walz & Manuel Conzelmann

How can we design fashionable, interactive systems that motivate healthy lifestyles, and that can support our wellbeing? UVear converges wearable technology with behavioural design to address the specific issue of skin cancer prevention, in a personalized fashion. This early technical prototype features a UV sensor which measures local and current brightness as well as infrared light, and then creates a UV-index based on this data. Three connected pixels display the UV value determined, using a traffic light-like output scheme designed to provide a UVF exposure alert system for the wearer.

UVear also describes a Curtin research project led by Professor Steffen Walz, with Dr Anne Farren, Manuel Conzelmann and Joanna Quake.

Sun Smart
Curtin University Fashion HUB

Design students at Curtin University are engaged in industry projects, such as the collaboration with the Cancer Council WA's SunSmart Program, that contribute to Curtin’s research into enhancing wearer well-being through design. This work is a design development by the Fashion HUB team working with SunSmart garment design by fashion student Gemma Peovitis and integrates a UVF sensing and warning system for the wearer.

The development of this work is supported by Curtin School of Design & Art technical staff Joanna Quake and Amy Hickman. This work also contributes to the UVear Project led by Professor Steffen Walz.

Run Smart
Curtin Interdisciplinary Design Project

Interdisciplinary teams have been identified as a key to the development of effective design solutions for wearables. Run Smart was developed by interdisciplinary design team composed of fashion and product students Naomi Hall, Sarah Mah, Thomas Robba and Blake Taylor. The focus of this project was on meeting the multiple demands placed on contemporary active wear by consumers, including, comfort, support and access to technology. This garment is designed to create cool, performance garments that provide an environment for the wearer that supports their engagement in running through access to music provided through an integrated sound system.

GPS Tracker ‘T’
Fashion Design & Research HUB

Performance management in sport has become increasingly sophisticated with the use of GPS tracking and monitoring devices. This has created a demand for comfortable garments that integrate these systems into sportswear. The GPS Tracker ‘T’ was developed by the Fashion HUB at Curtin University in response to a request from the Australian Hockey team management to provide a ‘bib’ to accommodate the GPS tracker used by the team during raining.

Fashioning Technology also presents as selection of student design projects completed as part of their undergraduate studies in Fashion and Product design at Curtin University.
Biographies

Manuel Conzelmann

Manuel Conzelmann is a visionary media designer, hacker as well as an artist. He dreams of naturally interactive, comprehensible technology. Manuel is currently undertaking his MA in Interactive Media Design at Furtwangen University, Germany. Manuel has a BA degree in Intermedia Design from Pforzheim University of Applied Sciences; he is also a professionally trained System Integration IT specialist.

http://bit.ly/2cNySit

Clara Daguin

French fashion designer Clara Daguin is based in Paris, but her work is global in its reach. Clara studied graphic design in San Francisco, then gained an MA degree in fashion at the Nationale École Supérieure Des Arts Décoratifs in Paris. Following short-term assignments at Iris Van Herpen, Maison Martin Margiela and Hussein Chalayan, Clara stepped into the media spotlight last April when she was selected as one of the ten finalists at the prestigious Hyères’ Festival International De Mode. The jury commended Clara’s ability to combine technology with traditional couture practices and described her Body Electric collection as ‘unmistakably elegant... a showcase of edgy, tech-inspired aesthetics ready for the catwalks of Paris’. As French fashion experts consider the future of the industry, all eyes are on Clara as she shows them the role that wearable technologies will play.

www.claradaguin.com

Erica Gray

Gold Coast artist Erica Gray works in mediums including painting, 3D plastic form, wearable art and soft sculpture. Initially influenced by garment design and the construction processes, Erica utilises similar principles to produce soft sculpture and installation art. Her art often contains reference to personal experiences, concerns for humanity, our environment as well as the treatment of animals. The pieces often translate into works comprising a blend of human and animalistic form that is often layered with meaning, through to pieces designed to play on emotions; works that toy with childhood memories and growing up, spending time on farms, disjointed family connections, empathy for the lost, a love of animals as well as the fun times amongst a family full of plumbers.


