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JOANNA BERZOWSKA · XS LABS

JOANNA BERZOWSKA

XS LABS

SEVEN YEARS OF DESIGN RESEARCH AND EXPERIMENTATION IN ELECTRONIC TEXTILES AND REACTIVE GARMENTS

XS LABS RESEARCH DIRECTION

Joanna Berzowska is the founder of XS Labs, a design research studio that develops innovative methods and applications in electronic textiles and responsive garments. She is Associate Professor of Design and Computation Arts at Concordia University and a member of the Hexagram Research Institute in Montreal. She lectures and consults internationally about the field of electronic textiles and related social, cultural, aesthetic, and political issues. Her two most recent research interests include human–generated power and fiber–based functionality. Her art and design work has been shown in the Cooper-Hewitt Design Museum in NYC, the V&A in London, the Millenium Museum in Beijing, SIGGRAPH, ISEA, the Art Directors Club in NYC, the Australian Museum in Sydney, NTT ICC in Tokyo, and Ars Electronica Center in Linz among others. She was recently selected by Maclean's Magazine as one of "thirty nine Canadians who make the world a better place to live in".

www.berzowska.com

Extra Soft Labs

XS LABS

www.xslabs.net

DESIGN RESEARCH STUDIO

XS Labs is a design research studio with a focus on innovation in the fields of electronic textiles and reactive garments: "second skins" that enable computationally–mediated interactions between individuals and environments. We are equally inspired by the technical and cultural history of how textiles have been made for generations (weaving, stitching, embroidery, knitting, beading, quilting) and by new and emerging materials with a range of electro–mechanical properties. This allows us to construct complex textile–based surfaces, substrates, and structures with transitive properties.

www.xslabs.net

XS LABS

SEVEN YEARS OF DESIGN RESEARCH AND EXPERIMENTATION IN ELECTRONIC TEXTILES AND REACTIVE GARMENTS

JOANNA BERZOWSKA

XS Labs: Seven Years of Design Research and Experimentaion in
Electronic Textiles and Reactive Garments

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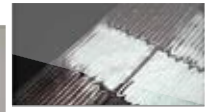
INTIMATE MEMORY


DISTRACT & RECLAIM


PULP-BASED COMPUTING


BLAZER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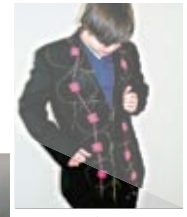
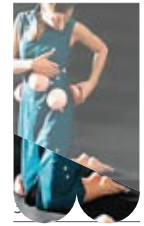
FEATHERY DRESSES


KUKKIA & VILKAS


OCTOPUS


ACCOUPHÈNE


BREAST DRESS


SPOTTY DRESSES


BIRDS & NUMBERS


CONCERTINA


LEECHES


KRAKOW


TETSUSHI


BUG


SMOKS


SOUNDSLEEVES

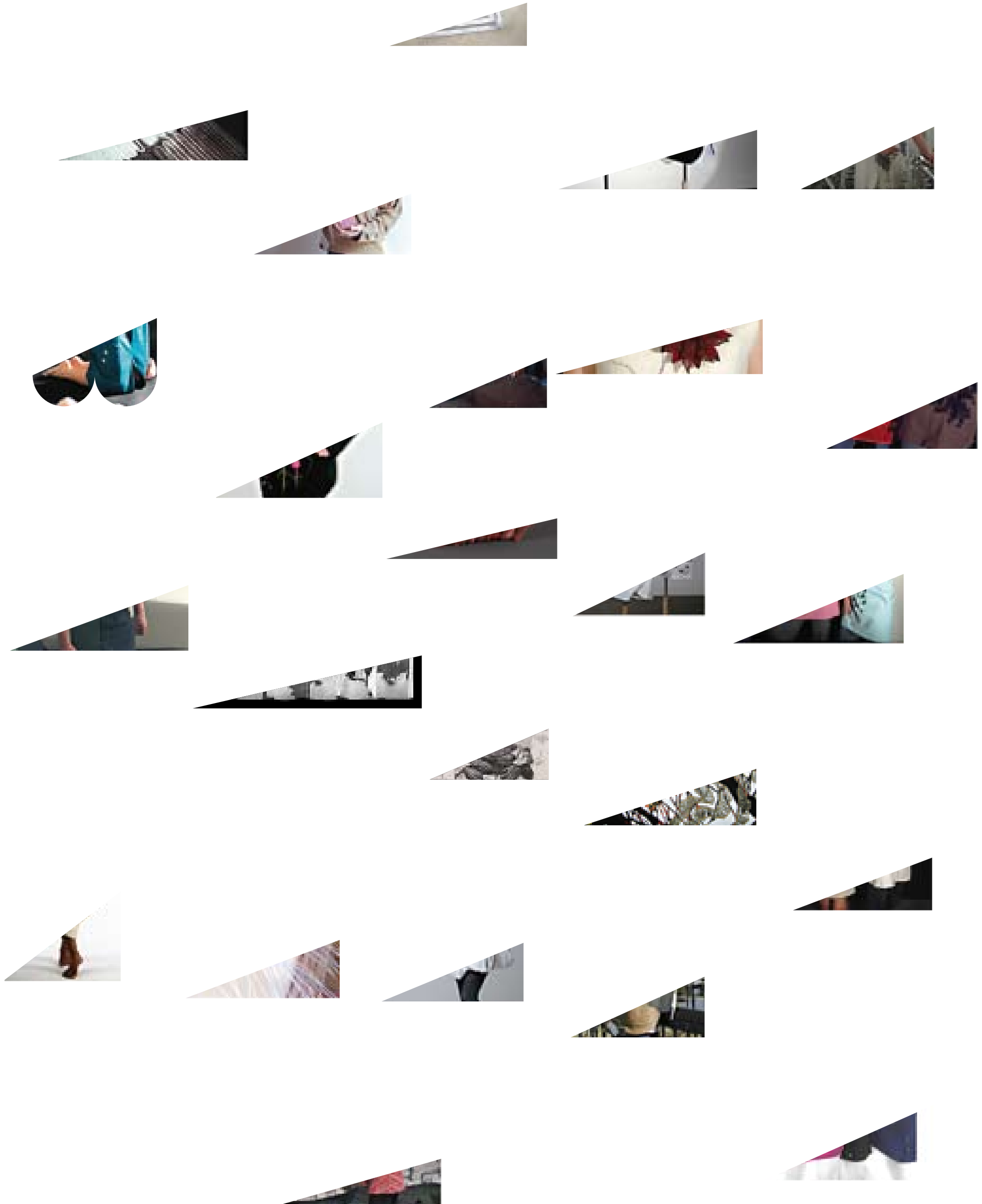

CAPTAIN ELECTRIC


KARMA CHAMELEON


SKORPIONS


CONSTELLATION DRESSES


CIDZIY



PREFACE

I founded XS Labs in 2002, in my first year at Concordia University, and positioned it as a design research studio with a focus on innovation in electronic textiles and reactive garments. My interest in this field, however, did not originate from weaving, fashion design, or even fiber arts. It emerged from a concern with the lack of softness in HCI (Human Computer Interaction) and the desire to explore a wider range of material properties in the development of physical interfaces.

While a student at the MIT Media Lab in the mid 1990's, I was drawn to electronic textiles for their ability to conform to the human body and their potential for bringing softness to physical interfaces. The work I was conducting in HCI focused on tangible interaction and involved the manipulation of physical objects with the human hand. I anticipated that electronic textiles would allow us to expand the realm of physical interaction into a wearable context and to explore the boundaries of what I call "beyond the wrist" interaction.

While Mark Weiser's prophetic vision of Ubiquitous Computing has largely become reality, and computing technology is truly receding into the background of our awarenes,[1] our relationship to materiality and design practices needs to evolve. The research directions that shape the field of HCI are still too often predicated on traditional definitions of computers and their intended uses. They do not consider the broad range of computational expression, technologies, and materials available to designers today.

In recent history, a scientific revolution has been redefining our fundamental design methods.[2] Materials such as conductive fibers, active inks, photoelectrics, and shape–memory alloys promise to shape new design forms and new experiences that will redefine our relationship with materiality and with technology.[3]
Our design philosophy at XS Labs focuses on the use of these transitive materials and technologies as fundamental design elements.

The projects at XS Labs often demonstrate a preoccupation with — and a resistance to — task–based, utilitarian definitions of functionality in HCI. Our definition of function simultaneously looks at the materiality and the magic of computing technologies; it incorporates the concepts of beauty and pleasure. We are particularly concerned with the exploration of interactive forms that emphasize the natural expressive qualities of transitive materials. We focus on the aesthetics of interaction, which compels us to interrogate and to re–contextualize the materials themselves. The interaction narratives function as entry points to question some of the fundamental assumptions we make about the technologies and the materials that we deploy in our designs.

A core component of our research at XS Labs involves the development of enabling technologies, methods, and materials — in the form of soft electronic circuits and composite fibers — as well as the exploration of the expressive potential of soft reactive structures. Many of our electronic textile innovations are informed by the technical and the cultural history of how textiles have been made for generations — weaving, stitching, embroidery, knitting, beading, or quilting — but use a range of materials with different electro–mechanical properties. We consider the soft, playful, and magical aspects of these materials, so as to better adapt to the contours of the human body and the complexities of human needs and desires. Our approach often engages subtle elements of the absurd, the perverse, and the transgressive. We construct narratives that involve dark humor and romanticism as a way to drive design innovation. These integrative approaches allow us to construct composite textiles with complex functionality and sophisticated behaviors.

Joanna Berzowska
2010

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1 Weiser, Mark. "The Computer for the Twenty-First Century." *Scientif American* Sept. 1991: 94-104. Print.

2 Addington, Michelle, and L. Daniel Schodek. *Smart Materials and New Technologies for the Architecture and Design Professions*, London: Elsevier, 2005. Print.

3 Coelho, Marcelo, Sajid Sadi, Pattie Maes, Neri Oxman, and Joanna Berzowska. *Transitive Materials: Towards an Integrated Approach to Material Technology*. Proc. of the 9th International Conference on Ubiquitous Computing. Innsbruck, Austria, 2007.

