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Swing That Thing : moving to move
The poetics of embodied engagement

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Danielle Wilde

14 July 2011

ABSTRACT

Swing That Thing : moving to move represents a systematic investigation of the poetic valence of body-worn technological extension. Gestural, mechanical and sensorial extension are explored and evaluated. The impact of different choices throughout the development process are considered, and theories relating to language, movement and cognition, as well as defamiliarisation and enchantment are leant upon to arrive at an emergent definition of a poetics of embodied engagement.

Focusing on the body and its capacity for movement opens up opportunities to develop deeply felt experiences that take us far beyond pragmatic considerations of functionality or practicality. Pairing technology with the body is not new. Yet embodied engagement has only recently emerged as a field of interest in its own right, despite the fact that moving is central to life. Humour, passion and empathy are desirable attributes through which to engage people. Through the praxis I demonstrate that core- and full-body engagement in ambiguous and playful situations, assist designer and participant to arrive at deeply felt understandings of embodied existence, and thereby re-imagine body-technology scenarios to mitigate unmet desires.

This research champions a number of key ideas. If we engage the body through the imagination and the imagination through the body, we can blur distinctions between art and everyday life. Doing so may result in transformative outcomes in contexts that are not usually considered cultural. By beginning with the body, rather than a perceived opportunity to redesign and thereby improve, I have been able to develop systems and processes that afford clumsy, as well as skilled engagement. Participation has thereby been democratized. The results are artefacts and opportunities for embodied engagement in cultural contexts, as well as in abilitation and learning.

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I dedicate this PhD to my mother
who instilled in me at a very early age the belief that anything is possible,
and that I should always reach for the top.

and to my father
who did not live to see me shine.

June 1913

A work of art is a declaration of freedom. There has never been anything so difficult for mankind to bear as freedom.¹

¹ Oskar Schlemmer, *The Letters and Diaries of Oskar Schlemmer*, ed. Tut Schlemmer, trans., Krishna Winston (Middletown, CT: Wesleyan University Press, 1972).

INTRODUCTION

The Poetics of Embodied Engagement

Our spinal column is at the experiential centre of our structural form. It holds us up and affords articulate, embodied expression on a broad range of axes. Yet it is rare for people, in their daily lives, to fully exploit the dynamic potential of their spine. At the base of our spine, the hips give pendular weight to our upright state. The hips ground and support the spine and all of our organs, as they float, suspended between heaven and earth, our heads and the ground, our eyes and our feet, our legs and our torso, capable, with the spine, of relatively unrestrained movement through space.

This research investigation is focused on core-body interaction – in particular extended physical engagement of the hips and spine. With the exception of specific body-centric practices such as dance, yoga, pilates, the performing arts and some sports, the range of articulation in our hips and spine is largely ignored. By pairing technology directly with the body we can extend the body mechanically, gesturally, sensorially and encourage people to move from their core. This brings focus to our centre. It provides people with the opportunity to re-examine the experiential centrality of the hip and spine area, which can lead, as this thesis argues, to a re-examination of embodied existence and potential poeticisation of experience.

The practical outcomes of this research are non-invasive, wearable technological extensions of the body for performance and play. For practical reasons the works are referred to as *body-worn devices and systems*. The term, *body-worn devices*, sometimes shortened to *body-devices*, is treated as an umbrella term to denote a range of possible approaches to wearable and other body-centric elements and systems, including, but not limited to: body extensions, interactive concept garments, and interactive body-technology environments and scenographies. Using a single term to denote a range of concepts is potentially fraught, as any term comes with existing associations and connotations – different for each reader. Nonetheless, the simplicity has been deemed useful as it allows me to maintain focus on the content of this investigation rather than becoming caught in the minutiae of categorisation and nomenclature.

The body-devices generated for this investigation sit within the broader field of Interaction Design, with outcomes destined for use in performance, exhibition, and both free-form and guided play.² Traditionally, in Interaction Design, fine articulation of the fingers and hands is the focal point of physical interaction – through keyboard, mouse, joystick, Wacom tablet and other peripherals.³ This has also been the case, historically, in wearables research, where the starting point has been to embed devices such as mp3 players and mobile phones into garments, shifting their buttons onto the surface of bodice or sleeve.⁴ Yet the body affords many different kinds of engagement – an interface can be distributed, and can capitalise on our vast capacity for movement rather than simply provide buttons or levers to be pressed or manipulated with our hands. This kind of thinking has gained currency as turn of the century technologies such as Nintendo's Wii, Sony's Playstation Eye and EyeToy, Microsoft's Xbox Kinect and more recently mind control systems created using NeuroSky technology⁵ reflect an increasing interest in the notion of "embodiment." Such thinking also resonates well with a performance context where the performer's entire body contributes to the audience's reading of the action.

The term *embodied interaction* emerged out of a growing focus on embodiment in Interaction Design, prompted in particular by scholarship in philosophy and cognitive science. Seminal texts include Francisco Varela et al's *The Embodied Mind*, Andy Clark's *Being There: Putting Brain, Body and World Together Again*, Clark and David Chalmer's *The Extended Mind*, which led to Clark's *Supersizing*

² Applications will be proposed for therapeutic, abilitation and learning contexts.

³ Wacom pen tablets and interactive pen displays: <http://www.wacom.com/en/Products.aspx>

⁴ A concise overview is provided at: Fibretronic Ltd, "Wearables Reaches Its 10th Year"

<http://fibretronic.com/news/Wearables%20Review>

⁵ Nintendo, "Wii™ Hardware and Computer Program."

http://www.nintendo.co.uk/NOE/en_GB/wii_54.html

Sony, "EyeToy" <http://au.playstation.com/ps2/peripherals/detail/item51695/EyeToy-USB-Camera-%28for-PlayStation-2%29/>

Sony, "Playstation Eye" <http://au.playstation.com/ps3/peripherals/detail/item78696/PlayStation-Eye/>

Microsoft, "Kinect" for "Xbox" <http://www.xbox.com/en-US/kinect>

NeuroSky, "Brain Wave Sensors for Every Body" <http://www.neurosky.com>, which have been incorporated into games by companies such as Mindflex, Mattel, Star Wars, Uncle Mitlon, etc:

<http://www.neurosky.com/People/Partners.aspx>

the Mind; Susan Hurley's *Consciousness in Action*, and Maxine Sheets-Johnstone's *The Primacy of Movement*.⁶ I also include here Shaun Gallagher's 2005 monograph *How the Body Shapes the Mind*,⁷ which has proven an invaluable resource as I developed my theories around phenomenology, in particular how my research outcomes may find applications in relation to physically manifested pathologies. In addition to these texts, the centrality of embodiment to Interaction Research was notably acknowledged for me when the Tangible and Embedded Interaction Conference (TEI), which is attended and run by leaders in my field/s, changed its name to Tangible, Embedded and Embodied Interaction (still TEI).⁸ The work presented at TEI addresses Human Computer Interaction (HCI) issues, design, interactive art, user experience, tools and technologies. The conference is relatively small, single-track, and allows for a range of presentation formats including talks, interactive exhibits, demos, hands-on studios, posters, art installations and performances. TEI thus reflects and is inclusive of the range of practices that are integral to my research. That the conference is single track encourages a non-hierarchical relationship to the different presentation formats and foci, and thereby acknowledges the importance of such a multi-faceted approach to embodied interaction.

My research focuses not just on embodied interaction, but on core- and whole-body interaction. People generally have a high level of dexterity in their fingers and hands. Engagement with this part of the body can be efficient and fine – writing provides an ideal example. Yet being seduced by this potential overlooks the value of full body, even clumsy interaction, often experienced at a lower resolution of control. Dexterity and efficiency may be viewed as something to strive for, yet fine motor control results in actions becoming disassociated from

⁶ Andy Clark and David Chalmers, "The Extended Mind," *Analysis* 58, no. 1 (1998); Andy Clark, *Supersizing the Mind* (New York: Oxford University Press, 2010); Andy Clark, *Being There: Putting Brain, Body, and World Together Again* (Cambridge, MA: MIT Press, Bradford Books, 1997); Francisco Varela, Evan Thompson, and Eleanor Rosch, *The Embodied Mind* (Cambridge, MA: MIT Press, 1991); Susan Hurley, *Consciousness in Action* (Cambridge, MA: Harvard University Press, 1999); Maxine Sheets-Johnson, *The Primacy of Movement* (Amsterdam: John Benjamins Publishing Company, 1998).

⁷ Shaun Gallagher, *How the Body Shapes the Mind* (Oxford: Oxford University Press, 2005).

⁸ <http://www.tei-conf.org> The text describing the conference is taken from the conference website.

the experience of the action as focus necessarily moves through the body to the task at hand. If this did not happen, attention would be caught in the manipulation of the tool and the associated fine detail of motor control, and the task would suffer.

Angelo Maravita and Atsuchi Iriki, in their studies of the neurophysiology of tool use have found that our body schema frequently enlarges to incorporate the tools that we use, particularly when our use of these tools is intentional.⁹ Phenomenological philosopher Martin Heidegger proposed that objects may be experienced in two different ways – as “ready-to-hand” and “present-at-hand”. When an object is “ready-to-hand” it is seamlessly integrated into our activities, as extensions of our bodies in action, in line with Maravita and Iriki’s outcomes. When an object is “present-at-hand” our attention is on the object directly – we perceive it as a resource for exploitation and relate to it independent of our bodies, as an agent to be acted upon and with, rather than through.¹⁰ My body-devices cannot be physically separated from the body, the two are tightly, and consistently coupled. This coupling engenders a different kind of relationship to both body and tool, as it is the body, not the device or tool that shifts in the attention of the wearer and observer: their focus moves between the physical actions and the results of these actions as engendered through the tool, rather than shifting solely between use of tool and resulting action. This shift in focus between body and body movement affords an inversion, or remapping of Heidegger’s notions onto the body, whereby it is the body itself that is experienced as present-at-hand or ready-to-hand respectively. The body-devices thereby afford different qualities of reflection about our bodies and experience. The whole contrasts with the experience of interacting with extreme skill and dexterity, where experience is *through* the body rather than *of* the body.

⁹ Angelo Maravita and Atsushi Iriki, "Tools for the Body (Schema)," *Trends in Cognitive Science* 8, no. 2 (2004).

¹⁰ Martin Heidegger, *Being and Time*, trans., John Macquarrie and Edward Robinson (New York: Harper & Row, 1962).

The control we have of our core bodies is generally coarser or clumsier than the control we have of our fingers and hands. When our physical core is a fundamental aspect of engagement, our body's capacities, tendencies and limitations can interfere with our process. Attention is thereby brought to our body, and can shift over time between the body, gesture and the outcomes that result from physical engagement. Our embodied-ness, necessarily, is implicit in this experience. The feeling of such engagement is fundamentally different from the interaction facilitated through our fingers and fine articulation. This feeling of integrated embodied-ness has been used as the starting point for this investigation, as a way to explore the notion of poetic engagement.

The aims of this praxis are to inspire people to move, literally, beyond their habitual limits; to consider technology's potential to poeticise experience when extending our dynamic moving form; and to broaden the way we think about our bodies and technology. In support of these aims, a systematic examination of the impact of different development choices in relation to technologically facilitated body-worn extension has been undertaken. The research is characterised by a series of phases. In chapter one I describe the phase one experiments, which investigate the potential of three different approaches to extension. Each approach engenders a range of opportunities for further investigation. The phase two experiments, described in chapter two and three, are more elaborate. They serve as case studies for further development, and also test hypotheses engendered by the phase one experiments. Interrogation of process and methodology are central. I examine and question the impact of development choices through my own practice, collaborating with a range of people in various situations, and observing and inquiring how other people work.¹¹

¹¹ This research has been undertaken in academic, scientific and artistic research labs in the United Kingdom, Europe and Japan, as well as in Australia. In my drive to understand process, and the impact of context, I have engaged in rich dialogical exchange on these subjects with collaborators, colleagues, other artists and practitioners. I also visited a number of labs across Europe and North America to interview lab founders and directors whose work is focused on embodied interaction research. This meta-investigation facilitated deep reflection on the impact of context, processes and

Many factors impact the development of body-devices. Consideration must be given both independently and interdependently to input, output, the aesthetics of the physical interface, and the experience of interacting, which exists at the juncture of the different elements. In addition, the experience of wearer and viewer differ in relation to each of these elements, so this too must be considered within the design process. Accordingly, careful consideration has been given to where the attention of the wearer and/or viewer might lie at any time, and how works might interfere with this focus to create a tension between body and expression, mediated by output. Soft, hard, embedded and extended interfaces have been developed. A range of different input and output modalities are explored, including a consideration of technical complexity, and what this complexity may or may not add to experience. Sensing technologies have included discrete, distributed and embedded bespoke sensor systems, as well as adapted off-the-shelf technologies. The research has been systematic with regard to the range of media explored. The results thus provide a comprehensive overview of what is necessarily highly subjective material, from which broad-based conclusions can be made. These conclusions are intended to inform and guide choices made by developers of body-worn devices to support poetic outcomes.

Importantly, throughout, the body has been central to the development process. The fundamental fact of our embodied existence, including our relatively untapped capacity for movement, has been foregrounded. This has allowed deep consideration and ongoing questioning of the roles of full- and core-body interaction and visceral experience, as well as mechanical, gestural and sensorial extension. In chapter one I demonstrate that beginning with the body engenders experientially rich outcomes that may have surprising applications beyond cultural contexts to abilitation and learning. I investigate this notion through the development of a playful musical interface that encourages people to explore and

approaches in my work, as well as in the different communities of practice that my research touches upon. A list of residencies, fellowships, lab visits and meetings is provided in Appendix A.

extend the range of movement in their hips, as well as through the development of tools and interfaces for the creation and enacting of performance. In chapter two this process is elaborated as I engage specifically with performance practitioners, developing interfaces for, with and through them; and also disability and abilitation researchers, investigating applications of my research approach and outcomes to a range of neurophysical pathologies.

The *Light Arrays* project, discussed in chapter two, benefitted from an extended development process. It serves as a case study for how the other phase one experiments might be elaborated.¹² Constructing my research in this way has allowed broad as well as deep consideration of my hypotheses. I have thereby been able to test and also develop my reflections through a range of embodied processes and approaches that build incrementally on each other, literally, as well as laterally. As will be demonstrated, consideration of the role of participant and viewer evolved as a major concern due to the inherent performativity of physically engaging body-devices. I discuss this in relation to each of the projects, and also conclude my praxis with a project that focuses entirely on participatory processes wherein the audience-performer / participant-observer relationship is conflated.

The *OWL project*, discussed in chapter three, investigates how the embodied imaginations of people outside of the design process may be leveraged to assist in the imagining of yet-to-be-developed body-worn technologies. Working in a speculative technology space with people who are normally outside of the design process has afforded wild thinking, often less constrained by the limitations of known processes. Doing so deepened my investigation of the centrality of the body to the praxis, and allowed focused consideration of the role of the imagination and desire in body-technology relationships.

¹² The phase one experiments are discussed in chapter one, sections one and three.

Throughout this investigation, the praxis serves to unveil, examine and articulate processes that support a poetics of embodied interaction. Movement precedes articulation, in all aspects of the work, and is supported and encouraged through various means. Importantly, consideration has been given to the idea of designing to encourage playfulness. French Sociologist, Roger Caillois describes playfulness as relating to unstructured and spontaneous activities (as opposed to games, which are structured activities with explicit rules). According to Caillois, play has a number of formal characteristics, which he sums up as follows:

we might call [play] a free activity standing quite consciously outside “ordinary” life as being “not serious,” but at the same time absorbing the player intensely and utterly. It is an activity connected with no material interest, and no profit can be gained by it. It proceeds within its own proper boundaries of time and space according to fixed rules and in an orderly manner. It promotes the formation of social groupings which tend to surround themselves with secrecy and to stress their difference from the common world by disguise or other means.¹³

Inspired by Caillois’ characteristics of play, I have created open systems that support different kinds of physical engagement that leave space for the participants to fill with meaning. As adults we easily forget, or overlook opportunities for play because of the dominance of utilitarian considerations – tasks we need to achieve, things we need to do, and the responsibilities that go along with these commitments. Yet the importance of play is underlined by a number of artists and theorists. Dutch historian and cultural theorist Johan Huizinga, who inspired much of Caillois’ thinking, argues the importance of play in the very development of civilisation.¹⁴ American composer and artist John Cage, speaks of “the purposeful purposelessness” of play, saying that it serves as

¹³ Roger Caillois, *Man, Play and Games* (Champaign, IL: University of Illinois Press, 2001), 4.