Eunjeong Jeon

From her base in Western Australia, Korean designer and researcher Eunjeong Jeon engineers wearable fabrics to have sensing, adapting and reacting capabilities. Embedded with sensory technology, Eunjeong’s textiles move and change shape. When made in wearable forms, Eunjeong’s textiles respond to the wearer’s actions by changing texture and reconfiguring their position on the body. The kinaesthetic experiences that fabrics have when worn make them dynamic and interactive as they flex and bend on the body. Today, Eunjeong’s research investigates how the emotional, sensory and kinetic dimensions of the human body can contribute to designing objects that boost health and well-being.

http://eunjeongjeon.wix.com/infor
Kristi Kuusk

Guided by a mission to combine craft techniques, sustainable practices and wearable electronics, Estonian smart textiles designer Kristi Kuusk is making technology more tactile. While carrying out her PhD research in The Netherlands at Eindhoven University of Technology, Kristi designed body-sensing networks and integrated them into wearable prototypes that respond to movement and touch. Kristi co-designed the Well-Be sensory jumper, which is programmed to transmit subtle vibrations throughout the surface of the skin and respond to the movements of the wearer. Today, Kristi continues to explore how the interplay of traditional crafts and emerging technologies can heighten sustainability through her company Spell Design.

www.kristikuusk.com

Wolfgang Langeder

Austrian designer and creative director Wolfgang Langeder has developed a range of technology-enhanced products, including menswear, sportswear and bags. Wolfgang emerged on the wearables scene with the launch of his company Utope and his role within projects at Fraunhofer Institute that pioneered uniquely stretchable electronic circuits that could be incorporated into garments. Wolfgang has long been acclaimed for his accessory prototypes, especially bags made with integrated technologies that ‘talk’ to the user or sound an alarm if opened or moved by a stranger. Wolfgang continues to develop these technologies today for the Skarabees accessory brand he co-founded in 2015, using smart sensor systems and low-voltage power sources to create portable/wearable security systems for fashion items.

www.skarabeos.com

Valérie Lamontagne

Canadian artist and designer Valérie Lamontagne is based in Montréal where she teaches in the department of design & computation arts at Concordia University. Valérie is also conducting PhD research into the extent to which ‘performative wearables’ reveal insights into the body, clothing and other cultural forms. Valérie established 3lectromode, a design studio and consultancy business that uses wearable technology to develop a wide range of unique products and services. She subsequently founded Agence Simultanée, a post-digital design lab, where she holds the position of creative director. Valérie has also curated exhibitions and participated in multi-media events held at institutions such as the Museum Boijmans Van Beuningen, the V2_Institute for Unstable Media, Museums Quartier in Vienna, the Vancouver Winter Olympics, the Musée national des beaux-arts du Québec and the New Museum in New York.

www.3lectromode.com

Angella Mackey

Canadian designer and researcher Angella Mackey has been specialising in wearable technology for more than a decade, developing systems for healthcare, aerospace and design. Angella is known for designs such as the Vega Wearable Light, a collection of illuminated outerwear for fashion-conscious cyclists she created between 2011-2014. Currently a PhD researcher in The Netherlands at the Eindhoven University of Technology, Angella’s research explores the synergies between smart fabrics, cutting edge fashion and augmented reality. Angella anticipates a time when everyday garments will have surfaces that function like computer screens, enabling them to change colour, patterns or display videos and animations. Her dynamic Phem design presents a vision of how fashion may unfold in the future.

www.angellamackey.com
Alex Murray-Leslie

Australian artist, designer and curator Alex Murray-Leslie is creating new expressions for wearable technologies. Through her PhD research studies at the University of Technology Sydney and her performances in art group Chicks on Speed, Alex is pioneering a new genre of wearable technology she calls ‘objectinstruments’. The computer-enhanced footwear she designs create interfaces between the wearers’ movements and audio-visual technologies, adding exciting new dimensions to performance art as a result. Alex’s research is widely published and highly regarded by sportswear designers, trainers and professional athletes, as it reveals the potential for footwear monitor sports performance and analyse metrics in real-time. Today, Alex is curator of the ASVOFF 9 fashion film competition, an Autodesk affiliate and adjunct faculty member at the University of Arts and Industrial Design Linz.  

www.chicksonspeed.com

Troy Nachtigall

With expertise in emerging technologies and Internet of Things-enabled products, the wearables field was a natural fit for American-born designer Troy Nachtigall. A former lecturer and researcher at the University of Venice, Troy is also a founding member of Fab Lab Tuscany. Troy works with a wide variety of materials and techniques, including computer pattern-making software, advanced knitwear manufacturing and 3D printing to develop interactive products that can be customised by the wearer. Troy used such skills to design products and digital systems for brands such as Hugo Boss, Calvin Klein, Jean Paul Gaultier Jeans and Emilio Cavallini. Today, Troy is a PhD researcher at the Eindhoven University of Technology, where he develops adaptive and responsive textiles that bring wearable technologies into the everyday wardrobe.