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MARC BEAULIEU

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XS LABS TEAM

XS LABS MAKES CLOTHING

This small book might serve as a primer for electronic fashion. Collected here are the residual traces of seven years of research and creation within XS Labs, the brainchild of Joanna Berzowska. XS Labs assembles a shifting team of research assistants, designers, programmers, students, artists, thinkers, and makers — all united in their examination of the functions of beauty and pleasure inherent in the materiality of new and emerging technologies. These terms are most often associated with lightweight ideals and the limited notion of aesthetics as currently understood, but as so deftly unpacked by Susan Buck-Morss:

> Aisthitikos is the ancient Greek word for that which is "perceptive by feeling," aisthisis is the sensory experience of perception. The original field of aesthetics is not art but reality — corporeal, material nature. As Terry Eagleton writes: "…aesthetics is born as a discourse of the body"[1]

Joanna Berzowska has asserted, throughout her practice, tangible results and displays of immaterial notions. It starts with acknowledging the function of ideas and crediting those associated with pleasure and expression as *substantial*, in both meanings of the word; being both worthy of consideration and literally of substance: they are stuff. This is not arrived at through magical thinking or pure desire (alone), but through observation and analysis. These seemingly disparate motives and methodologies are no longer separated out, but encouraged to actively intermingle so that actual progress can be made.

Herein lay the rub and the promise.
The pretense of pleasure and beauty as being somehow separate from knowledge is laid bare when the most rational of signifiers — computation — is made central to the delivery of fashion. In this work, the digital does not serve as motif alone (even though pattern and its development are deeply political and conceptual in origin); it is the very core of its existence. The actual fiber of its being.

Beauty has a function.
Fashion plays a role.

Fashion (together with its sociological root: "dress") has long been acknowledged as a material indicator of social beliefs, morality, and collective concerns. It has often been an indicator of place, as it is manufactured of fibers found within proximity of the wearer and marked by patterns and colors developed in concert with culture. It has always demonstrated the technical access of the persons that construct it. In essence, the primary role of fashion is as antennae.[2] It transmits a complex series of information about the self: culture, time, social status and social role, class and gender. The productions of XS Labs start here, stipulating that cloth and clothing can literally be a transmitter but acknowledging the reciprocal role of such things: that the body within such a framework is also a receiver. The works that are made in the lab bring that theoretical positioning into a sensate world through material production, where the clothing itself is both sender and receiver in theory and in practice.

The clothing and its environmental counterpart, architectural textiles, manufactured in the lab are brought into being as though haute couture. Skilled and deft handiwork allows electronic hardware to truly become soft. Traditional iterations of software, or code, required a hard casing to protect and deliver its immaterial data.
XS Labs indicates that while that may have been the simplest solution, it was not necessarily the best as it is so counter to the realities of the wearer. Early technological advancements often undervalue the role of the user or the human cost of development. This model — that comfort or acknowledgment of an existing body should be overwritten or reconfigured for an ideal — has been at the basis of the technologies of fashion. XS works have hard questions embedded into them alongside the soft electronics. This too is a traditional role of clothing.

> "…she doesn't know it but she's dressed for the H BOMB…"[3]

This song lyric by Gang of Four alludes to the bikini, that swimsuit assemblage of barely there triangles named for the Bikini Atoll, the site of early atomic bomb tests. Its function as clothing was certainly not to improve one's swimming. The linkage of the revealing of the feminine form and impending destruction have oft been cobbled together. What is interesting in the lyric is the suggestion that the wearer is unwitting.

Wearers of XS garments are aware of their roles and are active participants in them, bringing into question the simplistic notion of fashion victim. Just as contemporary feminism has reclaimed displays of sexuality and that which is coded feminine as sites of power, someone wearing a dress whose hemline might rise on its own or whose hips might expand to claim more space is acknowledging those sites as mutable and only at the edge of control. If one commands the gaze, can they truly become victim of it?

When the second skin one dons is responsive and ever–changing, it becomes a kind of camouflage — but one of spectacle and display.

XS Labs moves beyond the distraction and alienation of the spectacle by their very materiality and subtle inversions of the hard into soft. In XS works, flashing lights and changing colors are often traces of contact between people, and not always contact that was invited. Their shifting appearance is evidence of power, both in the sense of social structures and in the acknowledgment of the need for electrical current. Newer works are addressing the question of power sources head on and seeking not only sustainable solutions but self–driven or self–actuated ones. Embedded technologies are not hidden from view but intrinsic to the structure of the garments and the intended function. Those functions are always multiple, always layered, often beautiful, even playful. This open-endedness puts the wearable works firmly in the realm of research and investigation, for they are engagement and questioning, not tool building or end–product delivery.

Clothing thus configured is more than that first defense against the external world, the "that which is not me" of the weather and the unwanted touch, or the disguise of the leaky bodies that lie within them. Fashion, dress, and second skin are all semantic terms loaded with aesthetic complexities in what must be considered a "discourse of the body" while asserting that those bodies are not vacant sites. By amplifying the complexities that inform the bodies within them, considering those bodies not as users or wearers but as active participants, XS Labs garments, as mediating devices, are in no way excess, they are only starting to be enough.

jake moore
2010

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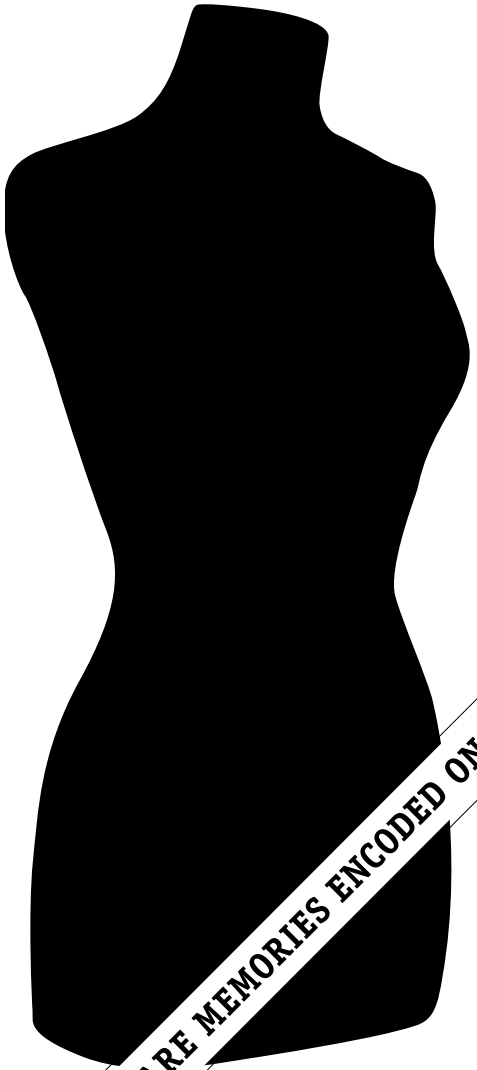
1 Buck-Morss, Susan. "Aesthetics and Anaesthetics: Walter Benjamin's Artwork Essay Reconsidered." *New Formations* 20. (Summer 1993): 123–143. Print.

2 Swift, Adam Glen. "Fashion as aerial: transmitting and receiving cyborg culture." *Textile: The Journal of Cloth and Culture* 3.1 (2005): 100–116. Print.

3 Gang of Four. "I found that Essence Rare." *Entertainment*. WarnerBros/EMI, 1979. LP.

FOREWORD



HOW ARE MEMORIES ENCODED ON THE BODY?

MRC: MEMORY RICH CLOTHING

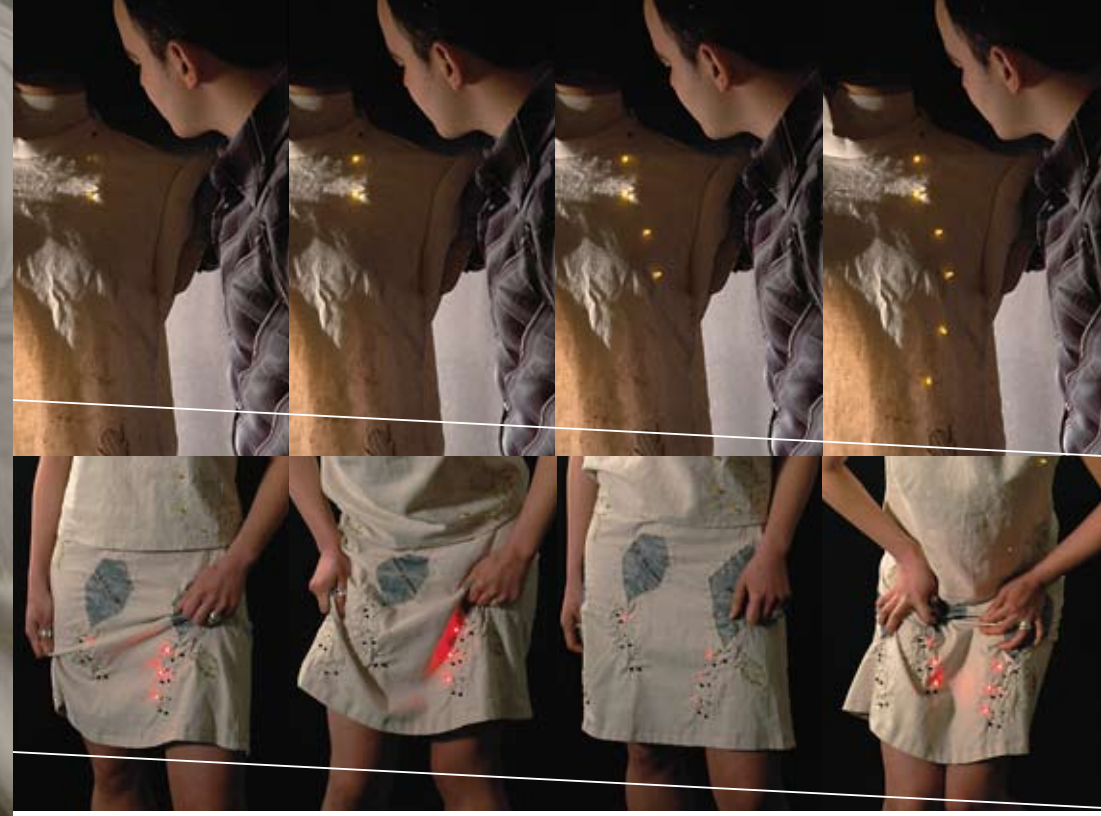
MRC focuses on the development of reactive garments that display their physical memory, which we define as the set of spatial, tactile, material, and sensory memory inherent in experiencing the world through the body.