¹⁴ Johan Huizinga, *Homo Ludens: A Study of the Play-Element in Culture* (London: Maurice Temple Smith Ltd, 1970). See also Huizinga in Caillois, *Man, Play and Games*, 3. Importantly Huizinga focused on competitive aspects of play, whereas Caillois argued beyond the need for competition.

“an affirmation of life – not an attempt to bring order out of chaos nor to suggest improvements in creation, but simply a way of waking up to the very life we're living”.¹⁵ Interaction research professor William Gaver writes that ludic design can support values such as curiosity, play, exploration and reflection, arguing that this is not only important, but is essential to wellbeing.¹⁶

Throughout my investigation I test the ability of playfulness to support and encourage embodied reflection. In chapter one I use clumsiness as a design resource to understand how playfulness might encourage people to go beyond tendencies to self-censor. In chapter two playfulness is applied to the serious pursuit of contemporary choreography, and the often difficult contexts of neurophysical pathologies to further investigate how playfulness might encourage engagement, and open up other ways of thinking. In chapter three I use playful structures to destabilize participants so that they might be able to imagine yet-to-be-imagined technologies, by doing things that they do not know how to do.

This investigation is fundamentally concerned with Cage's idea of “waking up to the very life we're living” as embodied beings, and the wellbeing that results from a poeticisation of experience, realised through embodied interaction. Curiosity, play, exploration and reflection are integral to the investigation, and are examined through their use and their absence. The examination begins, moves through and emerges out of the praxis, which includes designer participation, as well as co-creation and collaborative imagining with participants. I design for, with and through the moving, experiential body. This approach affords access to knowledge, expertise or connoisseurship that may otherwise elude articulation. In traditional design education we are encouraged to keep personal viewpoints and experience at arms length. Yet felt experience is idiosyncratic and difficult to articulate, and despite the shared experience of “being human”, may vary

¹⁵ Richard Kostelanetz in Dominic Robson, "Play!: Sound Toys for the Non Musical," *Computer Music Journal* 26, no. 3 (2002).

¹⁶ William Gaver, "Designing for Homo Ludens," *13 Magazine* 12, (2002).

dramatically. Bodies have different fits, feelings and ways of moving. These differences affect design process and outcome. By considering body-based design as an emergent, phenomenological process, the personal experiences of designers can become an integral part of the design process. By engaging directly in the movement discovery process I have been able to exchange bodily experiences with participants, as well as with the design itself. Emergent bodily knowledge thus is an essential material of my design process and thinking.¹⁷

The results of my investigation deepen our understanding of the impact of different choices relating to the development of body-worn devices. They facilitate intentional and considered design of poetically, as well as physically engaging interfaces, by articulating or embodying what poeticising experience might mean in the context of physically-engaged interaction. In doing so, they also demonstrate why it is essential that the notion of a poetics of experience be crucial to development if we desire to create works that go beyond our base functional needs.

¹⁷ These ideas are elaborated in: Danielle Wilde, Thecla Schiphorst, and Sietske Klooster, "Move to Design • Design to Move a Conversation About Designing for the Body," *Interactions* 18, no. 4 (2011).

Chapter: 1

In the Beginning

Beyond any doubt, we share a common creaturehood and humanity
in which movement is and remains our mother tongue.¹⁸

In this chapter I focus on how and why I have undertaken this research. My approach has been practice-based, which has involved making objects and devices, developing performances and designing experiences. It has also involved an active interrogation of the development process. The aim of this chapter is to lay out the progression of my ideas and process as a kind of foundation for understanding, on which I build my conclusions.

The first section presents my initial praxis outcomes and unveils my emergent theoretical concerns. *hipDisk* forms the central node around which the other works circle, collectively embodying my examination of the impact of different choices in the development process of body-worn, technologically facilitated extension. Gestural, mechanical and sensorial extensions are examined. The way we think about embodied practice, as well as choreographic and compositional extensions is also explored in different ways. The second project, *Gesture≈sound experiments*, completes this section.

The interdependent theoretical scaffold that supports, and is extended by this praxis is presented in section two. My references include theoreticians and practitioners from a broad range of disciplines including philosophy, architecture and literary theory, as well as Human Computer Interaction (HCI) and Interaction Design. The theoretical reach reflects the breadth of my concerns, as well as the diverse influences and hybrid nature of body-worn technologies. This investigation is emergent.¹⁹ It is grounded in experience and process. Phenomenological thinking is implicit throughout. My preference has been to reference theoreticians whose practice is itself grounded in phenomenology,

¹⁸ Maxine Sheets-Johnstone, "Why Is Movement Therapeutic?: Keynote Address, 44th American Dance Therapy Association Conference, October 9, 2009, Portland, OR," *American Journal of Dance Therapy* 32, no. 1 (2010): 13-14.

¹⁹ In the Philosophical sense: arising as an effect of complex causes and not analyzable simply as the sum of their effects.

rather than to focus on the founders of the discipline. My desire is to build further on a developing field, acknowledging where that field is today, as much as where it came from, by looking at theoreticians who have applied phenomenological thinking to different creative and expressive fields, relevant to my research. By doing so, I hope to have found new ways of looking at the material and thereby to have made a new contribution.

To complete this chapter I present the final phase one project, *hipDrawing*. This work opens out my thinking and both extends and clarifies questions raised by *hipDisk* and *the gesture≈sound experiments*, in particular in relation to performance. *hipDrawing* completes my basic approach, thus cementing the foundation from which I conduct this investigation. Importantly, phase one of this PhD also included experiments in which I extended the body with light. The *Light Arrays* are discussed in chapter two.

Movement is a counterpoint to motorological thinking. Without in the least devaluing neurophysiological studies of movement, I want to point out that the terms “motor control,” “motor learning,” “motor skills,” and so on, reduce movement to a motorology that completely occludes the experiential realities of movement and its inherent qualitative dynamics.²⁰

²⁰ Sheets-Johnstone, "Why Is Movement Therapeutic?: Keynote Address, 44th American Dance Therapy Association Conference, October 9, 2009, Portland, OR," 12.



Figure 1. Danielle Wilde, *hipDisk* (2007-2011)

1.1 The Foundation : *hipDisk* to *gesture~sound*

hipDisk (fig. 1) emerged from the desire to inspire people to explore and extend the range of movement of their hips. It is a mechanical extension that requires gestural extension, and gives the body musical capabilities. Two horizontal disks emerge from the torso, one above the waist, one below. Each movement of the wearer that causes the disks to touch results in a tinny, electronically generated tone that bursts forth from speakers mounted on the lower disk. The sound motivates and gives meaning to the wearer's movement. The result is clumsy, yet engaging. Though it was not the intention, *hipDisk* provides a novel framework for ungainly interaction. During development, as the interface took form, the movement of the wearer was incrementally rendered so strange that it became remarkable. In its final form *hipDisk* embodies what Russian Formalist Art Critic, Viktor Shklovsky, describes as the artistic-poetic power of defamiliarisation.²¹ A common technique of ethnography, design and art throughout the twentieth century, defamiliarisation is epitomised in the surrealist slogan "making the ordinary extra ordinary".²² *hipDisk* engages both wearer and viewer in surprising ways. The interface emerged from an embodied process, affords core-driven embodied interaction, and the results prompt deep reflection on what might constitute an embodied practice, as well as a poetics of embodied experience. In the first phase of development, the designer (and author) was the only person to wear the device. In phase two *hipDisk* was made available for other users: performers developing a *hipDisk*-ed performance troupe, and later the general public.

Judged externally, many parallels have been made between *hipDisk* and the hula hoop,²³ a device familiar to most people from their childhood, or from the circus.

²¹ Viktor Shklovsky, *Art as Technique. In Russian Formalist Criticism: Four Essays*, trans., L. Lemon and M. Reis (Lincoln: University of Nebraska Press, 1965 (1917)).

²² Henri Lefebvre, "Towards a Leftist Cultural Politics: Remarks Occasioned by the Centenary of Marx's Death, 1988," in *Marxism and the Interpretation of Culture*, ed. C. Nelson and L. Grossberg (Urbana and Chicago: University of Chicago Press, 1991). Defamiliarisation is discussed at length in section 1.2.

²³ private correspondence with observers in Europe, Australia, North and South America and Japan.

Many people have reported to me that they loved the hula hoop and played with it incessantly as a child.²⁴ They could not explain why, beyond enjoying how hooping felt. I argue here that core-body engagement was necessarily a fundamental factor in their enjoyment, because there is little else involved. To better understand the parallels being drawn, I began hooping.²⁵ It was often difficult to learn new tricks, yet I felt a deep sense of engagement, presence and dexterity in my entire being, not only when I was practicing, but at all times throughout the day. Dancer, choreographer, and phenomenological philosopher, Maxine Sheets-Johnstone describes this phenomenon as residual “spin-off of movement.”²⁶ She argues that it has the potential to awaken feelings of aliveness, in a personal and existentially vibrant sense. A similar sense of almost euphoric embodied-ness is experienced when using *hipDisk*, as intense focus is brought, through movement, to and through the core of the body.

In the modern dance revolution, at the beginning of the twentieth century, Isadora Duncan called for the initiation of movement from the lower torso “in a search for an absolute integrity of gesture and a liberation from highly mannered codes of motion.”²⁷ Helen Moller insisted that “All true physical sensation has its generative centre in the region of the heart....Movements flowing from any other source are aesthetically futile.”²⁸ In her discussion of modern dance, Hillel Schwartz argued that “[modern dance’s] chief pattern was the spiral; it’s deepest resource was torsion” or movement emanating from the solar plexus.²⁹ Hula hooping exemplifies this movement pattern. *hipDisk* also brings all of our attention and focus to the core of the body and requires torsion.

²⁴ Ibid.

²⁵ I undertook lessons and, at different times throughout the research, practiced hula hoop daily

²⁶ Sheets-Johnstone, “Why Is Movement Therapeutic?: Keynote Address, 44th American Dance Therapy Association Conference, October 9, 2009, Portland, OR,” 3.

²⁷ Hillel Schwartz, “Torque: The New Kinaesthetic,” in *Incorporations*, ed. Jonathan Crary and Sanford Kwinter (New York: Zone Books, 1992), 72.

²⁸ Ibid., 73.

²⁹ Ibid. See also Chris Salter, *Entangled. Technology and the Transformation of Performance* (Cambridge, MA: MIT Press, 2010), 225.

There are many other works that focus on core- or full-body engagement. Exertion interfaces are not unrelated,³⁰ though their focus is to generate excitement in sports and gaming. Sport generally focuses on skilled engagement, rather than aesthetic experience. Games also, competitive in nature, rarely lead us to examine the idiosyncratic nature of experience. Devices that more closely reflect the qualities of my interest in core body, physical engagement and Shklovsky's artistic-poetic notion of defamiliarisation, include Rinotschild's *Laughing Swing*, Bernie Lubell's *Cheek to Cheek*, and Grace Kim's *Twirl Skirt*.³¹ These three works focus in different ways on the hip area, and help us to reflect on how digital technology might be used to initiate or prompt core-body engagement, as well as the types of experiences such engagement might afford.

Laughing Swing, by Rinotschild, is a modified swing that contains a movement sensor, a soundchip and speaker embedded into the seat and workings of a swing (fig. 2). As the person on the swing moves, the swing emanates laughter, calibrated to the élan of their swinging. If the swing is moved slowly, for example, we hear a tentative giggle. As the swing is moved more vigorously, the laughter becomes accordingly more wild. *Laughing Swing* creates a feedback loop that prompts the person to swing, as well as to laugh. As laughter is contagious, it also prompts observers to laugh. Swinging and laughing are core-body experiences. As everyone laughs they experientially become an extended body, fuelled by the tight coupling of physical engagement to laughter, as well as by the laughter itself. Swinging requires a certain skilled dexterity with which laughter may interfere or interrupt. Throughout this exegesis I will posit the value of unskilled, awkward, graceless or clumsy interaction. *Laughing Swing* helps us to think

³⁰ Exertion Interfaces is a research activity that investigates how the design of computing technology that demands physical exertion can facilitate more exciting experiences. The work is most notably led by Floyd Mueller: <http://exertioninterfaces.com/>

³¹ Rinotschild, Rinott, M., Rothschild, M., Weinstein, L., "Laughing Swing" (2005) <http://www.michalri.net/laughingswing/>; Lubell, B., "Cheek-to-Cheek" (1999) <http://bernielubell.com/03cheekinstall.htm>; Kim, Grace, "Twirl Skirt" (2005) <http://www.iamgracie.com/twirl/>



Figure 2. left: Rinotchilid, *Laughing Swing* (2005).
centre+inset: Bernie Lubell, *Cheek to Cheek* (1999).
right: Grace Kim, *Twirl Skirt* (2005)

about different ways of engaging through our core, stimulating this engagement both directly and indirectly, as well as potential couplings between physical engagement and activities that lack, or bypass, gracefulness.

Cheek-to-Cheek, by Bernie Lubell, is a feedback loop of a different order (fig. 2). The user of *Cheek-to-Cheek* sits on a stool that is connected with pneumatic tubing to a headpiece. By moving their buttock cheeks, the participant inflates cushions that are held in place against their facial cheeks. When one buttock cheek moves, one of the facial cheek cushions is momentarily filled with air. The relationship is very direct and creates an intimate feedback loop in the body. According to Lubell, many people find the intimacy too confronting so wear the headpiece but choose to control the movement of the seat with their hands, leaning towards it, so that their hips can be held as far away as possible.³² This

³² I used the device when it was exhibited at the Ars Electronica Festival in Linz in September 2007 and can attest to how unusual an experience it was; I also observed other people using it and,

subversive (re)use of *Cheek-to-Cheek* suggests a fundamental difference between core-body and hand-based interaction, illustrating that it is easier to separate an experience from one's sense of self when engaging through the hands than the core. Our sense of embodied engagement seems proximally located.

Grace Kim's *Twirl Skirt* extends these ideas into a fully wearable space (fig. 2).³³ *Twirl Skirt* has three electro-luminescent panels that illuminate in reaction to how fast the wearer is spinning. Wearers of the skirt seem to spin and twirl in ways that they usually have not done since they were children.³⁴ *Twirl Skirt* encourages this movement through the coupling of visceral pleasure with feedback about the velocity of the wearer's spin. The Skirt prompts playful engagement in line with my interest in open systems for play as characterized by Caillois.³⁵

The works cited above bring attention to our bodies in different ways. The nature and quality of immersive experience they evoke resonates strongly with my praxis outcomes, which have evolved from the common design intent: "to move the body through real and virtual extension." The results encourage people to explore and move in extra-normal ways and thereby view and experience their bodies from perhaps hitherto unknown perspectives. The devices open up a free-form expressive space that brings the attention to and through the body just as *Laughing Swing*, *Cheek-to-Cheek* and *Twirl Skirt* do, but they do it in the context of the body-worn. Bringing focus to the body affords insight into how we can move and what this feels like; individual body-centric learning preferences; and the idiosyncratic nature of personal, corporeal expressiveness. The inherent openness of the systems results in a rich playground for self-expression that encourages playful engagement.

where possible, had short discussions with them about their experience; Lubell also spoke with me about user experiences throughout the lifecycle of the work, which was created eight years prior.

³³ Kim, Grace, "Twirl Skirt" <http://www.iamgracie.com/twirl/>

³⁴ The skirt has been made for adult women.

³⁵ As discussed in the introduction: Caillois, *Man, Play and Games*.