www.troykyo.com

Kristin Neidlinger

American bio-media designer Kristin Neidlinger has a background in dance, kinetic costumes and in physical therapies such as Dance Medicine. Kristin founded Sensoree Design Lab in San Francisco after receiving an MFA degree in Interaction Design from California College of the Arts in 2010. At Sensoree, Kristin explores how wearable technology can be therapeutic, emotive and enhance sensory awareness. Designs such as the GER Mood Sweater, the AWE Goosebumps bio-responsive skin and NeurotiQ 3D-printed knitwear were spawned by research undertaken for her graduate thesis, which explored the extent to which wearable technologies can alleviate mental health conditions such as sensory processing disorder, attention deficit hyperactivity disorder and autism. Kristin’s work has been widely publicised in the US and European media and presented at conferences, design forums and art museums.

www.sensoree.com

Ricardo O’Nascimento

Ricardo O’Nascimento is a Brazilian artist and researcher active in the field of interaction design and new media. He is the founder of Popkalab, a design and research studio based in Rotterdam, The Netherlands with a focus on wearable technologies. Ricardo’s research investigates body/environment relationships to develop interfaces for wearable devices, interactive installations and multi-media environments. Ricardo has received numerous awards, including awards from cYNETART and Rumos Arte Cibernética. His works have been exhibited in galleries and museums, and featured at Ars Electronica and other art and media festivals.

www.popkalab.com
Martijn ten Bhömer
Dutch designer Martijn ten Bhömer creates smart textiles for multi-disciplinary contexts, particularly healthcare and well-being. During his PhD research at the Eindhoven University of Technology, Martijn investigated how an embodied approach to technology can underpin the design of products and services. Martijn subsequently co-designed the Vigour cardigan, a garment made with integrated sensors that provide auditory feedback to support the wearer’s physical rehabilitation. Currently, Martijn works with companies such as OMsignal, Deutsche Telekom, Microsoft Research and Bambi Medical to develop smart textile services for a wide range of specialist products. Martijn’s designs have been exhibited internationally, while his research has been published in academic journals and presented at conferences around the world.
www.mtbhomer.com

Leonie Tenthof van Noorden
From her base in London, Dutch industrial designer Leonie Tenthof van Noorden pioneers new product types that bring fashion and technology together. Leonie graduated from the Eindhoven University of Technology in 2014 where she developed methods of personalising garments through 3D body scanning and generative design methodologies. Today, Leonie continues to use emerging technologies to add a personal touch to products and experiences. To this end, Leonie engages with disciplines ranging from architecture, mathematics and fashion to fully exploit cutting edge technologies and new production techniques.
www.leoniesuzanne.com

Oscar Tomico
Spanish designer and researcher Oscar Tomico fosters collaborations between textiles, interactive technologies and digital design. Oscar is an assistant professor in the department of industrial design at Eindhoven University of Technology and one of the most active members of the Wearable Senses Lab. Fashioning Technology includes a selection of garments and footwear curated by Oscar that showcase some of the wearable technology research and product development researchers at the university are pioneering today. Garments such as Well-be and Vigour reveal new potentials for integrated healthcare, while Phototrophe and Phem demonstrate how digital systems enable the wearers to interface with their surroundings in exciting new ways. Under Oscar’s direction, the Wearable Senses Lab has become a leading centre for the development of wearable systems and the application of advanced materials. As it extends its reach internationally, Wearable Senses is fast becoming one of the most acclaimed centres for wearable technology in academia today.
www.wearablesenses.net

Pauline van Dongen
Pauline van Dongen is a Dutch fashion designer who specialises in wearable technology, and is considered to be a leader in the field. Pauline established her design studio in 2010, where she embarked on a diverse range of collaborative inter-disciplinary projects held in studios, labs and institutes around the world. Her studio researches the human body’s relationship to its surroundings and initiates collaborative projects that place innovation and experimentation at the core of fashion and textile design. Pauline’s Phototrope top reveals how wearable technology can create new dynamics between sportswear, the athlete and the environment they train in. Currently a PhD candidate at the Eindhoven University of Technology, Pauline’s research explores the potential to make everyday fashion fully interactive. Today Pauline collaborates with leading innovators from the fields of science and technology to create wearable interfaces that can enhance the way we experience the world around us in an intuitive and personal way.
www.paulinevandongen.nl
Steffen Waltz