Garments naturally build up physical memory insofar as they retain traces of presence of the user, through the accumulation of dirt, sweat, bacteria, hair, stains, or tears. They sense and record personal histories that can be communicated visually and through other senses.

Digital technologies allow us to shape and edit that evidence to reflect more subtle or more poetic aspects of our identity and our history. They allow us to interrogate, to hide or reveal, to interpret, and to construct narratives.

MRC

INTIMATE MEMORY SHIRT & SKIRT



Our primary objective is to produce garments that sense and display embodied information, including subtle evidence of intimate contact such as breath and more specific information such as where and when they have last been touched or groped.

INTIMATE MEMORY consists of a shirt and a skirt that employ two different input and output modalities to record acts of physical intimacy and indicate the time elapsed since those "intimacy events" occurred.

The shirt contains a microphone in the collar and a series of LEDs stitched in a curved line across the front. When someone whispers into her ear or blows on her neck, the shirt lights up, showing that an intimacy event has taken place. The number of lights corresponds to the intensity of the intimacy event, similar to the volume indicator on a stereo. Over time, the lights turn off, one by one, to show the time elapsed since the intimacy event.

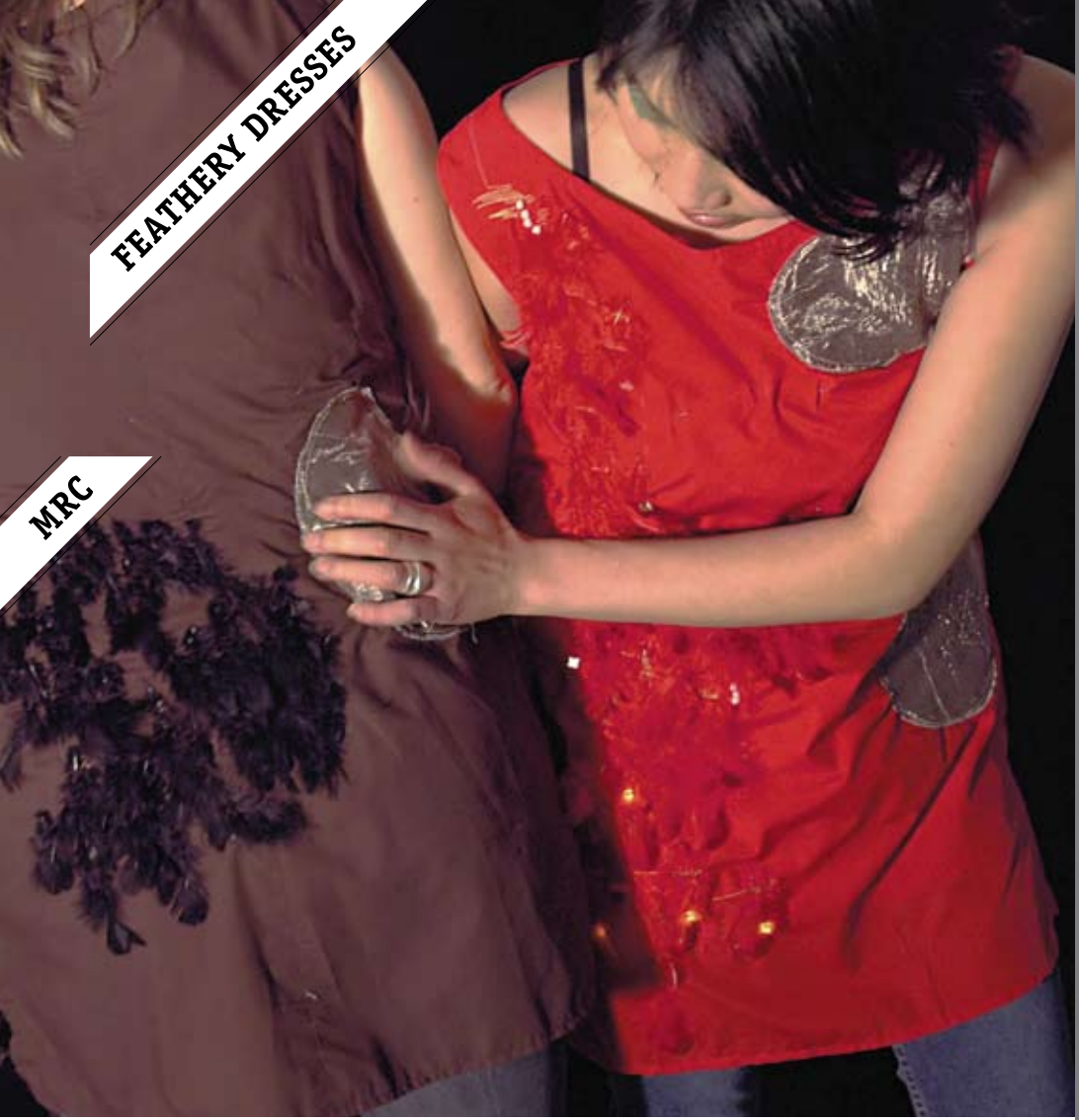
The skirt incorporates soft switches, sewn out of conductive metallic silk organza and connected with conductive threads to a stitched analog circuit. The circuit contains diodes, capacitors, and resistors beaded and embroidered on the surface of the fabric. When the skirt is touched or groped, LEDs illuminate in the embroidery to register the intimacy event. In a similar fashion to the way our skin registers touch, the illumination fades over time to indicate the time elapsed since the event. The light not only registers the intensity of the intimacy event but also how the event unfolds over time.

SPOTTY DRESSES

MRC

The light cotton SPOTTY DRESSES, worn by dancers in a performance, are overprinted with an irregular pattern of thermochromic spots inspired by animal camouflage. The dresses are sensitive to the warmth of the human body and respond visually to show when and where they have been touched. Physical contact — a caress, a rub, a stroke, a slap, or the pressure from another body or inanimate object — makes the inks change color and effectively disappear.

Direct physical contact erases our social camouflage; we become metaphorically revealed.



FEATHERY DRESSES are embellished with three soft sensors that record touch events on the hip, shoulder, and lower back. These events act as input for the custom software running on an embedded microcontroller and affect the pattern of illuminated feathers embroidered on the dress. The microcontroller allows us to use less conductive material in the body of the dresses and reduces failure rates due to broken connections. It also allows us to experiment with different timings, representations, behaviors, and narratives of physical intimacy. Each sensor can be mapped to illuminate a different area of feathers or to modulate the overall illumination.

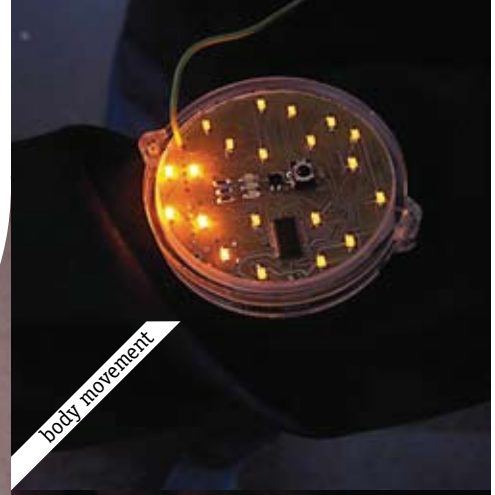
RECLAIM

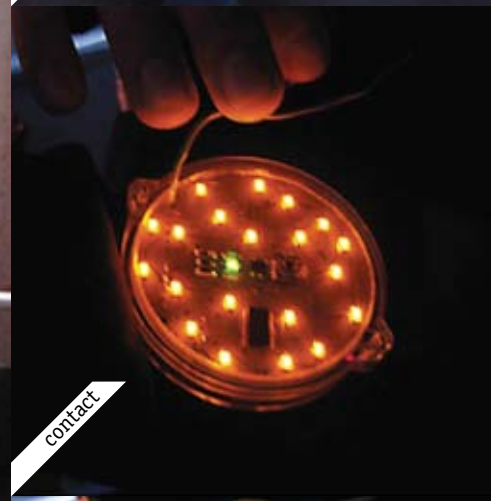
RECLAIM features two large silicone balloons placed on either hip, which can be inflated with a portable bottle of compressed air in order to increase the amount of personal space occupied by the user. In a crowded subway car or in any other situation where more privacy is required, the dress can be inflated to create a physical buffer between the user and the public sphere.

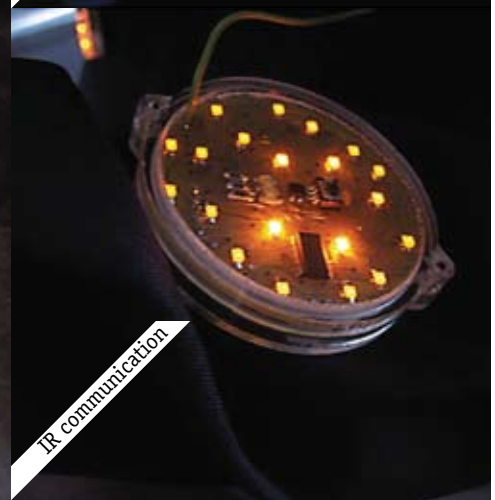
MRC

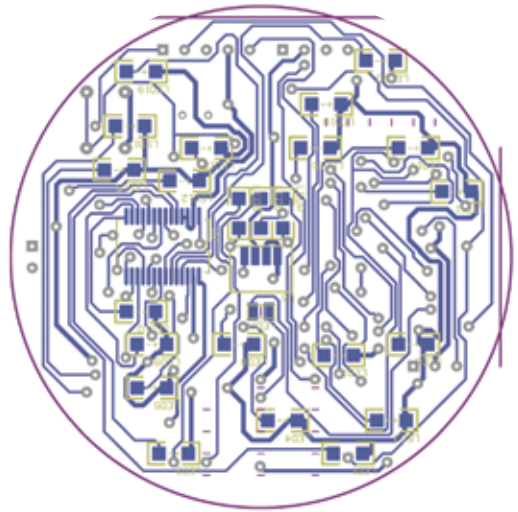
Influenced by animals such as puffer fish that can rapidly increase their size by pumping water or air into special sacs, DISTRACT contains a network of interconnected inflatable silicone compartments. In situations where the user feels threatened and requires immediate action, she can mouth–inflate protrusions around the body to intimidate and confuse the enemy.