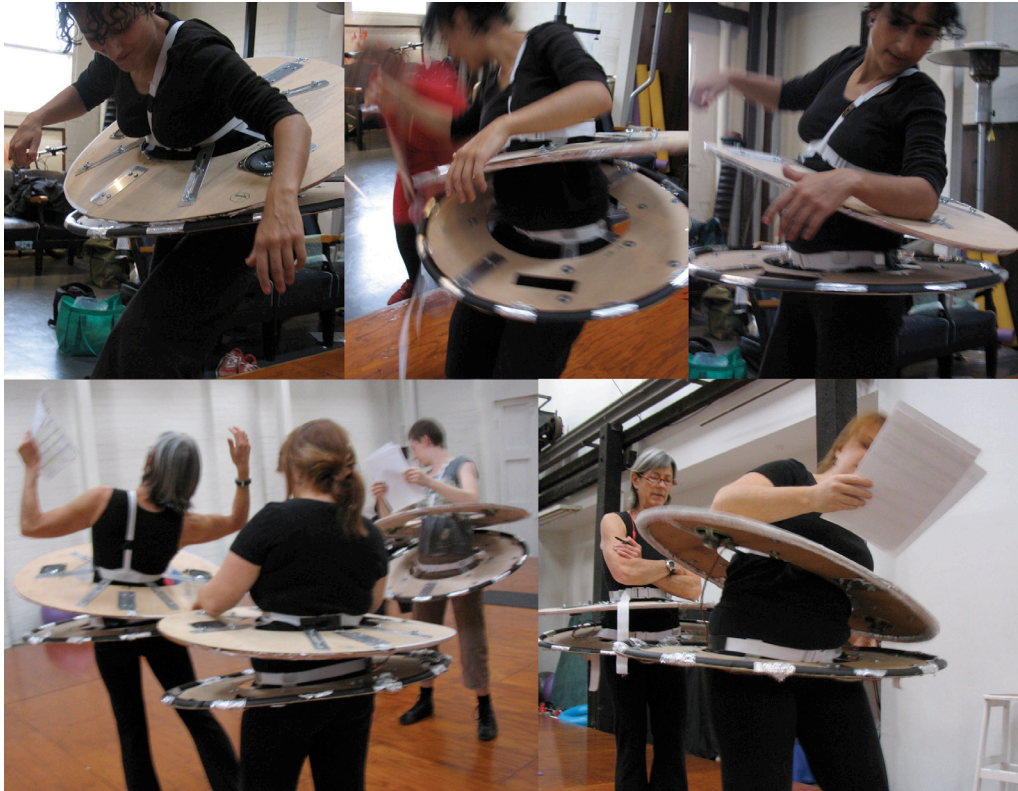


Figure 3. Danielle Wilde, *hipDisk* (2007-2011).
the *hipDisk* supports intrapersonal and interpersonal learning:
working kinaesthetically, visually, vocally, aurally, spatially, haptically.

The *hipDisk*, as described above, constrains, and requires a particular kind of extension. It brings to light idiosyncrasies in posture and flexibility. It also, surprisingly, provides information about individual body-centric learning preferences, as people instinctively look for the most comfortable way to learn how the device behaves – through visual supports; physically: proprioceptively and kinaesthetically, as well as with tactile support from others; through sound; or observation. Some participants even use spatial orientation, though the interface is self-contained and centred on the body, ensuring that no matter which direction the wearer faces the behaviour of the device is consistent.³⁶ All of these approaches offer insight into embodied knowledge generation (see fig. 3 for examples).

³⁶ Danielle Wilde, "The Hipdiskettes : Learning (through) Wearables," in *The Australasian Computer Human Interaction Conference (OZCHI 08)* (Cairns, Australia: 2008).

Moving the hips in extended and intentional ways is not a common activity, outside of an intimate context. It can be highly pleasurable. In the case of *hipDisk*, it also looks very strange. We do not normally view the body extended horizontally. We also do not normally undertake activities that have a disproportionate relationship between effort and outcome. The *hipDisk* can require an inordinate amount of effort to play certain notes, yet no matter the effort the outcome is a reedy, unrefined tone. There is nothing sophisticated or graceful about the device in any traditional sense, yet participants love wearing it and playing with it.³⁷ Such responses seem proportionally skewed considering the concurrent technical simplicity and challenges of use of the device.³⁸ To facilitate deeper reflection I developed the interface to make it adjustable and made a number of sets available for use. This afforded examination of the social behaviour of multiple users, as well as the interwoven choreographic and compositional possibilities of a *hipDisk* ensemble. *the hipdiskettes* were subsequently formed and sets of *Disk*s were made available and tested at three public events. I also began the second practical project, the *gesture≈sound experiments*, to examine the impact of tangible interface (or lack thereof), as well as the complexity of mapping between gesture and sound. I discuss *the hipdiskettes* and the *gesture≈sound experiments* in turn, in this section.

³⁷ Based on participant comments. Further information on contexts of use is provided below.

³⁸ To date no-one has succeeded in playing a predetermined tune. The device seems better suited to improvisational use.



Figure 4. Danielle Wilde, *hipDisk* (2007-2011)
the *hipdiskettes* explore the compositional choreographic potential of *hipDisk*

the hipdiskettes

The hipdiskettes (fig. 4) iterate the different aspects of *hipDisk* through time and space (across different wearers) and thereby afford a deeper examination of the interconnection between choreography and composition, as well as more complex sonic output than the one movement = one tone output of a single pair of disks. The group was formed to perform a rendition of the Bossa Nova standard, *The Girl From Ipanema*. Yet despite extensive rehearsals they were never able to master the tune. When video footage of their most successful attempt was presented at the Australasian Computer Human Interaction Conference (OZCHI) in Cairns in 2008, their dismal rendition of *The Girl From Ipanema* was met with an enthusiastic ovation and I was inundated with requests to try the devices.³⁹ The humanity of the struggle of the *hipdiskettes* is endearing and encourages people to want to play the device themselves. In addition, as it is apparently impossible to succeed with the *hipDisk*, there is no threshold of success or failure, so use of the device is democratised. The interface is fun, and provides a challenge that is engaging, entertaining and novel. It can also be used in as complex a way as the participant desires. I set out to test these hypotheses in a number of public events.

³⁹ OZCHI 2008 was held at James Cook University, in Cairns in December 2008: <http://www.ozchi.org/>, the situation I discuss occurred during the presentation of: Wilde, "The Hipdiskettes : Learning (through) Wearables."



Figure 5. Danielle Wilde, *hipDisk* (2007-2011)
Dressing a participants at OZCHI2009, at The University of Melbourne (2009)

random collections of hipDisk-ed “explorers”

In December 2009 I demonstrated four sets of disks at OZCHI 2009, which was held at The University of Melbourne.⁴⁰ The event lasted one hour. Nine people tried the disks including professors of HCI and Computer Science, a number of student volunteers and other conference participants. I can report the following outcomes: One group of participants used the musical score of “The Girl From Ipanema” (which I provided) to identify and form various chord groupings, which they demonstrated to me with much excitement and little awareness of how clumsy and awkward they appeared. Other participants randomly played together, worked alone, mimicked each other or undertook opposing experiments. One participant commented that the act of being dressed into the disks felt an important, almost ritualized, part of the process, which she subsequently desired to share with others, by dressing them in turn.⁴¹ I was curious to see if these varied, and apparently deeply felt, ways of interacting would be repeated in a different context.

⁴⁰ OZCHI 2009: <http://www.ozchi.org/>

⁴¹ The participant who made the comments was not the participant shown in fig. 5.



Figure 6. Danielle Wilde, *hipDisk* (2007-2011)
Free-ranging participants at Monash University Faculty of Art and Design, Melbourne (2009)

A week later the same four sets of disks were demonstrated at the Postgraduate Colloquium in the School of Fine Art at Monash University, Caulfield campus (fig. 6).⁴² There were seven participants and between six and twenty observers,⁴³ all mature and emerging artists and art researchers and theorists. They brought different understandings of the aesthetics of the device than the human computer interaction researchers at OZCHI. Yet their behaviours and reactions seemed to echo those of the participants at the first demo. *hipDisk*-ed individuals worked together or alone, they mimicked other participants or did opposing experiments and seemed unaware of, or undisturbed by, how awkward or clumsy they appeared. They rarely removed the devices in under half an hour, and when they did they seemed highly energized and wanted to describe their experience playing with the disks and discuss how their use compared to that of other participants. In both instances – at OZCHI and at Monash – I observed residual “spin-off of movement”: the feelings of aliveness, in a personal and existentially

⁴² The Postgraduate Colloquium is a yearly event in which postgraduate students from the Department of Fine Art demonstrate, present, view and respond to each other’s work. Monash has a sizeable postgraduate community, with approximately 100 PhD students and 150 Masters students undertaking research across a range of Fine Art disciplines: <http://www.artdes.monash.edu>

⁴³ The number of observers changed as people came and went. Approximately twelve observers stayed throughout the discussion with participants at the end of the session.

vibrant sense, described by Sheets-Johnstone in relation to active embodied engagement.⁴⁴ Curiously, these feelings seemed to be experienced by the observers, as well as the participants. I arranged a third, small demonstration to see if this phenomenon was consistent.

In June 2011 at Monash University Caulfield campus three participants were invited to play with the disks. The event occurred during semester break, and was notably different to the previous two events: the only observers were myself and a television film crew.⁴⁵ Despite the anomalous set-up, outcomes echoed and confirmed all outcomes from the previous two events, and confirmed the “spin-off” feelings of aliveness to be equally present in participants and observers, including the television crew, whose energy levels and discussion of the work shifted radically.

From these experiments I can conclude that the *hipDisk* interface prompts people to move in new ways, and frames the body so unusually that it affords radically different qualities of attention in both wearer and observer. The combination renders the body clumsy, yet also aesthetically attractive. We commonly assume that pleasure and fluency are the targets for movement experience, yet “newness” requires the unfamiliar, and discovery is epitomised by mistaken, erroneous, clumsy and inappropriate sensations.⁴⁶ With *hipDisk*, clumsiness becomes a partner of graceful discomfort. The awkwardness pulls focus to the body and brings to light the aesthetic nature of the experience. The attention of both wearer and observer cycles between the body in action and the effects of physical engagement as expressed sonically. Embodied-ness becomes implicit. Skilled, unskilled and clumsy play are democratised. This outcome prompted me to consider clumsiness as a direct design resource.

⁴⁴ Sheets-Johnstone, "Why Is Movement Therapeutic?: Keynote Address, 44th American Dance Therapy Association Conference, October 9, 2009, Portland, OR."

⁴⁵ *hipDisk* was featured on episode 22 of the ABC TV's New Inventors Program, which went to air on 6 July 2011. The event was filmed as background footage, to demonstrate the device in use. The crew consisted of the producer, a sound engineer and a camera operator.

⁴⁶ Wilde, Schiphorst, and Klooster, "Move to Design • Design to Move a Conversation About Designing for the Body."

By privileging bodily experience over externalised notions of beauty
a design can prompt different qualities of awareness in relation to the body.⁴⁷

⁴⁷ Ibid.



Figure 7. Danielle Wilde, *hipDisk* (2007-2011)
Assembling the disks at OZCHI 2009, Melbourne

The participatory version of *hipDisk*, notably, is characterized by a DIY aesthetic. The disks are made of laser cut MDF, hand-drilled and marked for construction and assembly. They are assembled in the demo area before use, in full view of potential participants (fig. 7). This aspect of the interface and of the entire experience combines with the clumsiness to further democratise engagement. You do not have to be highly skilled to assemble or use the *hipDisk*. Anyone can be augmented and thus enabled. You also do not need to fear looking silly, as everyone looks silly, but clearly seems to be having lots of fun. The devices seem robust and, in the unlikely event that a person might damage them, they do not seem expensive to replace. These characteristics nullify common excuses or reluctances to engage.

hipDisk began as a single user sonic body extension for improvised performative demonstration,⁴⁸ evolved into a context for multi-user choreographed performance, and from there evolved once more into a framework for open-ended free-form play by random collections of interested participants. This reflected a parallel evolution of my role as designer from investigator-creator-participant to outside eye/creatively involved observer, to enabler (i.e. the person who assembles the artefacts, personally augments the participants, mindfully observes their interactions and listens to their feedback). This evolution of roles and relationships supported embodied reflection from a range of perspectives, from all involved. It led to *the gesture≈sound experiments* which I discuss below, and helped to frame deep reflection that shaped my methodology.

hipDisk is inherently performative, but its uniqueness becomes challenging when attempting to consider the context for a fully developed performance work. The humanity of the struggle to play *hipDisk* with intention is so compelling, that if this struggle were removed as a result of mastery, the interest the disks generate may diminish, or even disappear. With mastery, the *hipdiskettes* would perhaps become yet another example of a dramatically costumed performance group, and would bypass what is arguably the most compelling characteristic of the device. The visual novelty of *hipDisk* combines with challenge of use to prompt observers to want to try *hipDisk* for themselves. Its impact is best experienced through this combination of observation and use, with and alongside other *hipDisk*-ed participants, in situations where the clumsiness, and the struggle this engenders, may be enjoyed to its fullest extent (i.e. where mastery is neither provided for, nor expected).

⁴⁸ *hipDisk* was developed as part of ANAT and Craft Australia's (re)Skin Wearable Technology Lab that took place at the Australian National University School of Art (SOA) in January and February 2007. Experiments by participants of (re)Skin were destined for presentation and two high profile (highly mediated) events: a press launch at SOA, and the live-streamed "Wear Now Symposium" that took place at the National Museum of Australia: ANAT: <http://www.anat.org.au>; Craft Australia: <http://www.craftaustralia.org.au/>; National Museum of Australia: <http://www.nma.gov.au/>; (re)Skin: <http://reskin.anat.org.au>; SOA: <http://www.soa.anu.edu.au/>; WearNow symposium: <http://reskin.anat.org.au/symposium>

In the introduction to his book, *Entangled: Technology and Transformation of Performance*, Chris Salter raises the notion that “everything has become performative”. He writes “Performance as practice, method, and worldview is becoming one of the major paradigms of the twenty-first century, not only in the arts but also the sciences”.⁴⁹ This raises the question, what is the new performativity? If “suddenly everyone [...is] speaking of embodiment, situatedness, presence, and materiality”,⁵⁰ and everything has become performative, how might this performativity best be experienced? I have reflected on these questions at length within, as well as beyond this investigation.⁵¹ Throughout, the inevitable performativity of embodied engagement lies under the surface prompting and supporting my research.

⁴⁹ Salter, *Entangled. Technology and the Transformation of Performance*, xxi.

⁵⁰ Ibid.

⁵¹ A parallel discussion of performativity in relation to body-devices, that emerged from this investigation, is provided at: Danielle Wilde, “A New Performativity : Wearables and Body-Devices,” in *Re:live Media Art History 09* (Melbourne, Australia: 2009).

The second project I discuss here, the *gesture≈sound experiments* (fig. 8), react, respond to and reflect questions brought up by *hipDisk*. They do this in a context where live performance is considered to be the natural outcome. The radically different, complementary approach I took in these experiments was integral to the distillation of my key questions and theoretical drivers. For this reason I delay elaborating my theoretical concerns until the next section.



Figure 8. (l-r) Ross Bencina, Danielle Wilde, Somaya Langley
gesture≈sound experiments (2007) composite video still.

gesture≈sound experiments

The *gesture≈sound experiments* emerged directly from *hipDisk*. The motivating questions for the experiments were: What would happen if the (*hipDisk*) interface was removed, to become discrete, rather than physically, materially, and dramatically extending, as well as physically constraining? and: What would be the impact on engagement if the sonic output were high quality, algorithmically generated, and able to be controlled through complex free-form gestures, as opposed to tinny, low quality tones triggered through a binary relationship with simplistic changes in posture?

To examine these questions I joined Australian electro-acoustic composer-performers, Ross Bencina and Somaya Langley,⁵² in a residency at STEIM, Studio for Electro-Instrumental Music, in Amsterdam – one of the world's preeminent centres for research and development of instruments and tools for electro-acoustic composition and performance.⁵³ Bencina and Langley shared my interest in embodied interaction and gesture to sound mappings, yet had little formal experience moving. Our residency took place in July 2007. Outcomes were presented at STEIM on two occasions: an open demonstration for invited artists and researchers at the end of our three-week residency; and a concert in September 2007, at which a range of invited artist researchers presented work using Nintendo Wii hardware.⁵⁴

⁵² Ross Bencina: <http://www.rossbencina.com/> Somaya Langley: <http://www.criticalsenses.com/>; Ross is also the creator/developer of the audiomulch interactive music studio software that we used together with Max MSP: <http://www.audiomulch.com/>, <http://www.cycling74.com/>;

⁵³ STEIM Studio for Electro-Instrumental Music. <http://www.steim.org>

⁵⁴ The wiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii [sic] concert:

http://www.steim.org/steim/events.php?event=121&year_archive=2007&type=1&archive=1; Nintendo, "Wii™ Hardware and Computer Program."

http://www.nintendo.co.uk/NOE/en_GB/wii_54.html We used the Wii Hardware so that our time wasn't monopolized by the development of bespoke sensing systems. Our collective research outcomes have also been published at: Ross Bencina, Danielle Wilde, Somaya Langley, "Gesture≈Sound Experiments: Process and Mappings," in *The 8th International Conference on New Interfaces for Musical Expression (NIME 08)* (Genova, Italy: 2008).