Dr Steffen P Walz is Professor of Design/Art in Curtin University’s School of Design and Art. Between 2011 and 2016, he led the GEElab, the Games and Experimental Entertainment Laboratory, with co-locations in Melbourne, Australia and in Karlsruhe, Germany, see geelab.eu. He is also Managing Director of Germany-based digital convergence consultancy and software development firm, gerenwa. In his current research around topics of convergence, Steffen explores how behavioural design principles can be applied to fashionable technologies, in specific to address health and wellbeing challenges.

playbe.com

Anouk Wipprecht

Dutch Fashion/Tech Designer Anouk Wipprecht makes fashion an experience that transcends mere appearances. She engineers garments to facilitate and augment the interactions we have with our bodies and our surroundings. Her Spider Dress is a perfect example of this aesthetic, where sensors and moveable arms on the dress help to create a more definite boundary of personal space while employing a fierce style. As you approach the wearer, this dress literally attacks you. Partnering up with companies such as Intel, AutoDesk, Google, Audi, and 3D printing company Materialise she researches how our future would look as we continue to embed technology into what we wear.

www.anoukwipprecht.nl

W230 Studio

W230 Studio is a project of Simone Leonelli and Michela Paolucci, Italian designers based in Perth, Australia. W230 studio explores the relationship between science and art and technology, crossing over differently media, materials and knowledges. Their mission is simple and is driven by a hunger to experiment with new combinations across different materials and production processes and aim to inspire the development of a new generation of forms and aesthetic values. Our works is recently focused on fashion garments with a view to include innovative technologies without forgetting the important heritage and pleasure of the handmade process.

www.w230.net
Credits and Acknowledgments

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Agent Unicorn was produced for the ‘Sparks’ touring exhibition (2016 – 2017) and received funding from the Sparks Project, the EU Horizon 2020 programme, and Ars Electronica Futurelab. We thank the Ars Electronica Centre for loaning this exhibit.

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Telstra for the loan of exhibition installation technology.

Curatorial Team
Dr Anne Farren & Bradley Quinn, Curators
Dr Joy Denise Scott, Registrar

Exhibition Design and Installation
Ron Nyisztor, Installation Design
Joanna Quake, Technical Assistant
Amy Hickman, Technical Advice
Sophie Watson and Jade Berthelsen, Installation & Invigilation Assistants.

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When: 4pm Sunday 27th November  
Where: Bathers Beach House, 47 Mews Road, Fremantle  
Entry: $85 + booking fee on sale Wednesday 3 August from Ticketek  
Tickets include both runway shows, canapes and a selection of premium drinks.

The temperature is set to rise as Swim + Resort Series returns to celebrate the beautiful beaches and laid back lifestyle WA is famous for. Enjoy the party as we showcase the hottest swimwear and resort looks of SS16/17 against the backdrop of Fremantle’s iconic Bathers Beach House.

**INDEPENDENT DESIGNER RUNWAY**

The event will kick off with a group runway show featuring the hottest Australian independent swim and resort designers including:

Amore & Sorvete  
Budgy Smuggler  
Chalice Clothing  
First Base  
Gypsea  
Ivory Daze  
Natalie Rolt  
Skye and Staghorn  
Zingiber

**SASS & BIDE RESORT 16**

Based on a series of treasures collected in the flea markets of Paris and decadent interiors of French Castles, Therese Rawthorne’s Resort 2016 collection for Sass & Bide is a love letter to Paris. Featuring ornate prints designed in-house, intricate embroidery and draped silhouettes which create drama and movement, the collection evokes a modern day romance.
Raine Square is proud to support the Fashioning Technology exhibition, as part of the Telstra Perth Fashion Festival. This exhibition explores how the combination of advanced materials, emerging technology and cutting-edge designs is helping take fashion to a higher level.

Plus, Raine Square is equally proud to be the Centre of your City, offering a number of health, fitness, fashion and beauty retailers under one roof, together with a substantial food court and Perth’s only Coles Central and rebel stores.

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