DISTRACT







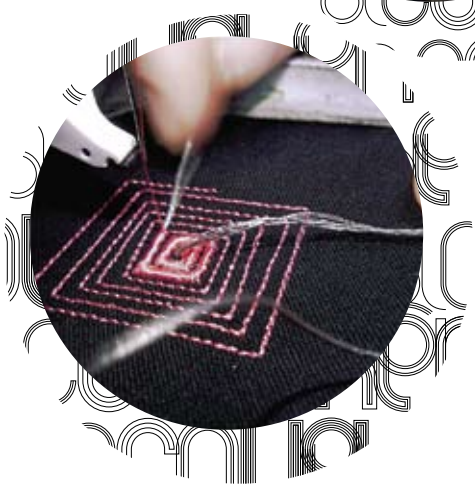


To allow more flexibility for our investigations in MEMORY RICH CLOTHING, we developed the OCTOPUS modules: compact, body-worn sensing displays that support a range of custom interactions. Several devices can be affixed and rearranged to a single person using magnetic snaps on a reconfigurable garment substrate.

Three types of events can be sensed using the OCTOPUS modules.

1. Body movement: An accelerometer detects shaking and tilting, thus simple changes in posture or gait can be tracked.
2. Contact: A capacitive sensor and an IR reflectance sensor detect the contact of hands or objects with the front surface.
3. Communications: The devices can interact over line-of-sight using an IR remote control protocol.

ACCOUPHÈNE



The ACCOUPHÈNE tuxedo creates a 3D sonic environment around the human body that is activated and can be modulated by moving the hands over the front of the jacket, touching, twisting, and manipulating the cloth.

ACCOUPHÈNE is decorated with thirteen soft speakers, created by embroidering decorative coils of highly conductive yarn on the front of the jacket. The coils are connected to a central circuit, which sends pulses of energy through them. When powered, the speakers generate a weak magnetic field that reacts to a strong magnet positioned in close proximity to the fabric. Sounds are generated when the sleeve of ACCOUPHÈNE, which contains a stitched magnet, is moved over the coils. The magnet's strength and its distance from the embroidered coil determine the amplitude of the sounds. By electronically pulsing the embroidered coils at different frequencies, ACCOUPHÈNE plays different notes.

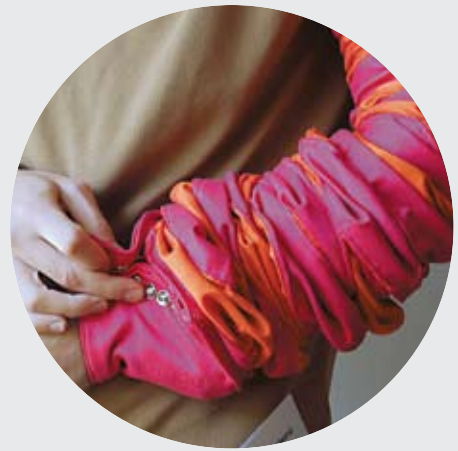
www.xslabs.net/accouphene

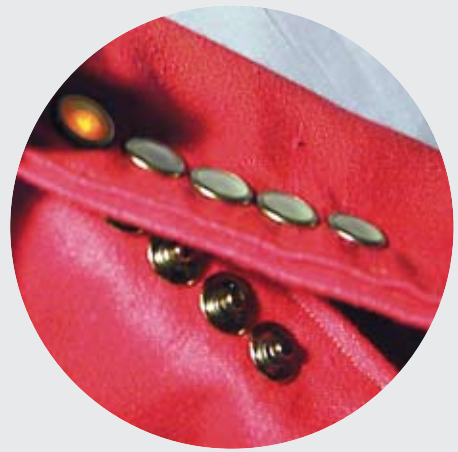
BREAST DRESS is a tailored second skin decorated with large metal snaps, which both refer to nipples and function to attach sculptural silicone modules. The modules are crafted out of pink foam (referencing the color of the artist's skin) and shaped like female breasts. A second set of modules refers to a different kind of nipple, the kind found on baby bottles.

This piece can be contextualized in terms of interrogating assumptions about femininity, intimacy, and boundaries. It engages questions about the definition of "second skin," the nature of fears and desires that need to be shielded versus those that can be revealed, the delineations of the politicized space that lies beyond the body, as well as the tension between private and public territory.

The performer sits on the floor, surrounded by the modules, and slowly attaches, removes, and displaces the breasts on the dress. This piece has been deployed as a performative artifact to explore a range of social and cultural questions important to the design and fabrication of interactive garments. The work also initiates a technical exploration of different ways to attach wearable modules, assuring both a mechanical and an electrical connection, for future projects such as LEECHES or OCTOPUS.

BLAZER





BLAZER is a light emitting bracelet, embedded within the cuff of a very long, orange and pink striped sleeve. It is used to display text by quickly moving the arm or the whole body in space. BLAZER integrates light emitting diodes in fabric, using traditional textile construction methods, to create a simple emissive display. The system takes advantage of retinal persistence to make sense of an apparently random pattern of flashing lights. When the body is still, we see noise. When the body is in motion, the noise becomes a message: text is displayed.

www.uttermatter.com/blazer/012

CONCERTINA

A reflection on patterns, pleats, and repetitive cycles, CONCERTINA functions as a poetic memory trigger, a reflection on another time period. One may expect to pick it up and produce the squeaky sounds of an old squeeze box, but this concertina contracts on its own as it emits breathing sounds, alluding to the very basis of our existence. It references a specific family history through the tartan cloth, evoking memories of old-time music played at family gatherings and player pianos. It also evokes the repetitive patterns that happen throughout history, reflected in the sound of breath: cycles that reoccur over and over again and mistakes we may or may not learn from.

Constructed using traditional pleating techniques in a wool plaid fabric, the pleats are crisp and hold the form of the concertina. Strands of Nitinol, a shape memory alloy made of nickel and titanium that can return to a preset shape when heated, are sewn on the inside of the structure. The custom electronics and software cause CONCERTINA to contract autonomously. The weight and structural construction of the piece brings it back to its original form. Mini speakers imbedded in each side play the sounds of human breath.

CONSTELLATION DRESSES and LEECHES raise specific questions regarding our increasing need for power — electric energy — in order to feed the electronic devices that we wear on our bodies and are beginning to integrate into our electronic garments. These projects address ecological concerns through the design of garments that directly tackle issues of power consumption and sustainability through the exploration of different parasitic metaphors, where electronic modules suck power from our bodies and electronic garments suck power from each other. Central to this exploration is the question: where does power come from in a wearable context and how do we connect to various power sources?

CONSTELLATION DRESSES are covered with twelve magnetic snaps arranged over the torso and thighs and connected in pairs through a single line of embroidered conductive thread. Light emitting diodes are integrated into the dresses in designs that resemble constellations, with clusters of stars connected to each other through conductive lines. One set of snaps acts as a switch for the LED circuit and, when connected to the snaps from another dress, the circuit on the garment is closed and the LEDs light up. The magnetic snaps act as a mechanical and electrical connection between bodies, and their irregular placement induces wearers to create playful and compelling choreographies to connect their circuits.

Rather than being complete and functional electronic pieces in themselves, the dresses work as meshes on a circuit network and depend on the physical contact of the magnetic snaps to function. By bringing people together mechanically and electronically, the garments explore metaphors for building electronic or social networks. In addition, the dresses compel people to draw power from each other, hinting at a parasitic model for powering our mobile technologies.