Figure 9. Danielle Wilde, Ross Bencina, Somaya Langley, *gesture≈sound experiments* (2007).
Ross Bencina plays *Speed Harmonic*

The overarching aim with the *experiments* was to extend the body with sound so as to mesh gestural/physical and sonic composition in such a way that sound production would seem to be an inherent and unavoidable consequence of moving the body. The desire was to encourage participants to explore movement and sound interdependently, taking into account complex and dynamic relationships that may be generated between the two modalities. The intention was to generate new kinds of mappings between gestures and sounds that would inspire composer-performers to step out from behind their laptops and engage in exploratory embodied (gestural) control and generation of sonic output (fig. 8). To support this research I developed vocal- and multi-modal prototyping methodologies that leveraged my knowledge of movement-based interaction, theatre and performance development techniques, as well as Bencina and Langley's knowledge of sound.

Importantly, the methodology hierarchically flattens movement and sound, by interweaving the development of physical movement; recording and generating sounds; and devising algorithms, taking into account their differing development times. The result is that sound and movement become enmeshed. The schema for the methodology arose out of a belief that interweaving the development of the different elements would open up new ways of thinking about gestural sound performance and lead to gestural sound synchresis. The methodology was devised and tested in collaboration with Bencina and Langley, leveraging their considerable experience with electro-acoustic composition, as well as programming knowledge and experience. Throughout, we adopted a strategy of

minimal development – pursuing development in each modality sufficient only to allow or provoke advance of the work as a whole. We were thus prevented from falling back on known methods and solutions, or staying in our comfort zones. The different modalities – sound, movement and technology – were developed in tandem. A new vocabulary was allowed to emerge from our existing skills and the area of inquiry. Our approach was neither extensively nor rigorously evaluated, nonetheless it resulted in each of us working in new and unexpected ways, with positive outcomes.

In stark contrast to the restrictive physical affordances of *hipDisk*, a gesture controlled sonic performance needs to engage the body of the performer in movement which incorporates a broad spectrum of physical expression. Musicians and technologists do not typically have highly developed skills in expressive movement exploration. While there was no desire to privilege the physical, short-circuiting Bencina and Langley’s tendencies to de-prioritise their body’s expressive range afforded a different mindset from which to investigate.

A detailed overview of our approach is provided elsewhere.⁵⁵ Over the course of the experiments we engaged in a range of activities to develop our gesture sound mappings, continually striving to broaden the parameters within which we were thinking and working. We investigated ideas stimulated by the sensor technology such as how and where the Wii Remote could be placed on the body and what kinds of gestures it might be able to sense and measure. We thought directly about sound – without limiting our ideas to the constraints of the technology; and worked directly from a consideration of the body’s affordances and dynamic capabilities. Throughout, we engaged in repeated ideation sessions, developed simple patches in response to ideas, and tried to understand what different choices afforded and what directions might be valuable for us to pursue. All of our experiments were captured on video to enable ongoing assessment and review. Although we kept our attention on the technology, we remained cautious

⁵⁵ Ibid.

that its demands not draw our focus away from other areas of inquiry. One method I developed to counter this tendency was to vocally prototype our ideas so that we could discuss and explore links between sound and movement without being limited by the technical constraints of the mapping process.⁵⁶

The aim of vocal prototyping was to challenge our usual ways of thinking about movement and sound and to begin to understand the kinds of relationships we might make between them. The outcomes demonstrated that our approach supported the emergence of new ways of working with and thinking about both sound and movement, it also released us from the constraints of technology development. The methodology was both rich and fecund. Importantly, throughout, we worked from body to technology. This will be a recurrent scenario in the development of my praxis and is investigated through different concerns in each of the projects. In the case of the *gesture≈sound* experiments, we were interested in how particular vocalized sounds might be reinterpreted through synthesis. We didn't want to simply translate what we had discovered, we wanted the creative process to continue.

The *gesture≈sound* outcomes afford comparatively free and unconstrained interaction, when considered alongside *hipDisk*. Any movement of the sensors may be tracked, within the constraints of the different patches, and the sound is algorithmically generated, so relationships between gesture and sound are far more complex than the binary offerings of *hipDisk*. The unconstrained nature of *gesture≈sound* opens up a free-form expressive space that may be used to encourage exploratory movement with targeted parts of the body. This suggests a range of applications beyond electro-acoustic performance.

Sheets-Johnstone claims that movement constantly generates a qualitative, proprioceptive, and kinesthetic consciousness of our bodies, and that built into any movement there is a felt sense of one's movement. As a result, she argues,

⁵⁶ Ibid.

movement-generated qualia constitute a constant bodily awareness.⁵⁷ According to Maurice Merleau-Ponty, “the body converts a certain motor essence into vocal form.”⁵⁸ Gallagher, beginning with the assertion that language is generated out of movement, untangles these ideas discussing a range of philosophers and theorists, examining the degree to which embodiment may shape language.⁵⁹ The depth of Gallagher’s discussion takes us beyond the scope of this investigation. Nonetheless, his interpretation of the literature prompted me to reflect that if, indeed, language is generated out of movement, then increasing a person’s capacity for movement expression may support greater ease with verbal expression, as well as other forms of communication. This hypothesis is supported by research into neuroplasticity, as discussed at length by Norman Doidge.⁶⁰

It has been suggested by audience members at public lectures, as well as in general correspondence with interested parties, that *gesture≈sound* would be useful for people with autism and other spectrum disorders, where the children in question have inordinate amounts of energy and have a tendency to obsess and make patterns.⁶¹ In its current form the sensors are worn, rather than integrated into garments, and these constraints may or may not be an issue – depending on whether the participant gains pleasure and comfort from physical pressure, or is hyper-sensitive to touch (or somewhere in between). Informal discussions with parents of children with autism suggest that developing the interface for their use would be welcome and worth pursuing.⁶²

⁵⁷ Maxine Sheets-Johnstone, “Consciousness: A Natural History,” *Journal of Consciousness Studies* 5, no. 3 (1998). Quoted in Gallagher, *How the Body Shapes the Mind*, 60-61.

⁵⁸ Maurice Merleau-Ponty, *Phenomenology of Perception*, International Library of Philosophy and Scientific Method (London: Routledge & Kegan Paul, 1962), 81.

⁵⁹ Gallagher, *How the Body Shapes the Mind*, Chapter 5: The Body in Gesture. pp.107-129.

⁶⁰ Norman Doidge, *The Brain That Changes Itself: Stories of Personal Triumph from the Frontiers of Brain Science*. (New York: Viking Penguin (USA), 2007).

⁶¹ Private correspondence. A list of lectures given in association with this investigation is provided at Appendix B.

⁶² The open nature of all of the systems has been remarked upon in informal conversations with parents of children with autism. In each case they are eager for their child to have access. They

My research outcomes were suggesting applications that foreground creativity and imagination in contexts that are not normally considered cultural. The praxis-guided reflective process led to the articulation of my theoretical foundation, simultaneously driven and led by these key research questions:

1. *how might extending the body, gesturally, mechanically, sensorially, through the use of body-devices (artistically-) poeticise embodied engagement? (and what might this mean?)*
2. *what are the impacts of different development choices of body-worn technologies on qualities of experience and engagement (for both wearers and observers)?*
3. *What role, qualities and contexts for performativity, will most powerfully leverage what is made available by the interfaces?*

and, finally:

4. *What constitutes a valid, stand-alone, cultural artefact when undertaking this kind of research?*

suggest that the openness presents an opportunity for their child to engage in an exploratory manner, in a system that operates outside of language, and has room for their idiosyncrasies.

1.2 Poetics & Theory

My key research questions raise the notion of (artistically-)poeticising embodied engagement. This idea directly references Shklovsky's artistic-poetic notion of defamiliarisation, cited in relation to *hipDisk*.⁶³ In this section I extend "the poetic" beyond Shklovsky's context to support a nuanced consideration of a poetics of embodied interaction that includes but is not limited to defamiliarisation. Articulating "the poetic" is contentious, yet subjecting the poetic to a rigorous critical analysis – moving beyond generalisations and universalist assumptions – leads to a better understanding of why consideration of the poetic might be important, even essential, when creating body-worn devices and systems. It also provides concrete reflection to begin to approach a conscious integration of the poetic into serious, highly functional and efficient, as well as whimsical and extra-realistic body-worn devices. Historically, the application of technology to the body has tended towards a functional analysis of efficiency issues.⁶⁴ Artists' approaches to body-worn technologies challenge such a conservative approach.⁶⁵ Efficiency and functionality are not the only aspects of life that are important. Not all experiences are enhanced by efficiency, and what is ideal for one person, may not work at all for someone else. Moreover, experiences may not be repeatable or transferable to a different context or moment in time. If we acknowledge the complexity of human beings, it is clear that focusing on functional efficiency responds to a small fraction of life's concerns.

Notions of the poetic are often instinctive, appeal to the extra-discursive, and are embedded in experience and perception in ways that cannot automatically or easily be defined through language. Bringing such notions into a conscious, articulate space can be challenging. For this reason I propose an emergent

⁶³ Shklovsky, *Art as Technique*. In *Russian Formalist Criticism: Four Essays*., cited in section 1.1, discussed in depth in turn in this section.

⁶⁴ Tom Djajadiningrat, Ben Matthews, and Marcelle Stienstra, "Easy Doesn't Do It: Skill and Expression in Tangible Aesthetics," *Personal and Ubiquitous Computing* 11, (2007).

⁶⁵ I will provide examples throughout this exegesis.

definition, which I examine through and against a number of practical examples by other artists, as well as examining it through my praxis outcomes. I recognise that in the context of physically engaging, body-worn technological extension, understanding is often embodied rather than intellectual. My claim is not that some idealistic, pristine truth exists beyond language. Rather the intention is to provide a foundation for a broadly applicable definition that can assist the discussion and consideration of the poetic in relation to physically engaging body-worn systems and devices. Such systems and devices can provide novel environments that enable new information, experiences and engagement. They can lift us out of the everyday to support experiences that go beyond the mundane, the prosaic or the merely functional, but they do not automatically do so. Understanding the value of a poetic approach and what might constitute or lead to poetic experiences is fundamental if we wish to support or generate such experiences.

The poetic is present in the moments when we catch our breath, are filled with wonder or delight, surprised by unexpected juxtapositions, are totally present in the moment, when we laugh with wild abandon or play like a child. In brief, the poetic is evident in the moments when life has a special, undefinable quality that elevates experience beyond basic functional concerns. Such moments are both meaningful and reflective of a fundamental integration between mind and body, thought and experience, that grounds us as it affords full engagement in whatever we are doing. Poetic experiences are not limited to the context of artistic endeavors. Like creativity itself, the poetic can be considered a part of life as a whole.

To arrive at my articulation of the poetic I consider a range of different elements, relevant to physically engaged body-worn technologies. Beginning with the use of language, especially non-verbal languages particular to body-worn devices and systems, I reflect on the importance of action, narrative and meaning-making in experience; and on the qualities of attention brought to the body as a result of

wearing or viewing a physically engaging body-worn system or device.⁶⁶ I then contemplate the nature or quality of embodied engagement and how this might relate to, or shift, experiential and conceptual thresholds. Finally, I consider a device's ability to engage the imagination or enchant the wearer or viewer; and the nature or quality of physically interacting with the effects of technology – whether or how this might extend the way we see, imagine or experience the world through our bodies, and how this might shift our relationships to our bodies, as well as to body-worn technology.

Through the praxis I examine these ideas from a number of different approaches. The underlying desire has been to engage people, physically, through their imaginations – having them “sing”,⁶⁷ draw or write things through their bodies, or otherwise focus on the results of their actions, rather than on the actions themselves. Humans are intrinsically imaginative and expressive. By providing frameworks for free-form expression, I have been able to observe idiosyncrasies of expression, engagement and communication, and to map this back to my reflections on the poetic. Participants have included highly skilled performing artists and people with different physical challenges and abilities, covering as broad a range of backgrounds and experiences as possible. Many people feel physically or communicatively challenged to some degree when engaging in one activity or another. Whether this challenge is extreme or simply reflects a person's dexterity, grace, prowess, or even confidence in a particular situation. I engage with this issue directly. The aim has been to understand how to arrive at systems that are physically and imaginatively engaging, for a range of contexts and abilities, with the knowledge that extreme case scenarios can better equip a developer to make meaningful design decisions.⁶⁸ The overarching idea is that the imagination, and the desire to express oneself, are nourished and supported

⁶⁶ I will propose the notion of an extra-discursive narrative: a series of connected events experienced kinaesthetically, perhaps completely abstractly, beyond the scope of, and not articulated through words.

⁶⁷ I use the term “sing” here in an abstract sense, such as singing through movement, or through the other non-verbal forms of expression covered by this investigation.

⁶⁸ Bill Moggridge, *Designing Interactions* (Cambridge, MA: MIT Press, 2006).

by the poetic; and doing so is fundamental to meaningful existence beyond base functional needs no matter what activities we are engaged in. This makes the poetic integral to a meaningful life, so that understanding the poetic is, in turn, integral to body-worn technologies. I will now map out my emergent definition.

towards a poetics of embodied interaction

If we begin with language and consider poetry to be a form of art in which language is used for its aesthetic and evocative qualities in addition to, or in lieu of, its ostensible meaning, we can consider how this idea might relate to body-worn devices and systems that use a range of languages to arrive at their final embodiment. Body-worn systems use languages of form, texture, colour, time and movement, as well as discipline-based languages of fashion, technology, architecture, performance and interaction design. Each of these may be employed for their aesthetic and evocative qualities in addition to, or in lieu of, their ostensible meaning, just as when a poet creates poetry or an author uses poetic language.

Poetic language is dense, imagery-laden and suggestive. Susan Stewart, in her book *On Longing*, describes it as a complex mix of languages, detached from their context of origin, displaying the oxymoron of the sign: while the signifier may be material, the signified cannot be.⁶⁹ She suggests that the poetic is so through suggestion, allusion, signification, rather than actual physical form, and that “poetic language” is an extension of everyday language. It is heightened in style, filled with signs and signifiers, juxtaposes different perspectives or modes, and allows for multiple interpretations. Slippage occurs between what is unsaid, culturally assumed or suggested, what is brought to the experience, and what is materially embodied. Shklovsky speaks of the difference between poetic language and what he calls natural language, claiming that natural language is more perceptible, more economical, more direct than poetic language, and that

⁶⁹ Susan Stewart, *On Longing: Narratives of the Miniature, the Gigantic, the Souvenir, the Collection* (Durham & London: Duke University Press, 1993; reprint, 10).

the difference between the two is the key to the creation of art.⁷⁰ I borrow Shklovsky's use of "natural" throughout this exegesis – as a signifier for a naturalistic, direct, everyday approach or experience. In contrast to this concept of natural, the technique of art, according to Shklovsky, is to make objects "unfamiliar," to increase the difficulty and length of perception and to thereby "defamiliarise."⁷¹ Extension is one way of doing this and is the external means through which I defamiliarise both body and movement throughout this investigation. Defamiliarisation links artistic language to poetic language. It is a means to create poetic-artistic works, and allows us to recognise them. Poetic language has a descriptive power that makes visible, as it shapes the way we perceive the landscape of action, and also our relationship to that landscape. This process affects the way narrative experiences unfold.

"Poetic" is a quality commonly ascribed to works of art and design when they capture the imagination or provide unexpected ways of considering a subject or object. The word poetic stems from the Greek word *poiesis* (from the Greek, *Ποιησις*), which means "making", "creating" or "producing". It is a verb – a word that embodies action and transformation as well as ongoing narrative experience, all of which are grounded in the body and can be considered fundamentals of interaction and interactive experiences. "Inter-action" implies ongoing interlinked actions that occur in a cyclical or concatenated relationship. It is not necessary that this process be complex. What is important is to consider the evolution of the relationships between action, transformation and ongoing narrative experience. If the narrative evolves in ways that are surprising, unexpected, less than obvious, indirect, this affords the kind of suggestion, allusion, signification, juxtapositions and slippages that Stewart speaks of. If we apply these ideas to non-verbal languages, and bring them into and onto the body, there is potential to consciously craft experiences poetically.

⁷⁰ Shklovsky, *Art as Technique. In Russian Formalist Criticism: Four Essays*.

⁷¹ *Ibid.*, 16.

Phenomenology, enchantment and a consideration of thresholds help to situate poetic uses of non-verbal languages in the context of physically engaging interaction. Phenomenology, founded by Edmund Husserl⁷² at the turn of the 20th century, is a method of philosophical inquiry that favours reflective attentiveness to “lived experience.” It has been taken up, and also challenged, by philosophers, theorists and practitioners from a broad range of disciplines, each of whom has shifted the emphasis of phenomenology in their own ways. A number of phenomenological theorists have been important to this thesis, in particular those discussing phenomenology directly through movement, performance, poetics, art and technology.

Martin Heidegger, a student of Husserl, emphasised the importance of art in helping to understand human relationships with technology:

Because the essence of technology is nothing technological, essential reflection upon technology and decisive confrontation with it must happen in a realm that is, on the one hand, akin to the essence of technology and, on the other, fundamentally different from it. Art is such a realm.⁷³

⁷² As Andrew Brown explains, Phenomenology is a method of enquiry that focuses attention on the act of experiencing and being aware. It was developed by Edmund Husserl in reaction against what he saw as the reductive limitations of the scientific method which he felt was ineffective in providing insight into human emotions and intentions that guided actions. Andrew R. Brown, “Music Composition and the Computer: An Examination of the Work Practices of Five Experienced Composers” (PhD diss., The University of Queensland, 2003), 35.

⁷³ Martin Heidegger, *The Question Concerning Technology*, trans., W. Lovitt (New York: Harper and Row, 1977), 35. It is important to note that while, on the one hand, Heidegger is considered one of the most important philosophers of the twentieth century, he is also strongly criticised for some of his more radical views. Emmanuel Fay, in his book: *Heidegger: The Introduction of Nazism Into Philosophy* goes so far as to proclaim that fascist and racist ideas are so woven into the fabric of Heidegger’s theories that they no longer deserve to be called philosophy. On a more balanced (but similarly scathing) note, critics, such as his former students Emmanuel Levinas (in Gauthier) and Karl Löwith, claim that Heidegger’s support for National Socialism revealed flaws inherent in his thought. These views are balanced out somewhat by Damon Linker in *The New Republic*, who argues that while “scholars have demonstrated beyond just about any reasonable doubt that, judged from moral and political standpoints, Heidegger was a pretty despicable human being (... he) also possessed the most powerful philosophical mind of the twentieth century.” Therefore “rendering a global judgment of Heidegger and his legacy is extremely complicated” Emmanuel Faye, *Heidegger, L’introduction Du Nazisme Dans La Philosophie : Autour Des Séminaires Inédits De*

The technology theorist, Don Ihde proposes that "In relationship with humans, and humans-in-culture, technologies transform experience and its variations",⁷⁴ as does art, ideally. If this transformation takes place in the realm of art, and if artistic language is directly linked to poetic language through the process of defamiliarisation, we can perhaps move closer to understanding and articulating a poetics of embodied interaction.

The direct intuition of phenomenon, apart from any prejudice, expectation, or reflection is neither objective nor subjective, but rather is an attitude of being present, fully and wholly, to intuit phenomena as they appear, without preshaping in any way by prior intentions or beliefs. The phenomenologist is led through such attitudes to describe the lived experience of phenomenon, the essential relationship between consciousness and its world.⁷⁵

Immersive physical experiences can generate these kinds of attitudes, not just for a phenomenologist, but for anyone. Physically engaging body-worn devices are ideally placed to support such a process. My experiments will consistently demonstrate that they are experientially immersive. They bring the attention through the body, and engage the wearer in a reflective process, embedded in the moment in which the experiences are occurring.

Such processes resonate well with Gaston Bachelard's notions of poetic thresholds, and the idea that we might be able to traverse these thresholds. Bachelard proposes that the poet speaks on the threshold of being, and poetry

1933-1935, *Biblio Essais* (Paris: Le Livre de Poche (2nd edition), 2007); David J. Gauthier, "Martin Heidegger, Emmanuel Levinas, and the Politics of Dwelling" (PhD diss., Louisiana State University, 2004); Karl Löwith, *Mein Leben in Deutschland Vor Und Nach 1933: Ein Bericht* trans., Paula Wissing (Stuttgart: Metzler, 1986). Quoted in Maurice Blanchot, "Thinking the Apocalypse: A Letter from Maurice Blanchot to Catherine David," *Critical Inquiry* 15, no. 2 (1989); Linker, Damon. "Why Read Heidegger." *The New Republic* November 1, 2009, [online edition] <http://www.tnr.com/blog/damon-linker/why-read-heidegger>.

⁷⁴ Don Ihde, *Philosophy of Technology: An Introduction*. (St. Paul, MN: Paragon House Publishers, 1998), 144.

⁷⁵ Maxine Sheets-Johnstone, "Emotion and Movement: A Beginning Empirical-Phenomenological Analysis of Their Relationship," *Journal of Consciousness Studies* 6, no. 11-12 (1999).

takes place on the threshold of language.⁷⁶ He writes that communication, concepts and experiences can exist outside of, as well as within, natural, everyday cognitive and linguistic states.⁷⁷ Bachelard speaks as if there is an identifiable threshold separating the natural from the poetic. Stewart also speaks of thresholds, proposing an interdependent dichotomy between the natural and the poetic, but she suggests that the thresholds are fluid and mutable.⁷⁸ With the kind of attitude Sheets-Johnstone equates with movement, such thresholds may be traversed and natural experience poeticised.

In *Eyes of the Skin*, the Finnish architect, Juhaani Pallasmaa, writes that poetry has “the capacity of bringing us momentarily back to the oral and enveloping world”, and that “this re-oralised world of poetry brings us back to the centre of an interior world.”⁷⁹ This suggests a cyclical relationship that may be paralleled by interactive processes. Pallasmaa interweaves the body, experience, language and poetics, acknowledging a threshold between oralised and pre-verbal relationships to existence, across which poetry can help us to move. He describes artistic expression as being engaged with pre-verbal meanings of the world, meanings that are incorporated and lived rather than simply intellectually understood.

Sheets-Johnstone, reflecting on the relation between movement and language, asserts that movement is our mother tongue, and that “infants are not prelinguistic, as is commonly declared; [ergo movement is not pre-verbal] on the contrary, language is post-kinetic.”⁸⁰ This contrasts with but also complements

⁷⁶ Gaston Bachelard, *The Poetics of Space. The Classic Look at How We Experience Intimate Places.*, trans., M. Jolas (Boston: Beacon Press, 1994).

⁷⁷ Bachelard's use of the word natural, cited here, does not refer to a pre-cultural idyllic state, rather it aligns with Shklovsky's use of the word: as a signifier for a naturalistic, direct, everyday approach or experience. As noted, I use the word natural, with this meaning, throughout this exegesis.

⁷⁸ Stewart, *On Longing: Narratives of the Miniature, the Gigantic, the Souvenir, the Collection*.

⁷⁹ Juhani Pallasmaa, *The Eyes of the Skin : Architecture and the Senses* (Chichester: Wiley-Academy 2005), 25.

⁸⁰ Maxine Sheets-Johnstone, "Man Has Always Danced: Forays into an Art Largely Forgotten by Philosophers," *Contemporary Aesthetics* 2, no. 1 (2005): 50.

Pallasmaa's notion of pre-verbal. It suggests that the primary port of access to understanding is the body, rather than conscious articulate reflection.

Like Sheets-Johnstone, Pallasmaa assumes the role of the body as the locus of perception, thought and consciousness. He speaks of a poetics of embodied experience – beyond, or perhaps on the threshold of language, in the way that Bachelard speaks of poets and poetry in relation to language and being. Pallasmaa also claims that existential understanding arises from our encounter with the world, our being-in-the-world – it is not conceptualised or intellectualised. His approach parallels my own commitment to the centrality of embodied experience in my praxis.

Heidegger also refers to threshold occasions when discussing *poiesis*, but of a different order. Rather than thresholds between two states that co-exist, Heidegger speaks of thresholds between states that have a diachronic relationship. He illustrates this idea with naturally occurring events with which we are all familiar such as the blooming of a blossom, the coming-out of a butterfly from a cocoon, or the plummeting of a waterfall when the snow begins to melt. These moments are moments of transformation, when something actually transforms from its being as one thing into something completely different.⁸¹ All interactive works have, at their core, this potential for transformation, but this does not automatically make them poetic. As discussed above, a consideration of the interrelationships between action, transformation and ongoing narrative experience is integral.

⁸¹ Heidegger, *Being and Time*. Quoted in Brown, "Music Composition and the Computer: An Examination of the Work Practices of Five Experienced Composers".



Figure 10. left: Assa Ashuach, *My Trousers* (2003).
right+inset: Joo Youn Paek, *Self-Sustainable Chair* (2005)

If we look to some projects by other artists we may gain a better sense of what this might mean. Assa Ashuach and Joo Youn Paek have both created garments that can transform into a chair and back again. The two projects are a little different, and can be used to tease out different ways of considering action, transformation and ongoing narrative experience. They engage with the notion of enchantment, discussed below, and through transformation make a clear bridge between a “natural,” everyday space and a poetic space. Ashuach's *My Trousers*⁸²(fig. 10) are a seemingly normal, everyday pair of jeans. Yet if the wearer takes a seated position, a hidden mechanism locks into place to support them, so they can sit, apparently supported by nothing but air. The result appears to challenge what we know about the laws of physics. It also alludes to the collective desire for a seat on a crowded train or in a busy life, and so enables empathic engagement. In a different way, Joo Youn Paek's *Self-sustainable Chair* gives us access over time to the transformation of a dress into a seat⁸³ (fig. 10). As the wearer of the dress walks, a large pocket at the rear of the dress inflates. Once inflated the wearer can sit but in doing so, they cause the dress-chair to deflate until eventually it can no longer hold them and they have to start walking again to re-inflate their seat. The cyclical nature of the relationship

⁸² Assa Ashuach, "My Trousers" <http://www.assaashuach.com/> (2003)

⁸³ Joo Youn Paek, "Self-Sustainable Chair" <http://www.jooyounpaek.com/ssc.html> (2006)

between dress and chair is clear and not complex, yet it is still surprising, as (like jeans), dresses are not normally chairs. Eliding these two, seemingly unrelated articles (dress and chair, or jeans and chair) through movement makes an elision between the stillness normally associated with being seated, and the act of being in motion. It connects to the collective desire for time to sit, reflect and relax while “charging” through contemporary life, or the desire for small conveniences like a seat when making a phone call, or when on a crowded train, and it does so through physical engagement. This connection, with collective desires or imaginings through the body, allows the viewer to situate themselves as a player within the presented narrative and literally, viscerally imagine themselves within the action.

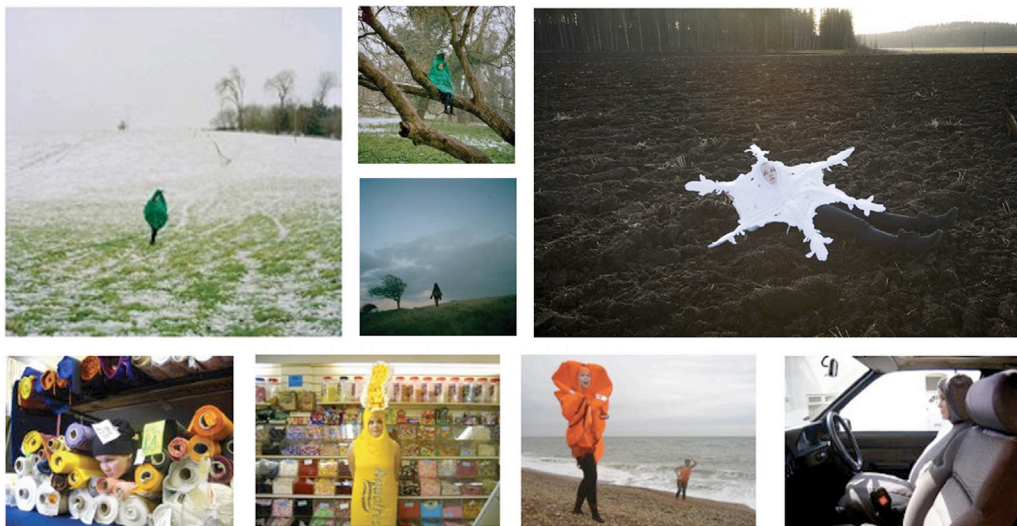


Figure 11. top, left: Riita Ikonen and Anja Schaffner, *Bird and Leaf* (2007-)
top, right: Riita Ikonen, *snowflake* (2007).
bottom: Riita Ikonen, *Human Nylon* (2005)

A compelling, yet very different, example of how body-worn devices can help us to imaginatively traverse the threshold between the natural and the poetic is provided in the work of Riita Ikonen. Through a range of costumes and scenarios Ikonen imbues inanimate objects with human emotions to encourage empathic engagement. She anthropomorphizes a range of “things” such as snowflakes, leaves and nylon, situating their embodied fantastical forms in everyday

situations (fig. 11).⁸⁴ By doing so she exposes hidden or otherwise overlooked narratives to our scrutiny. *Snowflake* is a costume that turns her into a stranded human snowflake to bring attention to the recent lack of snow in Finland at Christmas time (fig.11, top, right). *Bird and Leaf* reflects on the artist's sentimental yearning to "get back to nature," a yearning that is easily recognisable (fig. 11, top, left), and *Human Nylon*, situates Ikonen as "nylon" in a range of forms, at various points along the product's lifecycle (fig.11, bottom images). The works are highly engaging. They do not require physical engagement to affect transformation, nonetheless they effectively bring us to the threshold between natural and poetic ways of being and engage us in an ongoing narrative through their embodied forms.

These works surprise and delight. They make use of defamiliarisation and take us a step closer to arriving at an articulation of the poetic. They are different to my praxis outcomes in that they are meant for the observer more so than the participant. My outcomes are aimed at both wearer and observer, though they are essentially designed to generate reflection through the engaged experiences of the wearer. The projects cited above illustrate different ways of engaging with action, transformation and ongoing narrative experience, and help us to consider how this can shift our relationships to thresholds. They also raise the notion of enchantment.

Enchantment describes what we often miss in the ordinary, everyday world because of a tendency to define it in our minds, and not scrutinize it closely.⁸⁵ Enchantment is a complex concept that brings together the specific sensuousness of a thing, senses of play, paradox and openness, as well as the potential for transformation. It brings us into direct relation with the thresholds that separate the natural from the poetic, and can facilitate closer relationships between people

⁸⁴ Riita Ikonen, *Snowflake*: <http://www.riittaikonon.com/projects/snowflake/> (2007); *Bird and Leaf*: <http://www.riittaikonon.com/projects/bird--leaf/> (2007-); *Human Nylon*: <http://www.riittaikonon.com/projects/human-nylon/> (2005)

⁸⁵ John McCarthy and others, "The Experience of Enchantment in Human-Computer Interaction," *Personal and Ubiquitous Computing* 10, (2006).

and technologies.⁸⁶ Describing why something is enchanting can destroy the magic in it - as with Ashuach's *My Trousers*, or when an adult describes to a child the logic behind a fairy tale, because enchantment depends to a considerable degree on a person not quite knowing why they are delighted by that which enchants them.⁸⁷ Yet understanding how to enchant can assist in the creation of poetic works.

Jane Bennett describes enchantment as being “both caught up and carried away.”⁸⁸ She suggests that the disorientation involved is associated with a pleasurable sense of fullness and liveliness that charges attention and concentration. When perception and attention are heightened, and we are awakened to wonder and to the wonder of life, this may be experienced as enlivening. The combination of emotional attachment and a sense of something “not yet understood” leaves us feeling disrupted but also attentive and curious. This idea connects back to Shklovsky's notion of defamiliarisation, which brings us around to notions of poetic vs natural language. Enchantment does not necessarily imply that the object of enchantment must be novel or extraordinary, rather that a person sees how rich and extraordinary the everyday and familiar can be. It occurs at thresholds and assists us to shift, blur or traverse these thresholds.

John McCarthy explains that enchantment engages with paradox and ambiguity, putting “being” in play in an open world. This process contributes to creating depth in a system or object. It affords the possibility of complex, layered interpretation. According to McCarthy, “when it comes to experiences such as enchantment feelings are as important as thoughts, sensation is as important as cognition, and emotional consciousness is as important as will.”⁸⁹ The depth in a system or object allows it to contain within itself the possibility for complex,

⁸⁶ Ibid.

⁸⁷ Bruno Bettelheim, *The Uses of Enchantment: The Meaning and Importance of Fairy Tales*. (London: Penguin, 1973), 18-19.

⁸⁸ Jane Bennett, *The Enchantment of Modern Life: Attachments, Crossings, and Ethics* (Princeton: Princeton University Press, 2001).