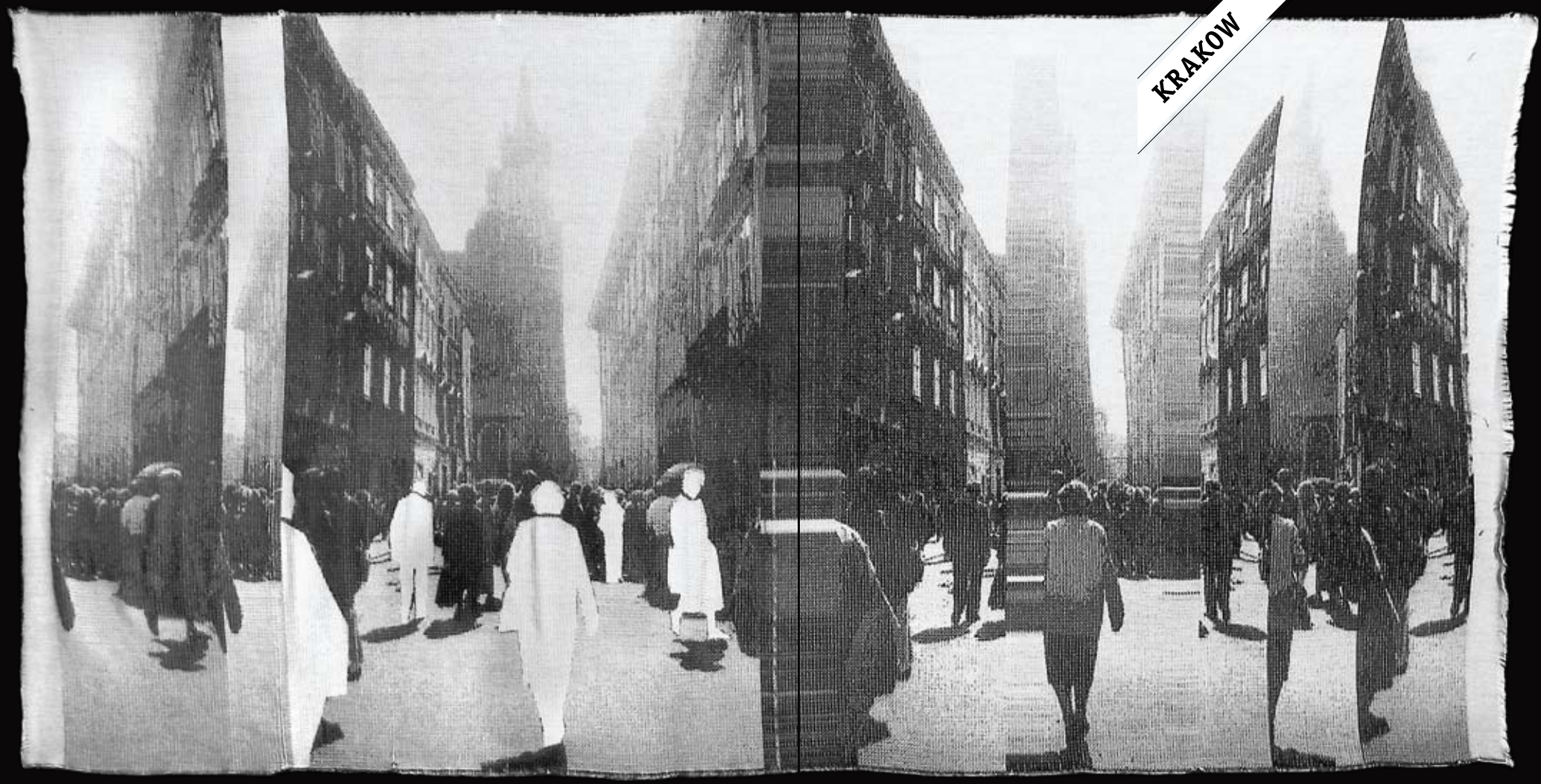
www.xslabs.net/constellation

CONSTELLATION DRESSES

The dresses, augmented with stitched conductive material, function as soft, wearable, reconfigurable power–distribution substrates. They host the LEECHES, individual silicone–coated electronic modules. LEECHES can be affixed in a variety or positions and configurations, held in place by magnetic snaps, which act as mechanical and electrical connections. A single power module, attached at the shoulder, can power up to ten LEECHES scattered around the body, enabling them to illuminate the dress.

The red LEDs inside the LEECHES reference power-hungry creatures that, once attached, suck or draw energy (the metaphoric "blood") from your body. The blood–red illumination also alludes to the potential dangers of electromagnetic fields emanating from electronic garments and other environmental concerns.

www.xslabs.net/constellation



KRAKOW is a non-emissive, electronic, color-changing Jacquard weaving that integrates conductive yarns, thermochromic inks, and custom control electronics. Control electronics send power to different areas of the electronic textile to generate resistive heat. Thermochromic inks have the ability to change color in response to a change in temperature, without emitting light.

The weaving illustrates a scene from the artist's childhood in Poland. Over time, the ink overprinted on the figures in the weaving changes from black to transparent. Like our memories of them, the people in the textile disappear over time. As populations are displaced, the traces of their presence in place and time are similarly erased.

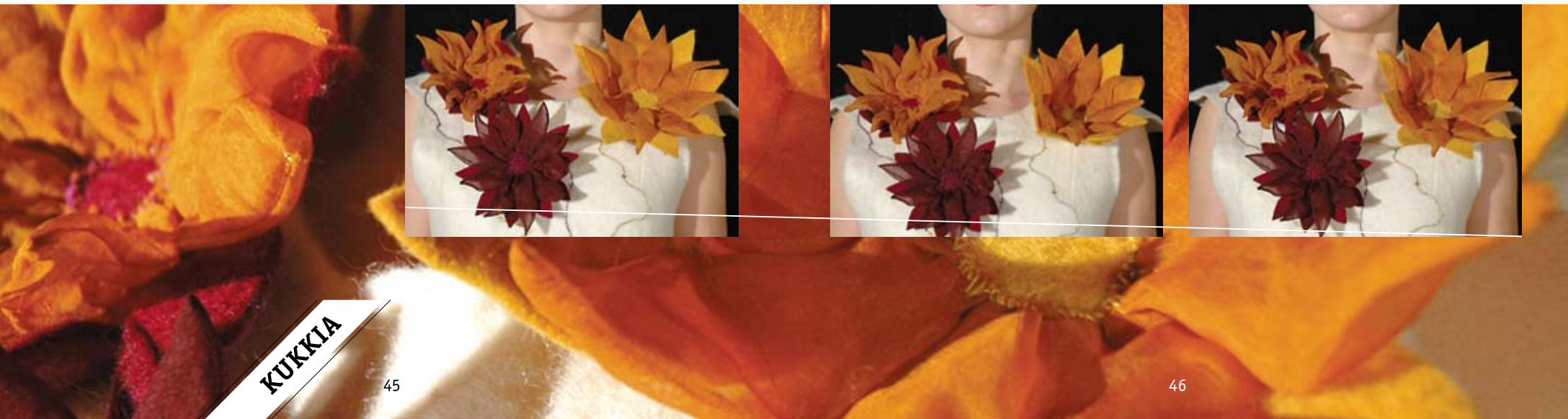
VILKAS

KUKKIA and VILKAS are the first of many XS Labs experiments in developing kinetic electronic garments, engaging the context of fashion design and performance. We have integrated the shape memory alloy Nitinol in textile substrates to create two animated dresses that move or change shape over time, using resistive heating and control electronics.

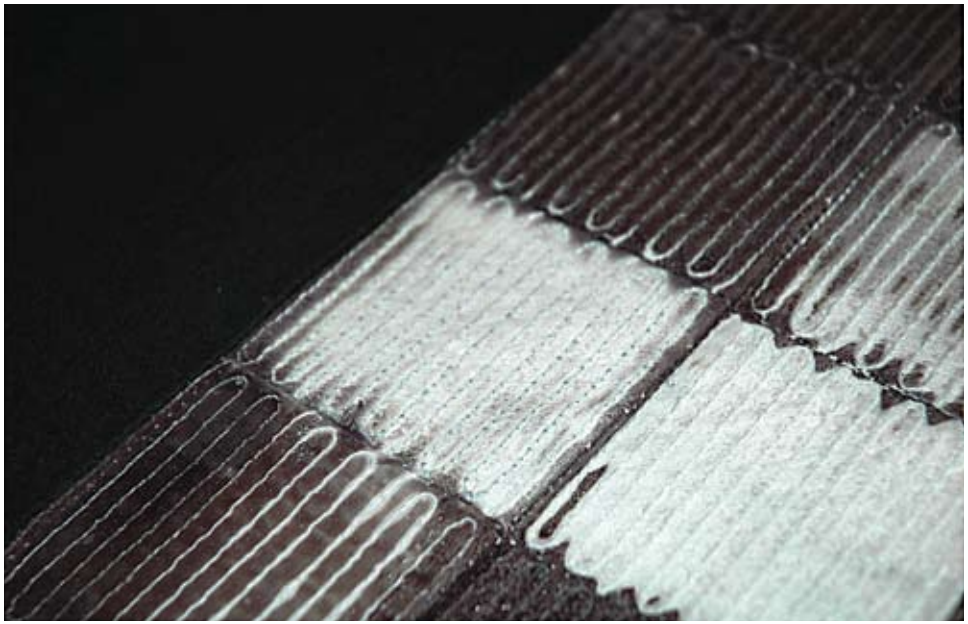
www.xslabs.net/kukkia&vilkas

The KUKKIA flowers frame the face and slowly open and close over time, like a caress.
The dress does not respond to proximity, mood, or the stock market. Rather, it is an expressive and behavioral kinetic sculpture that develops a visceral relationship with the wearer. The KUKKIA flowers are constructed out of felt and silk petals that provide relative rigidity and integrated stitched Nitinol wire, which enables the slow, organic movement.

VILKAS is a winter dress with a kinetic hemline on the right side that rises over a thirty second interval to reveal the knee and lower thigh. It is constructed of heavy hand-made felt with a very light yellow cotton element that contracts through the use of hand-stitched Nitinol wires. Once heated, the Nitinol easily pulls the cloth together, creating a wrinkling effect. This movement is slowly countered by gravity and the weight of the felt. The hemline is programmed to rise autonomously, not in response to any external or internal input. This creates a kinetic dress whose behavior can be playful and even desirable, but can also be problematic in certain social situations. The wearer can wait for the hemline to fall, which can take several minutes, or can actively pull it back down. This initiates a physical conversation between the wearer and the garment, as they fight over control of the body's real estate.



KUKKIA

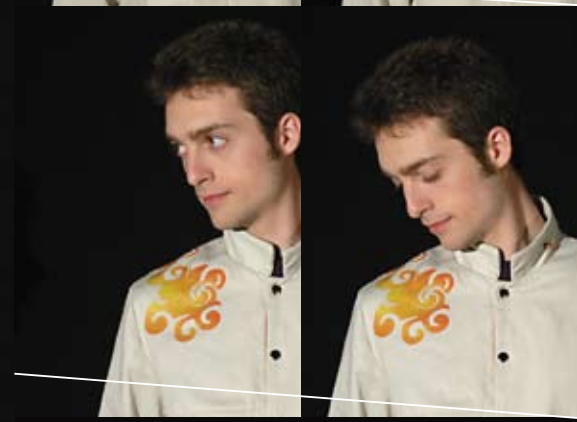


The ANIMATED QUILT (AQ) is a non–emissive quilt whose swatches change color over time. This electronic textile can display different images and change from one pattern to another, producing a smooth transition between different designs. There is a conscious effort to ensure that the aesthetics of the display mirror the soft qualities of the construction.