⁸⁹ McCarthy and others, “The Experience of Enchantment in Human–Computer Interaction.”

layered interpretation that may surprise the interpreter. These interpretations then allow traditionally separate categories of experience to live together in a creative response to new technologies. McCarthy argues that it is this depth that supports enchantment in human-computer interaction. I suggest that enchantment confers depth because of the inherent ambiguity. William Gaver has written at length about ambiguity and *homo ludens*, or “playful man.”⁹⁰ He argues that ambiguity allows for meaning making, as the openness allows a person to infer or apply their own understanding of the world, to interpret and name what they are engaging with. This process creates a spiral relationship, enchantment supporting depth and meaning making, which further supports enchantment. Enchantment enriches experience and affective attachment, and engages the whole person. It is intrinsically related to the notion of the poetic that I am articulating throughout this thesis, through open, ambiguous, novel opportunities for full- and core-body interaction. I will demonstrate this further as the praxis evolves.

Extension

This investigation is focused on extending the body through the real and imagined use of digital and electronic technologies.⁹¹ Extension provides an ideal vehicle for engagement as it may be used to defamiliarise and thereby prompt a person to negotiate or re-navigate their physicality. It is a common device used to draw attention to the body and has been of seminal importance in Media and Technology Theory. Canadian Media Theorist, Marshall McLuhan, most famously posited that the book is an extension of the eye, the wheel an extension of the foot, clothing an extension of the body, electronics an extension of the central nervous system.⁹² McLuhan argued that certain media alter the balance of the senses. By literally physically, gesturally and sensorially extending the body I provoke imbalances that defamiliarise and thereby afford heightened qualities of

⁹⁰ Gaver, "Designing for Homo Ludens."

⁹¹ Imaginary uses are discussed in Chapter Three

⁹² Marshall McLuhan, *Understanding Media: The Extensions of Man, Critical Edition*, ed. W.T. Gordon (Corte Madera, CA: Ginkgo Press, 1964/1994), 19.

attention. Importantly, this is not the only affordance of extending the body with technology. In the introduction to *Supersizing the Mind*,⁹³ Clark cites the famous exchange in which Nobel Prize-winning physicist, Richard Feynman refutes historian Charles Weiner's assertion that Feynman's notes provided a record of his work. As Feynman insists, it is not a record of the work, it is the work. The pen and paper (as Clark elaborates) were part of Feynman's extended embodied thinking process. They acted as feedback loops, in the form of physical machinery, that shaped the flow of his thought and enlarged, or extended, the boundaries of his mind. American Technology Theorist, Kevin Kelly, in his book *What Technology Wants*, explains that technology not only extends our minds, but thereby becomes the extended body for ideas.⁹⁴

The theories elaborated by Clark and Kelly are important, and have helped to shape my thinking. Nonetheless, my practice leans more towards notions of extension practiced by fine artists, such as Rebecca Horn, who, by literally extending the body – making gloves with fingers long enough to scratch the walls on either side of the body in a standard sized room, for example (see fig. 20, p.84) – used defamiliarisation to shift body awareness for both wearer and viewer. Such mechanical, or tangible extension is a powerfully direct way to raise and explore questions about movement, body dynamic and our fundamental embodied states. Other artists, such as Australian Performance Artist and UK nightclub scene legend, Leigh Bowery, with his bulbuous body distorting and extending costumes (fig. 12); and Japanese Fashion Designer, Kei Kagami, with his delicate dynamic extensions of body and posture, provide us with subtly different examples of mechanical extension⁹⁵ (fig. 13).

⁹³ Clark, *Supersizing the Mind*.

⁹⁴ Kevin Kelly, *What Technology Wants* (New York: Viking (Penguin Group), 2010).

⁹⁵ Leigh Bowery and Fergus Greer, *Leigh Bowery Looks* (London: Violette Editions, 2005); Kei Kagami, "Head Holder," in *The Fashion of Architecture: Constructing the Architecture of Fashion*, ed. Bradley Quinn (AIA Center for Architecture, New York: 2006); Armin Zweite, Katharina Schmidt, and Doris von Drathen, *Rebecca Horn, Drawings, Sculptures, Installations, Films 1964-2006*, Exhibition Catalogue (Berlin: Hatje Cantz, 2007).



Figure 12. Leigh Bowery (1961-1994)



Figure 13. Kei Kagami. Spring/Summer collection (2006)

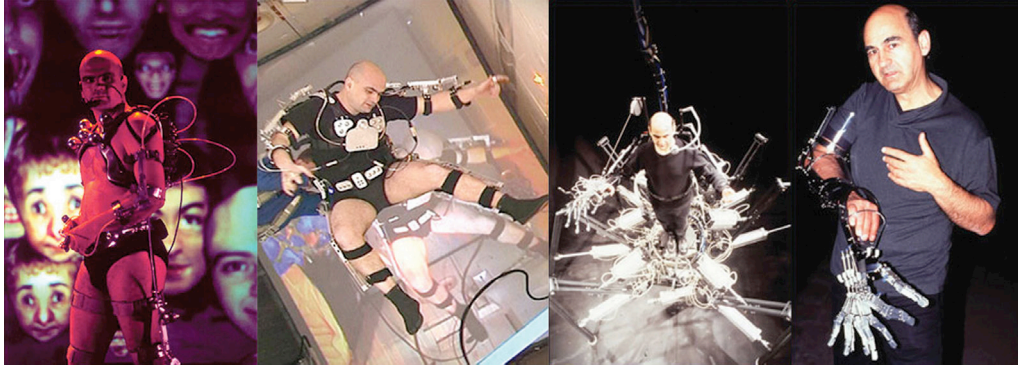


Figure 14. Left+centre-left: Marcel-lí Antúnez Roca, *Afasia* (1998) *Transpermia* (2003). centre-right+right Stelarc *Exoskeleton* (1998) *Extended Arm* (2000).

Surprisingly, there has been little focused exploration of mechanical extension in the field of body-worn (digital) technologies. Spanish media artist Marcel-lí Antúnez Roca's and Cypriot-born, Australian media artist Stelarc's cyborg-like extrusions (fig. 14) provide notable exceptions.⁹⁶ My investigation has more in common with Horn, Bowery and Kagami's body-centric approach than with the "cyborg discourse" commonly marshaled in response to Stelarc and Antunez's work.⁹⁷ However, it is important to note that we all seem to be addressing the relevance of reassessing our corporeality by extending it spatially, through technologies, in different ways.⁹⁸

⁹⁶ Marcel.lí Antunez Roca, "Afasia" (1998) and "Transpermia" (2003)

<http://www.marceliantunez.com>; Stelarc: <http://www.stelarc.va.com.au> (1996-)

⁹⁷ Donna Harraway, "A Cyborg Manifesto: Science, Technology and Socialist-Feminism in the Late Twentieth Century," in *Symians, Cyborgs and Women: The Reinvention of Nature* (London: Free-Association Books, 1991); Anna Munster, *Materializing New Media: Embodiment in Information Aesthetics* (Dartmouth, NH: University Press of New England, 2006).

⁹⁸ Here I use technology in its broadest sense.

In theatre and performance research, there has long been interest in the idea of extending, as well as in distorting or shifting the perspective of gesture in order to focus attention. The American choreographer Agnes de Mille described the use of distortion, or what she called “turning”, in dance as the extension of effort, the prolongation of stress beyond the norm, saying that it can be arresting or remarkable, and it can help fix a gesture in memory.⁹⁹ Shklovsky wrote that everything around us is asleep and that it is the function of art to awaken what is asleep, to “turn” it slightly until it awakens.¹⁰⁰ Bertholt Brecht, building on Shklovsky’s work, developed theories about making the strange familiar and the familiar strange, saying: “What is “natural” must have the force of what is startling. This is the only way to expose the laws of cause and effect.”¹⁰¹

Extending the body amplifies physical placement and relationships, and thereby brings to light details that might otherwise escape attention. The dynamic capabilities and nuances of the moving body are largely overlooked in everyday life as well as in the design of many body-devices. Yet moving can feel good and is essential to life. Bringing attention to the nuances of our moving bodies can enchant, can bring us present to the wonder of our bodies and render our ongoing actions poetic.

⁹⁹ Anne Bogart, *A Director Prepares, Seven Essays on Art and Theatre* (London: Routledge, 2001).

¹⁰⁰ Shklovsky, *Art as Technique. In Russian Formalist Criticism: Four Essays*.

¹⁰¹ Luth Otto, “Interview with Luth Otto” in *Brecht on Theatre: The Development of an Aesthetic*, ed. J. Willett (New York: Hill and Wang, 1964).

Summary

If we distill the above discussion we can list a series of points to consider when evaluating a work's inherent qualities to ascertain if that work might be considered poetic:

- If a body-worn device or system uses the various languages at its disposal – form, texture, colour, time and movement; as well as fashion, technology, architecture, performance and interaction design – for their aesthetic and evocative qualities in addition to, or in lieu of their ostensible meaning, the works can be experienced as poetic.
- If action, transformation and ongoing narrative experience evolve in ways that are surprising, unexpected, less than obvious, indirect, to result in the kind of suggestion, allusion, signification, juxtapositions and slippages that support multiple interpretations, such works can generate poetic experiences.
- If the works bring attention to the body in unusual or unexpected ways, and thereby bring to light aspects of our embodied-ness that would otherwise be overlooked, this can enchant and be experienced as poetic.
- If works physically engage us in pre-reflective or extra-discursive narrative experiences that operate in the vicinity of, and help us navigate, synchronic or diachronic thresholds, this can be poetic.
- If they enchant us and make us experience ourselves as complete embodied and spiritual beings by responding to, reflecting or embodying pre-articulated thoughts and perceptions in ways that are considered meaningful, this can be poetic.

- If the works extend the way we see, imagine and experience the world by bringing attention or awareness to shifting relationships to the body in space; or if they engage wearer and observer in an ongoing, evolving process of creation, reflection and construction, as a direct result of interaction between body movement and the effects of technology, this can be highly poetic.
- If works foster new physical states and levels of conscious awareness to shift the way we see, imagine and experience our embodied-ness; if they awaken what is asleep, to turn it slightly until it awakens; if they render something startling; make strange; bring to light details that might otherwise escape attention; they can be poetic.

These points can help us to analyse why we might consider or experience a work as poetic. I have used and continued to develop them throughout this investigation as a way of understanding and analysing if and how a physically engaging, body-worn technological extension might facilitate a poetics of embodied interaction.

In the next section I discuss the final phase one praxis outcome, *hipDrawing*.

1.3 The Elaboration : *hipDrawing*

Phase one of this research includes *hipDisk*, the *gesture≈sound experiments*, the *Light Arrays* and *hipDrawing*. The first two projects, *hipDisk* and *gesture≈sound*, were discussed in section one of this chapter. The *Light Arrays* benefitted from extended development, and will be discussed in chapter two. To complete my discussion of phase one research projects (and this first chapter), I report here on *hipDrawing*. Like each of the other projects, *hipDrawing* examines the poetic potential of a specific approach to technological extension of the body – in this case, graphic extension – and it does so in a performative context. Designer participation has been integral to the project. Unlike *hipDisk* the interface has not been iterated to allow for public participation or use by other wearers. Rather, the investigation remained tightly focused on a single application and format, which evolved in subtle ways as it was tested in different contexts. This approach afforded a condensed and nuanced examination of the opportunities and limitations of this particular device, in a single application. Arguably, *gesture≈sound* also focused on a single application, but *gesture≈sound* examined embodied development of a tool for performance creation, whereas *hipDrawing* examines the use of an interface, rather than its development. In this way it relates more closely to *hipDisk*, yet the performative context, and audience performer relationship are more traditional. *hipDrawing* also distinguishes itself from the other projects through the use of a screen. I begin my discussion with a description of the system.

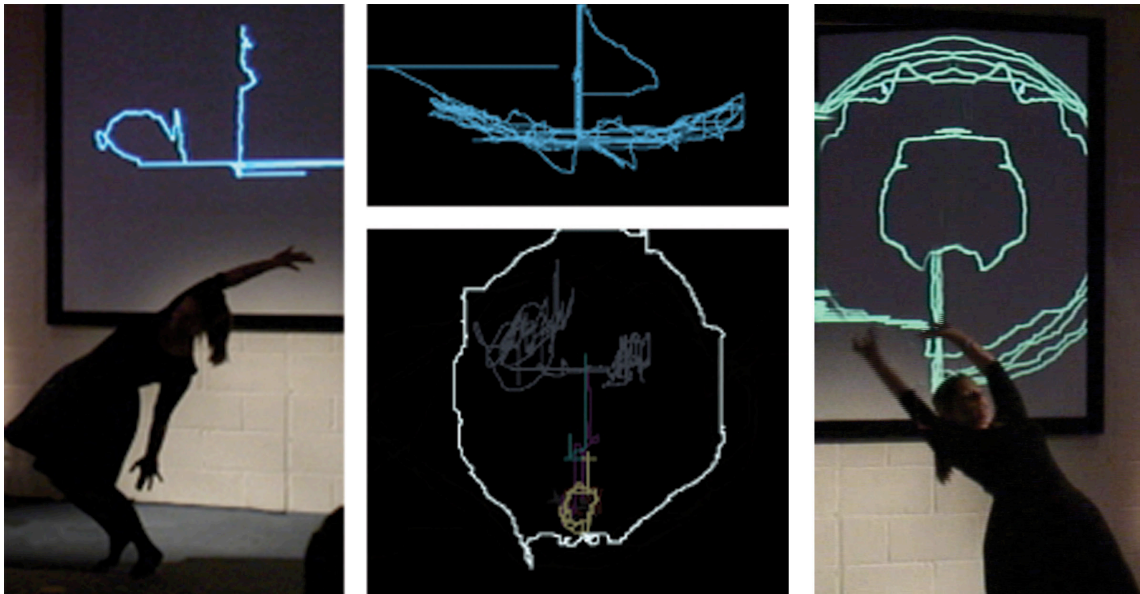


Figure 15. Danielle Wilde, *hipDrawing* (2009)
performance stills and hipDrawings. Dana Centre, London Science Museum, London.

The *hipDrawing* interface turns the wearer into a human, hip-controlled *Etch-a-Sketch*¹⁰² by transforming hip-movement data into two-dimensional (2D) graphics (fig. 15). The interface uses custom textile sensing technology¹⁰³ to measure change in relative tilt between the hip and torso. This data is sent wirelessly to a computer running Processing,¹⁰⁴ is mapped from 3D to 2D and is projected onto a screen as graphic traces in an *xy* Cartesian environment. The garment also measures intensity of “hip shake” to enable the “shake to erase” function of the children’s toy.

¹⁰² Ohio Art, “Etch-a-Sketch”: <http://www.etch-a-sketch.com>

¹⁰³ Richard J.N. Helmer and others, “Smart Textiles: Position and Motion Sensing for Sport, Entertainment and Rehabilitation,” *Advances in Science & Technology* 60 (Smart Textiles), (2008).

¹⁰⁴ <http://processing.org>

Waist movement is relatively unconstrained in 3D space. Flattening this movement onto *xy*-coordinates results in outcomes that are often anti-intuitive. Moving the body in a spiral, for example, typically results in a rounded off diamond-shape. Leaving precisely considered graphic traces thus requires an unusual quality of attention to be turned to the body as it moves. *hipDrawing* demands constant cycling of attention between the actions and gestures of the body, and the resulting graphic output, shown on the screen. Such scrutiny of the relationship between gesture and output opens up new ways of seeing, thinking and generating knowledge about this part of the body. More intensely than any of the other devices in the suite of works described here, *hipDrawing* prompts a process of creating and reflecting on new modes and patterns of bodily experience, as facilitated by the interaction between body movement and the effects of the technology.¹⁰⁵ As a result, action, transformation and ongoing narrative experience constantly evolve in ways that are surprising, unexpected, less than obvious, indirect. This results in the kind of suggestion, allusion, signification, juxtapositions and slippages that support multiple interpretations, and that I describe in the previous section as rendering an experience poetic.

This clumsiness of mapping serves to democratise the technology in a similar way to the clumsy gracelessness of *hipDisk*. The system is consequently accessible to people with varying abilities, so long as they are physically able to wear the interface.¹⁰⁶ Drawing tasks may be designed for personal idiosyncrasies and desired challenge levels, and outcomes provide access to the inherent

¹⁰⁵ Danielle Wilde, "hipDrawing" (2009)

<http://www.daniellewilde.com/iWeb/daniellewilde/hipDrawing.html> This notion is discussed in relation to all of the praxis outcomes (to date) in: Danielle Wilde, "Using Technology to *Poetically* Extend the Dynamic Moving Body," in *SEAM Spatial Phrases* (Sydney: Critical Path, 2009).