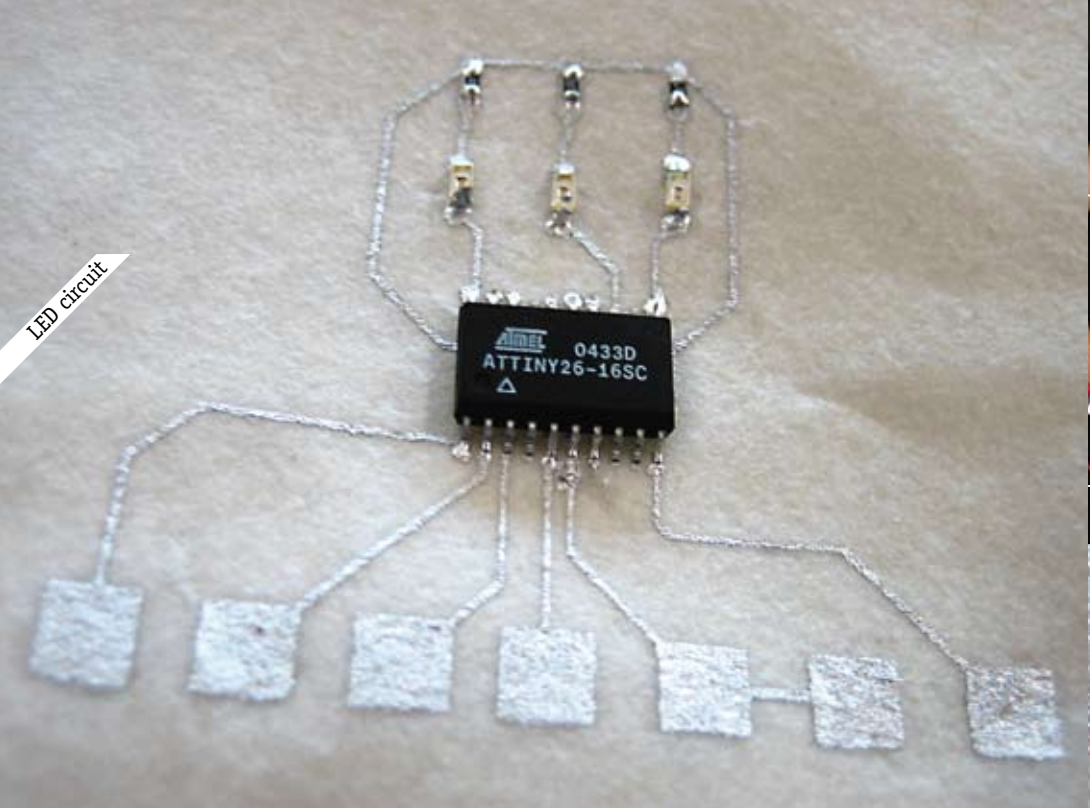
AQ is a soft, reactive, addressable, visually animated modular fabric display. The textile uses thermochromic pigments as well as conductive fabrics and fibers for power delivery, communication, and networking. It is sewn out of multiple fabric modules that are individually addressable (with conductive threads) and slowly change color from black to white. Each color change can be programmed in the custom electronics board or controlled in real time. The textile can be used to display animated low-resolution images on garments.

AQ changes in a slow and contemplative way, referencing the processes of weaving, knitting and other textile construction techniques. Resulting imagery blurs the boundaries between digital image and textile surface. The aesthetics of the patterns and the animation references the concept of pixel, traditional quilting and embroidery practice, as well as emerging research in visual display technology.

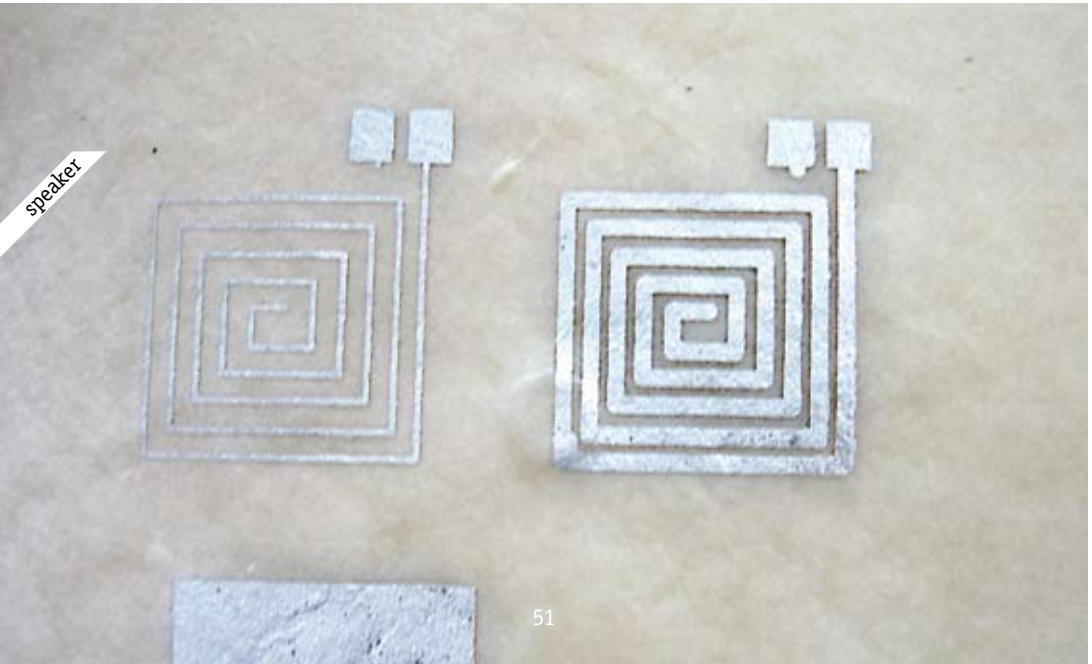
AQ



SMOKS is a pair of electronically enhanced suits that act as an experimental platform for constructing individual and collective memories, for creating and nurturing social networks, and for personal communication and intimacy. By capturing physical memories, representing traces of human touch, recording and playing sounds, and by providing hiding places for physical mementoes, SMOKS use fashion and our interactions through clothing to accumulate and display traces of physical memory in personal and playful ways. We are particularly interested in the exploration of simple interactions that emphasize the natural expressive qualities of electronic circuits and of the body, spawning modes of interaction that are not normally associated with computing technologies.

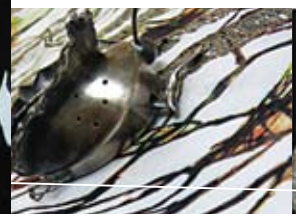


LED circuit



speaker

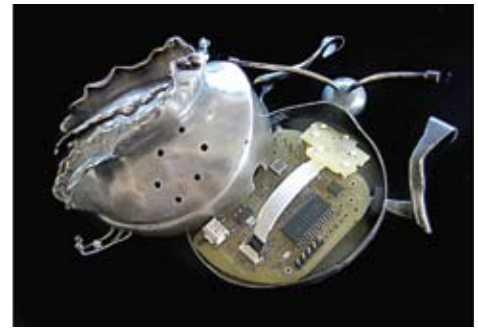
By embedding electro-active materials into paper during the papermaking process, we create sensors and actuators that convey the affordances and tactile qualities of paper, while leveraging the potential of ubiquitous computing. Moreover, since this approach amalgamates an object's substrate with its internal electronic components, we can create truly seamless collocated input and output interfaces.



The BUG brooch attaches to the body and travels through the world, recording events such as human touch, the acceleration of the body during the course of the day, and changing levels of illumination in the environment. BUG is constructed of two very different kinds of materials. Its shell and enclosure are crafted by a metalsmith out of silver. Its brain is engineered out of electronic components on a printed circuit board (PCB). The electronics integrate a light sensor, a touch sensor, and a movement sensor, as well as a microcontroller. BUG records its history of use (or history of interaction) and, when attached to a conductive textile substrate, communicates with a central microcontroller, which then analyzes and visualizes the information. The textile is embroidered with highly conductive tracks, which allow BUG to attach with its legs and draw electricity as well as exchange data.

BUG senses and remembers:

1. How the body moves and shakes during the day (accelerometer).
2. How much light a person is exposed to during the day (photo sensor).
3. Whether it has been touched (capacitive sensor).



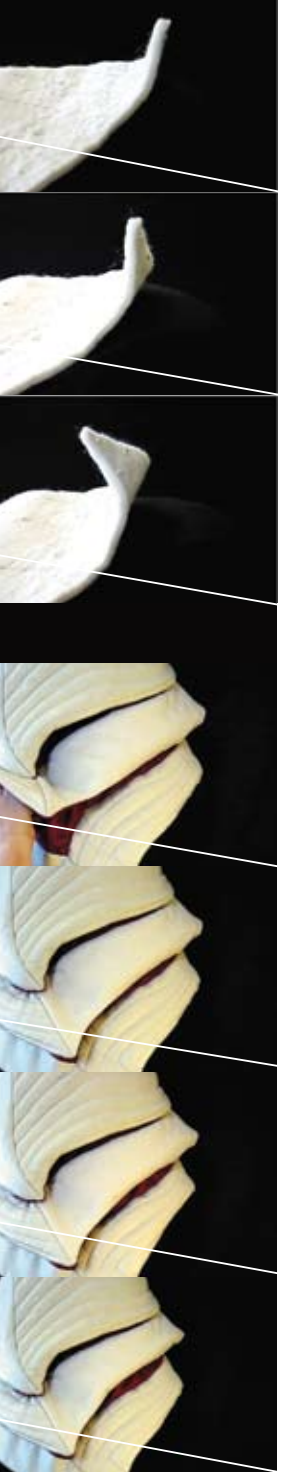
Tetsushi Nonaka is a musician and artist from Tokyo. He modeled for me in the summer of 2000, which led to a series of photographs and mixed media drawings. The drawings were later developed into large scale paintings as well as Jacquard weavings. In this weaving, Tetsushi's hands are brocaded with conductive yarn and connected to capacitive sensors. Touching his hands triggers sound events in the space.

TETSUSHI

SOUNDSLEEVES

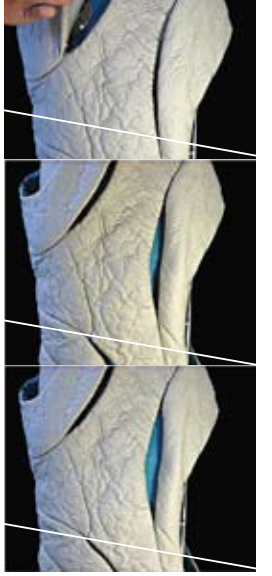
SOUNDSLEEVES is a set of disembodied sleeves covered with conductive strips of silver metallic organza, sensitive to physical contact. When Vincent flexes or crosses his arms, a sound is synthesized within the sleeves and output through miniature flat speakers at the wrist.

The strips are individual variable resistance switches but, when considered as a whole, they become a body-scale flex sensor that can be used to generate sounds. This simple design illustrates the possible emergent behaviors of multiple soft switches, which, when dispersed on the body, can be deployed to create a larger wearable sensate surface. SOUNDSLEEVES augment our natural body language with sound. They become an extension of the body: when our body language is tense and protective (crossing our arms, for instance), the pitch of the sounds becomes higher, as if signaling danger. When our body language is more relaxed, the pitch shifts down and becomes more comfortable, like the purring of a cat.



SKORPIONS

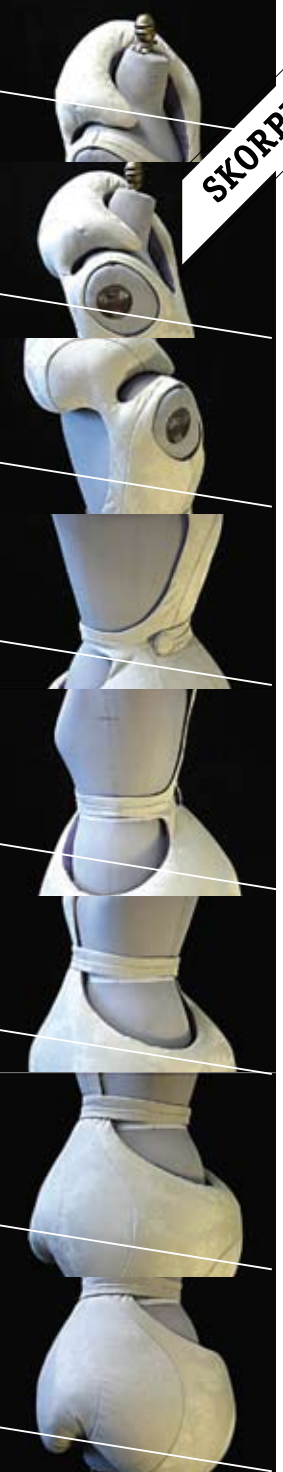
photography by Nico Stinghe



SKORPIONS are a set of kinetic electronic garments that move and change on the body in slow, organic motions. They have anthropomorphic qualities and can be imagined as parasites that inhabit the skin of the host. They breathe and pulse, controlled by their own internal programming. They are not “interactive” artifacts insofar as their programming does not respond to simplistic sensor data. They have intentionality; they are programmed to live, to exist, to subsist. They are living behavioral kinetic sculptures that exploit characteristics such as control, anticipation, and unpredictability. They have their own personalities, their own fears and desires.

SKORPIONS integrate electronic fabrics, the shape–memory alloy Nitinol, mechanical actuators such as magnets, soft electronic circuits, and traditional textile construction techniques such as sculptural folds and drapes of fabric across the body. The cut of the pattern, the seams, and other construction details become an important component of engineering design.

www.xslabs.net/skorpions



SKORPIONS

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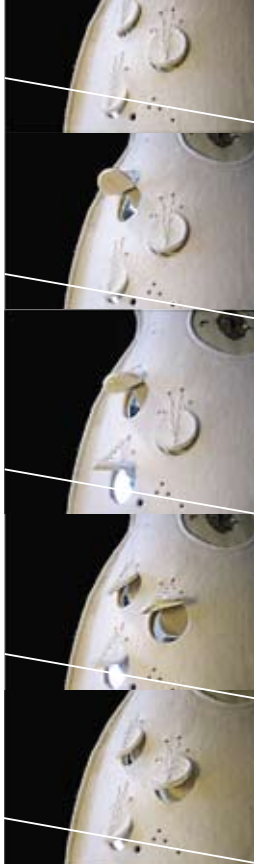


SKORPIONS shift and modulate personal and social space by imposing physical constraints on the body. They alter behavior, by hiding or revealing hidden layers, inviting others inside the protective shells of fabric, by erecting breathable walls, or tearing themselves open to divulge hidden secrets.

SKORPIONS reference the history of garments as instruments of pain and desire. They hurt and distort the body in ways reminiscent of corsets and of foot binding. They emphasize a lack of control over our garments and our digital technologies. Our clothes shift and change in ways that we do not anticipate. Our electronics malfunction and become obsolete.

CAPTAIN ELECTRIC

www.captain-electric.net

CAPTAIN ELECTRIC is a collection of three electronic garments that both passively harness energy from the body and actively allow for power generation by the user. Reflecting fashion's historic relationship between discomfort and style, the dresses restrict and reshape the body in order to produce sufficient energy to fuel themselves and actuate light and sound events on the body.

ITCHY, STICKY, and STIFF conceptually reference safety apparel and personal protection as well as our fears of natural disasters and other states of emergency, personal phobias, anxieties, and paranoia.

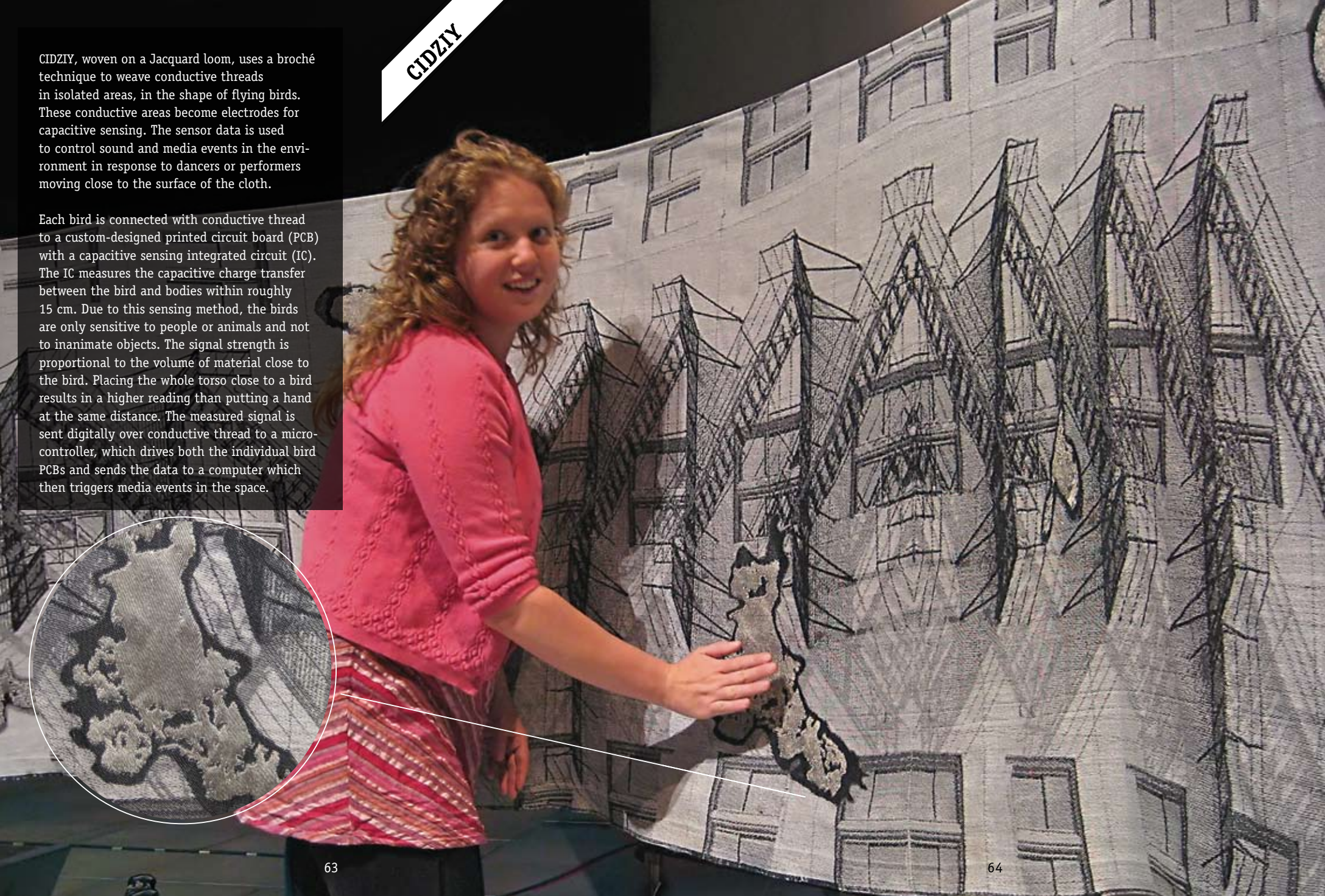
Using inductive generators, we convert kinetic energy from the human body into electric energy and store it within a power cell integrated into the garments. Rather than attempting to conceal the generators and their operation, we chose to overtly integrate them into the garment concept and design.

photography by Guillaume Pelletier

CIDZIY

CIDZIY, woven on a Jacquard loom, uses a broché technique to weave conductive threads in isolated areas, in the shape of flying birds. These conductive areas become electrodes for capacitive sensing. The sensor data is used to control sound and media events in the environment in response to dancers or performers moving close to the surface of the cloth.

Each bird is connected with conductive thread to a custom-designed printed circuit board (PCB) with a capacitive sensing integrated circuit (IC). The IC measures the capacitive charge transfer between the bird and bodies within roughly 15 cm. Due to this sensing method, the birds are only sensitive to people or animals and not to inanimate objects. The signal strength is proportional to the volume of material close to the bird. Placing the whole torso close to a bird results in a higher reading than putting a hand at the same distance. The measured signal is sent digitally over conductive thread to a microcontroller, which drives both the individual bird PCBs and sends the data to a computer which then triggers media events in the space.