¹⁰⁶ The interface currently consists of a modified compression garment, which may prove difficult to put on or wear for some people. Body-worn technologies often embody pragmatic challenges relating to fit, as well as functionality. No two bodies are identical, yet if body movement is being measured, the relationship between sensors and body must have integrity, not only during an activity or use, but also across different activities, as well as different participants. The garments and devices must also be able to be put on and taken off without damaging delicate components. Where the core body is concerned, this can be particularly challenging. If the participant is not body-typical, there may be additional challenges relating to fit, functionality and the wearing and donning of the garment or device, that need to be treated on an individual basis.

aesthetics of movements of all types. This affords desirable experiences for people with a range of physical and communicative challenges, to generate self-knowledge, as well as for creative expression and playful physical engagement. Gallagher provides an extended discussion of the interrelation of body schema and physical activity, and the benefits of engaging in different types of movement that affect motility and postural schemas.¹⁰⁷ He cites a study by Irving Rock and Charles S. Harris that demonstrated that where visual information conflicts with proprioceptive input, such as may occur with *hipDrawing*, adjustments take place in the interpretation of proprioception and the body schema shifts to accommodate what the person is seeing.¹⁰⁸ *hipDrawing* provides surprising visualizations of movement, which may contribute to surprising shifts in proprioception. According to Franklin Shontz, “body schemata (...) are not fixed photographs of bodily structure but are active, changing processes.”¹⁰⁹ Body-devices such as *hipDrawing* may contribute to an ongoing assessment of body schemata, and positively affect the plasticity of the mind, and thereby physical and mental health and wellbeing.¹¹⁰

¹⁰⁷ Gallagher, *How the Body Shapes the Mind*, 145-146.

¹⁰⁸ Irvin Rock and Charles S. Harris, "Vision and Touch," *Scientific American* 216, no. 5 (1967).

¹⁰⁹ Franklin Shontz, C., *Perceptual and Cognitive Aspects of Body Experience* (New York: Academic Press, 1969).

¹¹⁰ Norman Doidge provides substantial reflection on the benefits of exercising, and thereby preserving the plasticity of the mind in: Doidge, *The Brain That Changes Itself: Stories of Personal Triumph from the Frontiers of Brain Science*.

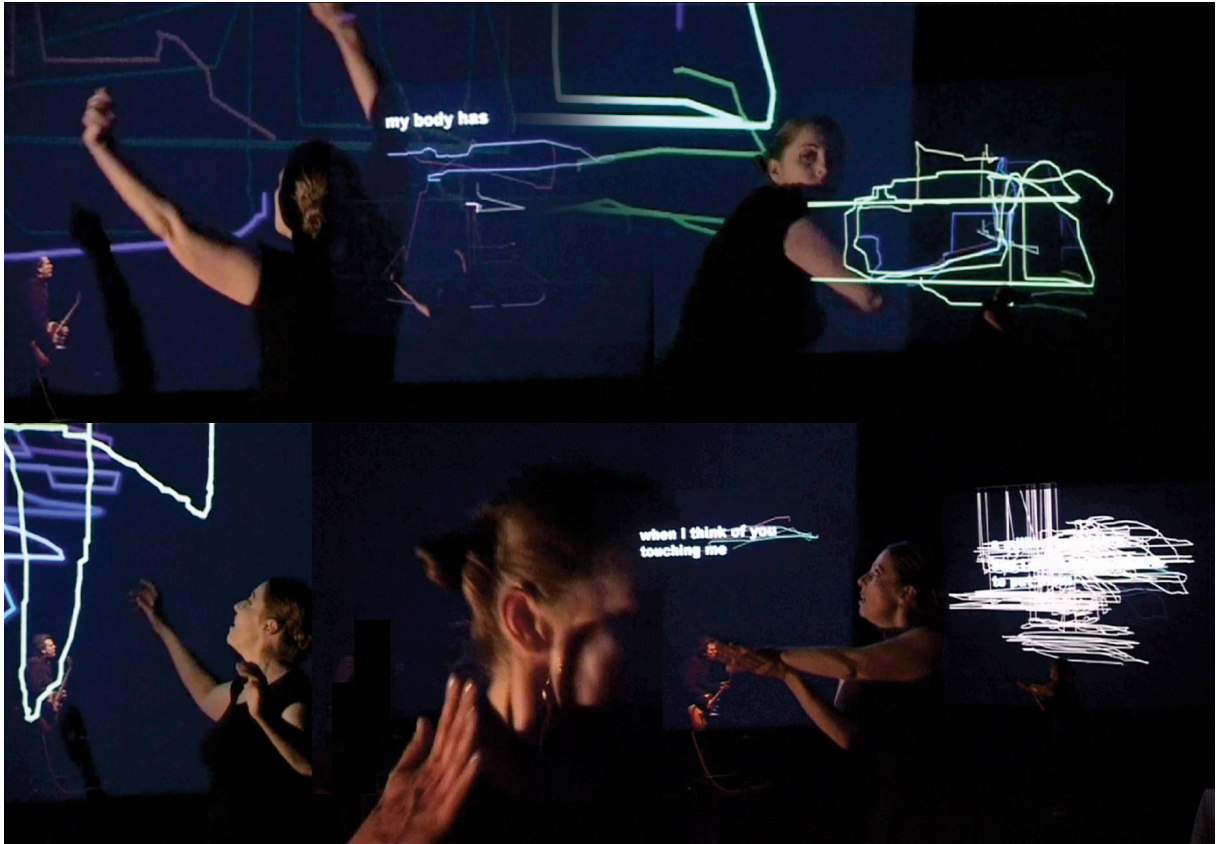


Figure 16. Danielle Wilde, *hipDrawing* (2009) performance stills. Dancehouse Melbourne, with Piers Morgan on improvised guitar. Video by Michael Borthwick.

hipDrawing has been presented in performance on four different occasions: in June, 2009 at an event at the London Science Museum's Dana Centre for public engagement with science; in July 2009 at Melkweg nightclub in Amsterdam as part of an opening event for the 2009 Five Days Off Festival; in September 2009 at a showing of works in development at Dancehouse, Melbourne; and in October 2009, also at Dancehouse, for the closing event of the Time Transcendence Performance Conference (fig. 16). The interface was also exhibited on a mannequin alongside video footage of a performance filmed in a studio (without an audience), as part of the curated group exhibition: Powered Art and Fashion Design at the Netherlands Institute for Media Art (NIMK).¹¹¹ In each presentation the performance, audience and context were all slightly different, though the performer/audience/screen structure was maintained throughout.¹¹²

In discussions with audience members after the different performances, many observers reported that *hipDrawing* made them see the wearer's movement differently, in ways they had not previously viewed as, or considered to be movement.¹¹³ Certain people reported that they felt as if they saw movement that may not have even been there. On two occasions, when the technology malfunctioned, observers nonetheless expressed excitement at the possibilities suggested by the work, and many people wanted to try the interface for

¹¹¹ Surface Tension event at the London Science Museum:

<http://www.danacentre.org.uk/events/2009/06/23>; 5 days off festival event at Melkweg, Amsterdam: <http://www.5daysoff.nl/index.php?id=424>; Wearable Technology - Powered Art and Fashion Design exhibition at NIMK:

[http://www.montevideo.nl/en/agenda/detail_agenda.php?id=314&archieff= ?](http://www.montevideo.nl/en/agenda/detail_agenda.php?id=314&archieff=)

<http://www.nimk.nl>; the video performance was filmed at STEIM: www.steim.org; Dancehouse, Melbourne on 13 September 2009; and the Time, Transcendence, Performance Conference closing event also at Dancehouse, Melbourne on 3 October 2009.

¹¹² The work evolved after each showing as I experimented with narrative structure and levels of abstraction. The events may be characterized thus: Dana Centre for public engagement with science had a polite audience interested in being both entertained and informed. Melkweg is the largest nightclub in Amsterdam and the Five Days Off Festival predominantly focuses on live performance. The audience was typical for a nightclub/late night live music and culture venue. The first showing at Dancehouse had an audience of dance aficionados, interested in viewing works in progress. The second performance at Dancehouse was attended by academics, performers, performance theorists, artists and students: conference attendees interested in being both challenged and entertained.

¹¹³ This, and following comments, are based on informal discussions with audience members, gallery goers, producers, venue staff, and, where appropriate/possible with co-presenting artists.

hipDrawing fit comfortably into any of the genres or forms Salter describes. The attempt with *hipDrawing* seems to flatten the work, diminish its potential. If there is indeed a new kind of performance to be accessed through the research I am undertaking I believe it will require shifting the experience of *hipDrawing*, and perhaps all of the other interfaces, toward a participatory performance model as realised with *hipDisk*.

hipDrawing shows potential as a multi-user socially navigated experience, in its current setup with a single screen for shared output, as well as a single- or multi-user experience that sends graphic output to a hand-held device, rendering the output private, inaccessible to the viewer. The multi-user versions would provide opportunities to examine social navigation and engagement. The private screen would afford closer observation of audience reactions, to tease out the role that different elements of a system play in audience meaning-making. The effect of the private screen may be similar to a *gesture≈sound* participant wearing headphones. The observer in both cases would be denied access to the logic behind the participants' actions. *hipDrawing* tends to result in less fluid movements than *gesture≈sound*. The opportunity to analyse the different kinds of movements generated and their effect, independent of the graphic and sonic outcome, would be welcome.

My research focus is on non-codified “natural” movement (to return to Shklovsky’s use of the word natural), and technologies that are at once worn on the body, and bring the focus to the wearer’s body, in motion. The phenomenologies of felt experience¹¹⁶ are foregrounded and seem to render more traditional approaches to performance dissatisfying as a medium to extend my research outcomes. Despite positive feedback, I contextualise my struggle with creating performative outcomes with and for the *hipDrawing* system by this sense of dissatisfaction.

¹¹⁶ Sheets-Johnstone, “Emotion and Movement: A Beginning Empirical-Phenomenological Analysis of Their Relationship.”

Salter proposes some useful theories for thinking about the relevance of performativity to my research. He cites cultural theorist Karen Barad's argument that "the move towards performative alternatives to representationalism shifts the focus from questions of correspondence between descriptions and reality (e.g., do they mirror nature or culture) to matters of practices/doings/actions", suggesting that this implies that "the world emerges over time, continually transformed through our history of interactions with it."¹¹⁷ By taking performativity out of the theatre and into a direct engagement with the world, we can move closer to a consideration of the relevance of Francisco Varela's notion of Enaction,¹¹⁸ "which describes the performance or action of "bringing forth of a world" based on the fact that we are a sensorimotor-based embodied agent in which meaning emerges through a continually historical process of "active living."¹¹⁹ Varela et al's seminal publication *Embodied Interaction* discusses "the spontaneous and reflective dimension of human experience".¹²⁰ In many respects this can be considered to be the core focus of my own research. It is echoed in my discussions of a poetics of embodied experience, and demonstrated by my interest in the process of creating and reflecting on new modes and patterns of bodily experience, through the interaction between body movement and the effects of the technology.

To enter more deeply into the question of the relation between my works and performance, I invited two choreographers into my process, specifically to observe their interpretation of performative applications of my research outcomes. I undertook this in phase two, during the developments of the *Light Arrays* project, discussed in the next chapter.

¹¹⁷ Karen Barad, "Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter," *Signs: Journal of Women in Culture and Society* 28, no. 3 (2003). Quoted in Salter, *Entangled. Technology and the Transformation of Performance*, xxvii.

¹¹⁸ Amy E. Cohen and Francisco J. Varela, "Facing up to the Embarrassment: The Practice of Subjectivity in Neuroscientific and Psychoanalytic Experience," *Journal of European Psychoanalysis* 10-11, no. Winter-Fall (2000). Quoted in Salter, *Entangled. Technology and the Transformation of Performance*, xxvi-xxvii.

¹¹⁹ Ibid.

¹²⁰ Francisco Varela, Evan Thompson, and Rosch, *The Embodied Mind*, xxvi-xxvii.

Conclusion

In this chapter I described in detail the *hipDisk* and *gesture≈sound experiments* to elucidate my working methodology and articulate my key research questions. I then provided a thorough overview of the theoretical scaffold that supports the reflective thinking and making process of this investigation. The scaffold interweaves theories related to embodiment and notions of the poetic in literature, as well as architecture, fine art and interaction design. Notions such as playfulness, enchantment, the value of open systems without fixed outcomes and also clumsiness as a direct design resource to democratize physical engagement are foregrounded. In section three I discussed the *hipDrawing* interface and reflect upon the performative nature of embodied interactive experiences.

hipDisk, *gesture≈sound* and *hipDrawing* each approach the question of performativity, and role of audience/observer and performer/participant from different perspectives. Outcomes suggest that participation may be key to fully leveraging the experiential possibilities of body-worn technologies. Yet traditional performance paradigms may also offer a potent context for exploration. In phase two of the research I therefore undertake two extensive projects, one focused on performance, the other on participation.

The *Light Arrays*, discussed in chapter two, takes initial prototyping into an extended investigation of the applications and implications of a light-based approach to extension. The project includes the development of interfaces and creation of performances with two choreographers, as well as deep reflection on applications in abilitation.

The *OWL project*, which ran concurrently with the *Light Arrays*, is discussed in depth in chapter three. The project focuses entirely on the development and investigation of participatory processes. It acts as a lens through which to reassess all the other outcomes and approaches, including the *Light Arrays*.

Chapter: 2

Let There be Light

This chapter is devoted to the *Light Arrays*, an investigation of light-based body extension. In the first section I discuss the genesis of the project, and related thinking. I develop basic prototypes and investigate their performative, and other potential. The approach complements that taken in the projects discussed in chapter one, by applying my research thinking to light-based extension.

In section two I focus on how this work was elaborated during a year-long research fellowship at The University of Tokyo. The intention was to develop all aspects of the project, with a strong interrogatory focus on performance. I begin by considering and refining the interfaces in response to participant feedback received in phase one, and continue evolving these outcomes in and through additional experiments with participants and collaborators. The approach affords deep focus on electronic and textile interface research and development, as well as the development and testing of an interwoven design-choreographic development process. Through this process I extend the embodied development approach I used to create *hipDisk*, to participants, and thereby allow their embodied testing of my interim experimental outcomes to inform development of these outcomes. I also build upon the experiments I undertook during *gesture≈sound*, developing the multi-modal prototyping methodologies with, on and through other practitioners.¹²¹

In section three I speculate on applications of the *Light Arrays* in disability and abilitation contexts. My thinking in this area was supported by discussions with concerned stakeholders in Japan and Australia, as well as at an international conference, which took place in Chile.¹²²

¹²¹ Electro-acoustic composers, Ross Bencina and Somaya Langley, as discussed in 1.2 and also Bencina, "Gesture≈Sound Experiments: Process and Mappings."

¹²² Personal correspondence with family and carers of people with disabilities including spectrum disorders and Cerebral Palsy; *The 8th International Conference Series on Disability Virtual Reality Associated Technologies*, Viña del Mar/Valparaíso, Chile: ICDVRAT/ University of Reading, 2010: <http://www.icdvrat.rdg.ac.uk/>

To conclude this chapter, I discuss how my focus on process has led my thinking towards a consideration of how technology development might be approached in a future not predicated on current understandings of what might be technologically feasible. The aim of the final project, discussed in chapter three, is to develop processes that support innovative leaps rather than technologically feasible adjacent possible iterations. The *OWL project* ran in parallel to the extended *Light Arrays*. It builds further on the discoveries made in phase one of this research, as well as throughout the *Light Arrays*, by applying them to a participatory development process, wherein the design of the participation constitutes the outcome.



Figure 17. Danielle Wilde, basic *light arrays* experiments (2007)

2.1. Light-based bodily extension

The *Light Arrays* is a series of garments and modular wearable interfaces that incorporate arrays of visible LEDs and lasers to project a dynamic representation of body movement and posture onto the environment (fig. 17). The lights protruding from the body allow us to examine how a person's movement impacts space physically and dynamically, and how the different parts of their body might interact with each other (and others) through gesture and posture.

The initial experiments were simple – a series of modular supports that incorporated the lights were taped to the bodies of performers who had extensive movement training and experience. Lasers were also extruded at a 90 degree angle from the spine using a neutral, one-size garment. Explorations with these interfaces demonstrated that it was possible to form an experiential bridge between what we see and what we feel or know about the dynamic, moving body by extending it with light.