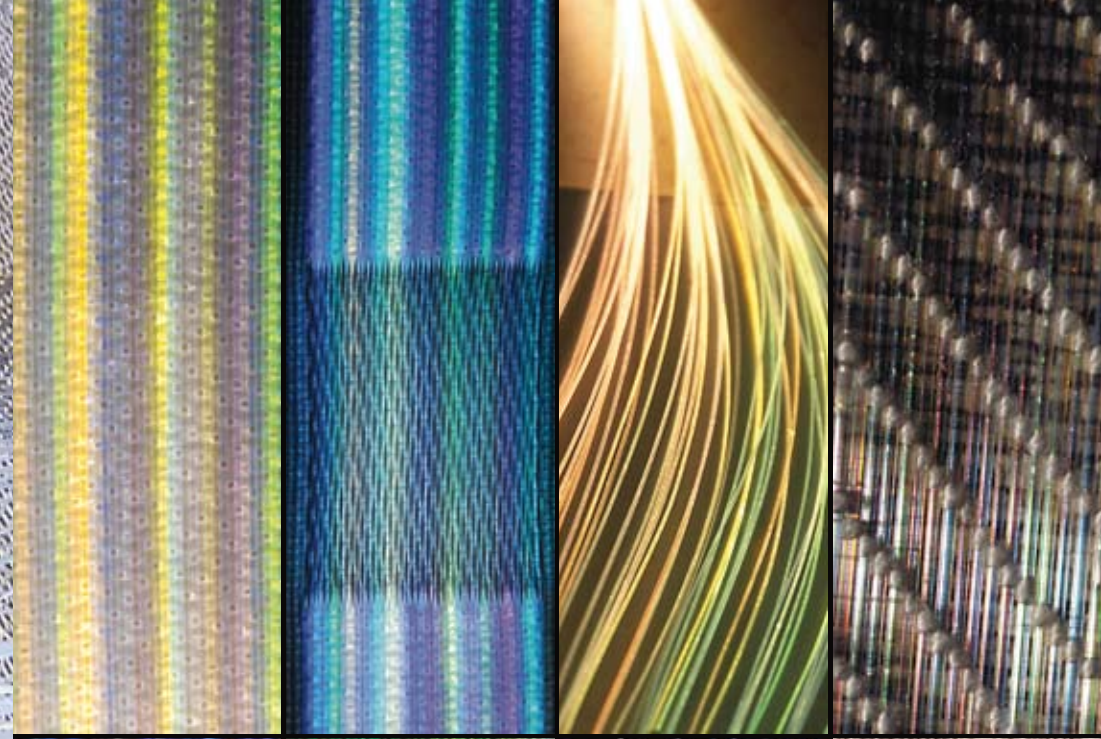


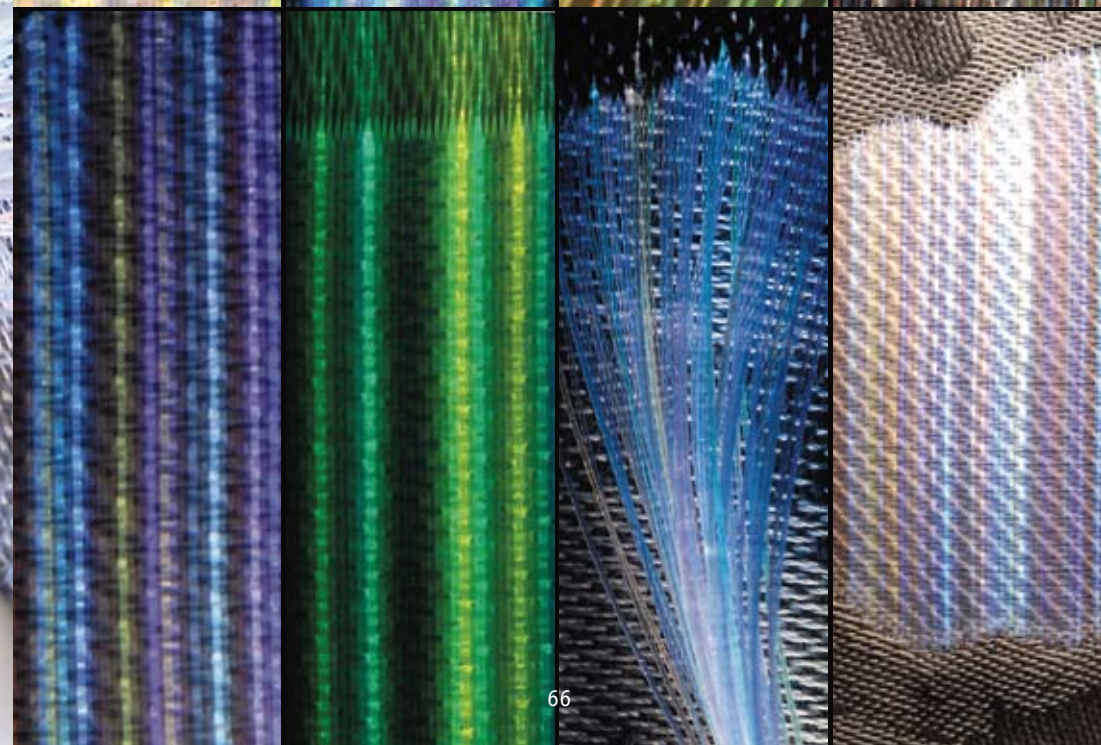
KARMA CHAMELEON

We are collaborating with Prof. Skorobogatiy's Complex Photonic Structures and Processes research group to develop and integrate new types of technical fibers such as drawn polymer microstructured fibers for biomedical and sensing applications. We have been using the Jacquard loom to develop new weave structures using Photonic Band Gap Bragg fibers for applications in interactive garments, interior design, sensing fabrics, signage, and art. These fibers can be compared to optical fibers, but have very different visual characteristics. Under ambient illumination, the fibers appear colored due to their microstructure even though no dyes or colorants are used in their fabrication. When white light is transmitted through the fiber (using a high–brightness LED) the fiber illuminates in color. The colored light is visible without the need for bending or abrasion (as is necessary for fiber optics).

Bragg fibers can be designed to reflect one color when side illuminated, and to emit another color when transmitting light. By controlling the relative intensities of ambient and guided light, the fiber color can be varied, thus enabling a new kind of color changing textile.

www.xslabs.net/karma-chameleon





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	SOUNDSLEEVES Vincent Leclerc Joanna Berzowska	**BIRDS & NUMBERS** Joanna Berzowska	**CONSTELLATION DRESSES** Joanna Berzowska	**BUG** Joanna Berzowska Vanessa Harden Shirley Kwok-Choon Marcelo Coelho Vahid Giahi Marguerite Bromley	**SKORPIONS** Joanna Berzowska Di Mainstone with Marguerite Bromley Marcelo Coelho David Gauthier Francis Raymond Valérie Boxer		**KARMA CHAMELEON** Joanna Berzowska Maksim Skorobogatiy
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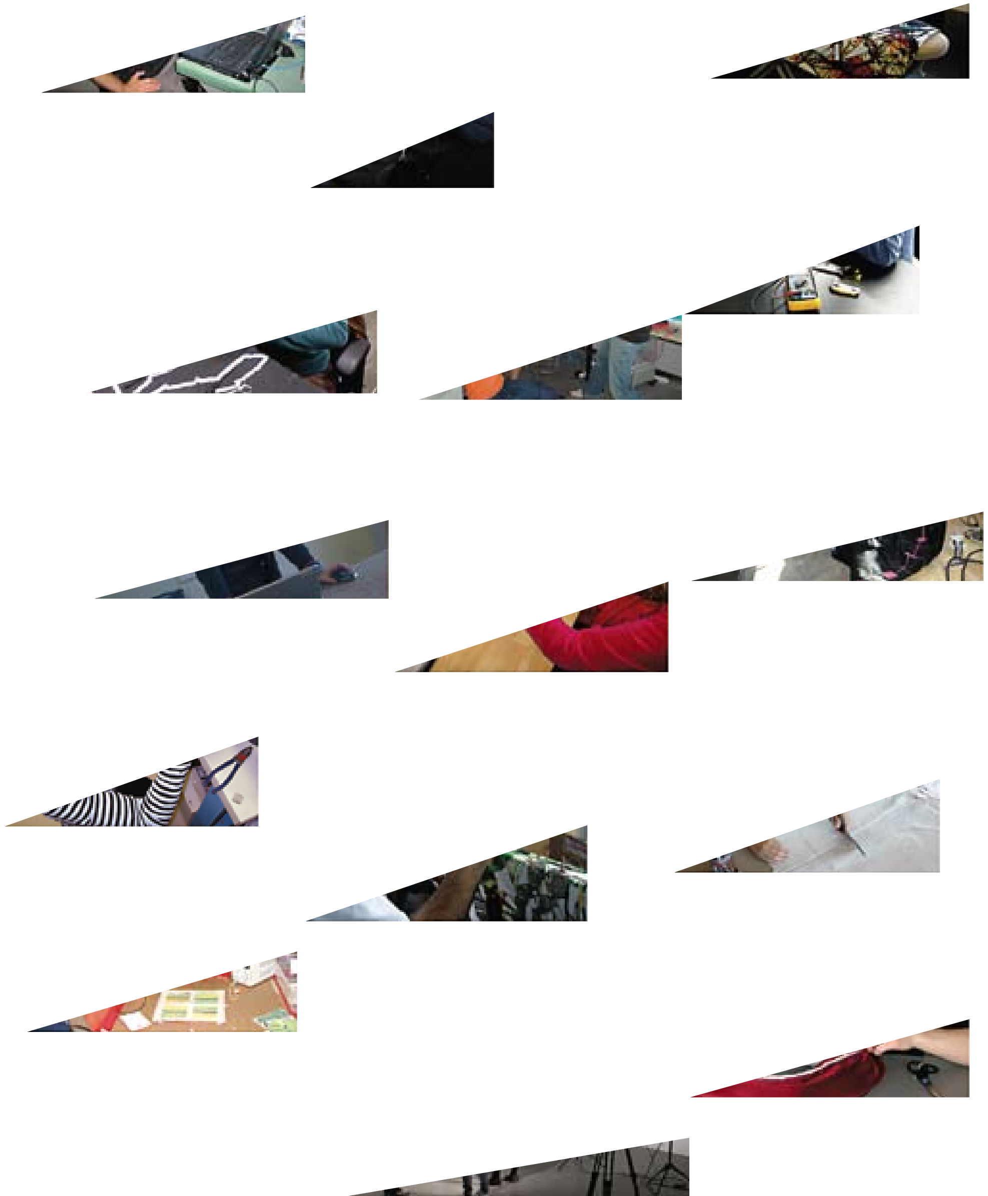

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