In the book *Body, Memory and Architecture* Kent Bloomer and Charles Moore suggest that what is missing from dwellings today are the potential transactions between body, imagination and environment.¹²³ They propose that the emotional spatiality of the body is social, “with all the meanings which find expression along its boundaries, centres, and psychophysical coordinates,” and claim that it is impossible to imagine spatial organisation “more universal, more valued, and more immediately understandable to everyone than the one provided by the human body.”¹²⁴ They suggest that as everyone is conscious of their “spatial” sensibility at one time or another, people are likely curious about that sensibility in others. This curiosity not only allows us to enjoy an external expression of our private feelings but, according to Bloomer and Moore, confirms our own

¹²³ Kent C. Bloomer and Charles W. Moore, *Body, Memory and Architecture* (New Haven: Yale University Press, 1977).

¹²⁴ *Ibid.*, 46.

existence in humanity.¹²⁵ These ideas are relevant to the *Light Arrays* in a number of ways. Firstly, *Light Arrays* provide a way of thinking about the potential transactions between body, imagination and environment from an experiential, as well as visual, perspective. They also allow the participant to enter, understand and experiment with the meanings, which find expression along the body's boundaries, centres, and psychophysical coordinates, as well as with non-observational relationships to space. Echoing Merleau-Ponty's claim that the paintings of Cézanne "make visible how the world touches us,"¹²⁶ the *Light Arrays* make visible how our gestures touch the world.

Light is not tangible, in a readily perceivable tactile way. It does not normally interfere mechanically with body positioning. The feedback it provides is predominantly visual, and a viewer's understanding of it qualitatively shifts with perspective. Observers and wearers of the *Light Arrays* view and experience the system in different ways at any moment in time. This simultaneity of multiple perspectives leads to opportunities to feed forward, in addition to sharing perceived information and providing feedback.

Feedback can be described as the information that a system provides to a participant or user in response to their actions. The systems described in this PhD, for example, give feedback in the form of sound (*hipDisk* and *gesture≈sound*), graphic output (*hipDrawing*) and light (*Light Arrays*), as well as the highly idiosyncratic feedback each user gains from their body, as they give attention to their feelings, movements and physical responses as they interact with the different interfaces. Feeding forward points to the information that the system's state communicates beyond the participants, to others. In the case of the *Light Arrays*, the augmented and amplified body in motion is literally "fed forward" to create a kind of observable synesthesia for the viewer.

¹²⁵ Ibid.

¹²⁶ Maurice Merleau-Ponty, *Phenomenology of Perception* (London: International Library of Philosophy and Scientific Method, Routledge & Kegan Paul, 1962), 182.

Unlike the projects described in the previous chapter, the basic *Light Arrays* systems are not interactive, per se. The lights sit on the body, in a range of configurations, to amplify movement and body position. There is no on-off switch and the lights are not configured to respond dynamically to movement or other stimulus. The system is passive. Importantly, this aspect allows comparisons with a more complex interactive approach, such as has been developed in phase two of this project, discussed in the following section.

practical experiments

To test the basic interfaces, three artists with extensive movement training and performance experience were invited to play and explore while wearing the lights in a range of configurations. The experiments were filmed and the live-feed from the video camera made available on a monitor for the performers to view as desired, in real time, as they undertook their experiments. This filming provided real-time access to an outside perspective and resulted in insights that would not necessarily be available without this external visual feedback. It also brought to light how seductive the image of one's body, transformed by technology, could be. At times the performers' attention was totally absorbed, and their explorations guided by, what they were able to see on the video monitor – any notion of internally driven movement exploration was eclipsed by the visual feedback. This resulted in an externally driven exploration predicated on the value of what was being constructed visually, rather than a curiosity-driven exploration of felt experience.

While I have no desire to place a hierarchical value on these two different approaches, I have found that recognizing and acknowledging the differences between them is integral to developing poetic and engaging outcomes. My results highlight the importance of being aware of where a participant's attention may lie at any time, and the value of prompting their attention to cycle between action | gesture and the results of action as embodied by the technology.

Despite the, at times total, distraction of their images in the monitor, the participants report being inspired to move and discover their bodies through movement, in ways that differed radically from their usual approaches and habits.¹²⁷ Comments include:

I became aware that I know so little about my body

it gave me a map of the subtlety and size of my gestures, as well as the shift between what it feels like, and what reads for an audience

it made me want to move my body in new ways

I wanted to explore shape

I felt I had a heightened sense of awareness

I became frustrated with the limits of my body

it made me move how I don't normally move

the lights provided confirmation/verification and support for my body memory

it challenges what you're used to

it's like learning a new rhythm

the revelation of light is breathtaking

¹²⁷ Comments have been extracted from discussions amongst the three performers over the course of the days' experiments. Some of these discussions took place in the rehearsal/experiment venue, and were captured on video. Additional discussions were undertaken during lunch and coffee breaks, and were documented in a workbook.

and they all wanted more lights.

The experiments proved rich and evocative. The work raised many questions in regard to the performers' relationships to their bodies, their relationships to technologically facilitated body extensions, as well as how such extensions might affect a person's ability to generate and explore through movement. The feedback provided by the lights augmented participant's proprioception.¹²⁸ It also afforded an integration of the space and other people as part of an extended body, simultaneously "shared" by all of the participants, as well as the surrounding architecture. This sharing prompted self-reflection,¹²⁹ created connections and afforded co-creation of understandings of the system through synchronized and/or asynchronous behaviour. The performers dynamically created shared reference frames, and brought observers' and the other participants' attention to their externalized proprioception. In addition, the lights allow them to individually explore the different qualities of their physical presence in space.

The effects of these light extensions on the way the body in motion was experienced and understood brought to light clear opportunities related to working with this technology in performance, exploring the body's expressive capabilities through guided and freeform play, and also learning complex somatic techniques and speeding up rehabilitation. Each of these applications required further reflection, contextualization of the system and development, which will be discussed below.

¹²⁸ the participant's sense of where their body is at any time

¹²⁹ see comments on p.77

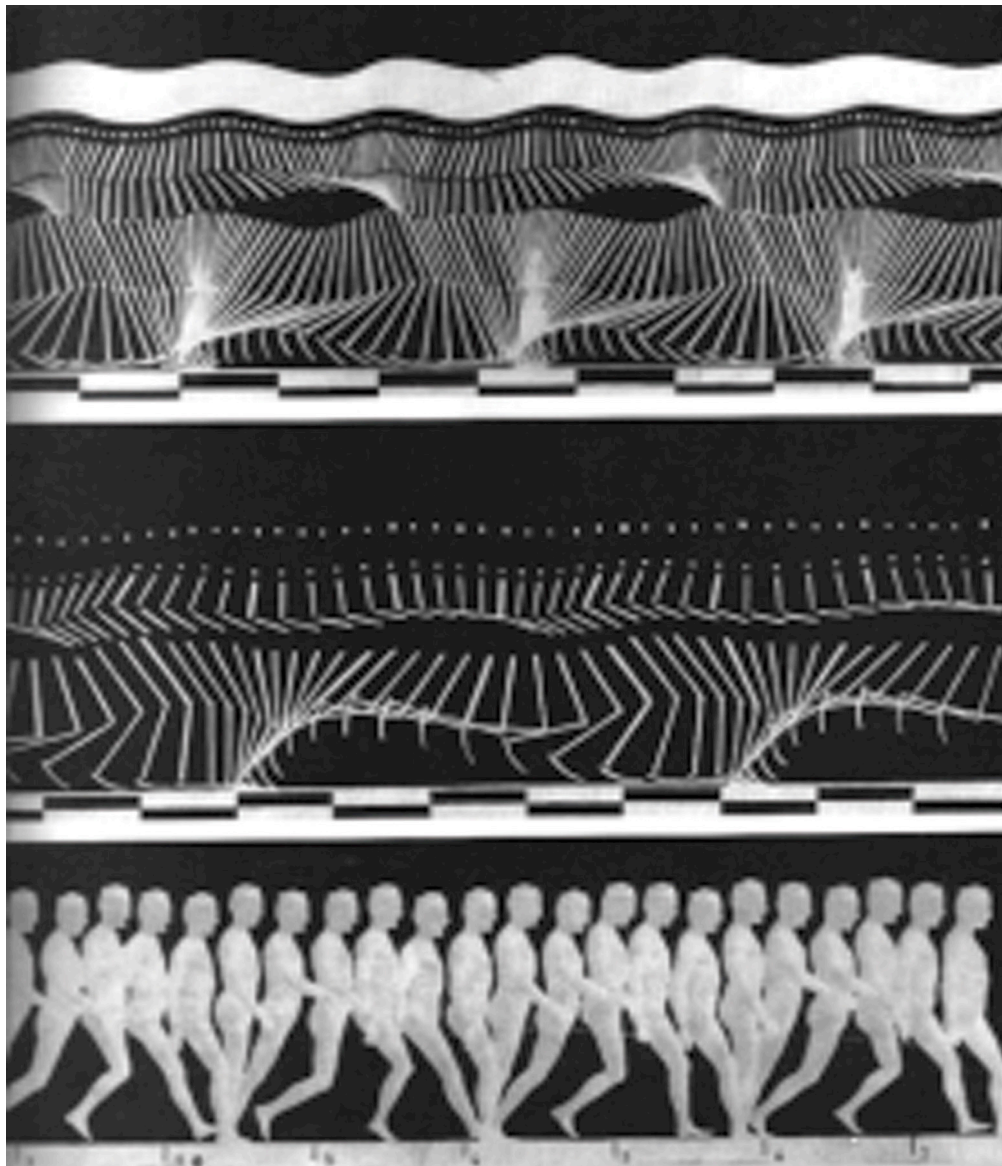


Figure 18. Etienne-Jules Marey, *Man Running* (1882)

Light has long been used as an exploratory tool to gain insight into body dynamics. Historic examples include Etienne-Jules Marey (fig. 18) and Charles Muybridge's photographic locomotion studies.¹³⁰ Through photography their work gives us insight into movement as it occurs over time and through space – presenting the body as an integrated whole comprised of linked parts and dynamically shifting relationships. Motion capture provides a contemporary equivalent.¹³¹ The celebrated choreographer and dancer, Merce Cunningham, said that motion capture technology allows him to “see movement in a way that was always there – but wasn't visible to the naked eye.”¹³² The *Light Arrays* do the same, but in real time, independent of architecturally based infrastructure. In contrast to motion capture systems, the *Light Arrays* aim to provide inspiration and insight through real-time feedback, rather than quantifiable data. It is not, in any traditional sense, a technical tool.

In certain respects, the *Light Arrays* is more closely related to *Synchronous Objects for One Flat Thing, reproduced*, the award winning project of choreographer William Forsythe and The Ohio State University's Advanced Computing Centre for the Arts and Design, and the Department of Dance (fig. 19).¹³³ *Synchronous Objects for One Flat Thing, reproduced* offers “alternative sites for understanding Forsythe's work and seeing its choreographic structures unfold.”¹³⁴ The *objects* are computer generated graphic overlays and reinterpretations created after the fact, using as their source material the *One Flat Thing, reproduced* choreography: in video form, and as recounted by the dancers and by Forsythe.

¹³⁰ Etienne-Jules Marey, *Etienne-Jules Marey* (Paris: Centre de la Photographie (Photo Poche), 1994); Eadweard Muybridge, *Complete Human and Animal Locomotion: All 781 Plates from the 1887 Animal Locomotion: New Volumes 1-3 (Reprints of Original Volumes 1-4, 5-8 and 9-11)* (Dover: Mineola, 1979).

¹³¹ For an overview see: Maureen Furniss, "Motion Capture: An Overview," *Animation Journal* 8, no. 2 (2000).

¹³² Evantheia Schibsted, "Lifeform," *Wired* October 1996.

¹³³ <http://synchronousobjects.osu.edu/content.html>

¹³⁴ Maria Palazzi, *The Objects*, Columbus Ohio, March 2009: <http://synchronousobjects.osu.edu/content.html>

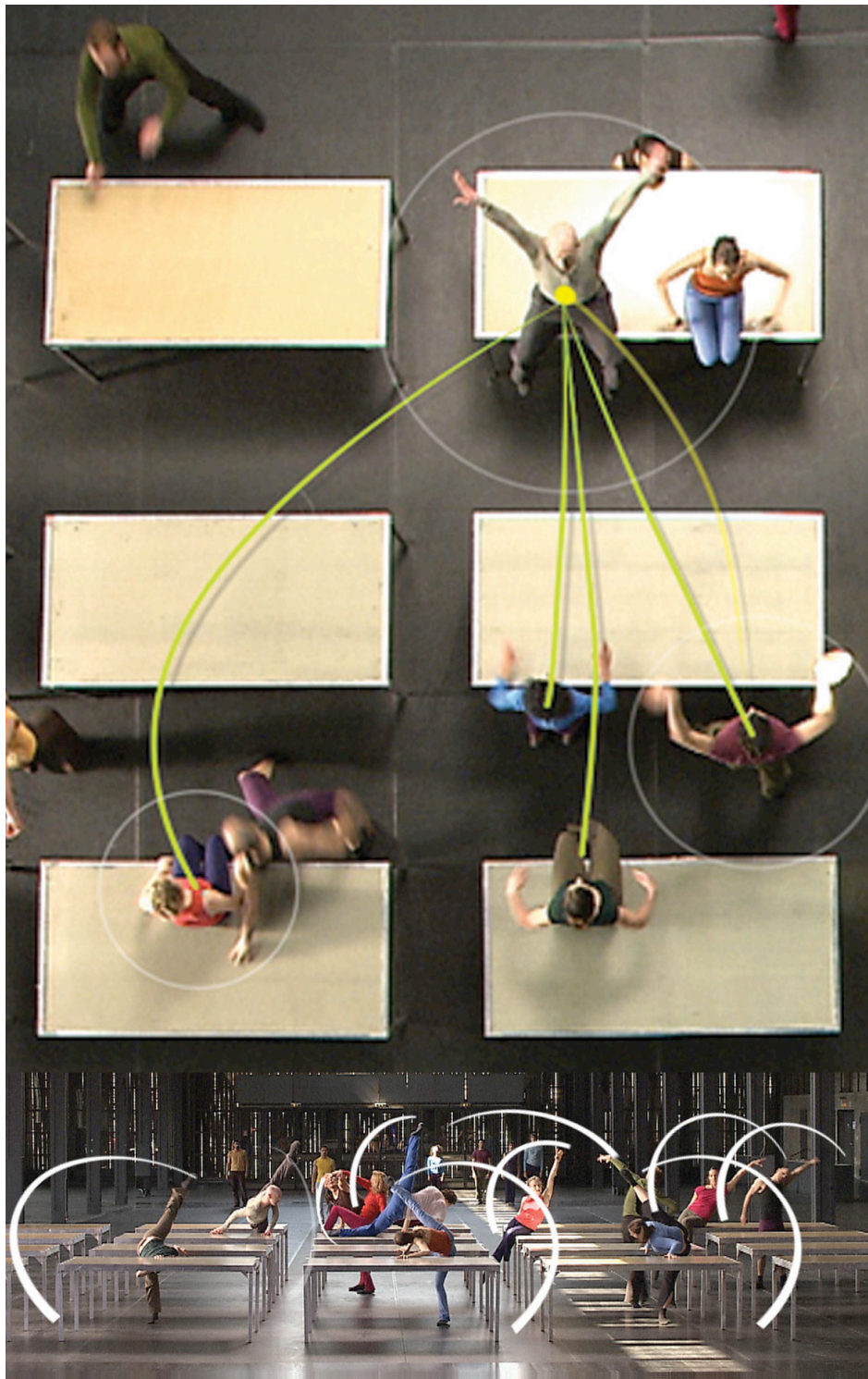


Figure 19. Synchronous Objects Project
The Ohio State University and The Forsythe Company (2009)

The *Light Arrays* extrude the body of the performer with light during their performance. This distinction is significant. The underlying movement and relationships dynamically unfold before the eyes of both wearer and observer in real time – as they happen, providing “alternative *synchronous layers* for understanding [the] work and seeing its choreographic structures unfold.”¹³⁵ The information is not broken down over time, preserved or reinterpreted for later referral, such as in the aforementioned systems and approaches.

Though intangible, the *Light Arrays* echo Rebecca Horn’s early body extensions, which literally and figuratively extend the body through mechanical means.¹³⁶ The works *Unicorn* and *fingergloves*, in particular, provide linear extensions of the body. As shown in (fig. 20, top, left), *Unicorn* consists of a single, or uni- “corn” (horn) that extends up from the head of a partially dressed woman. The straps holding the horn in place wrap around her body in such a way as to seem to merge the two materials – body/flesh and fabric/horn. Like a hybrid creature such as a minotaur or centaur whose body merges both animal and human as it transforms spatially from one material to another, the horn seems to merge with and be part of the woman. *fingergloves* (fig. 20, top, right) similarly elongate the body by extending each of the digits such that the wearer may touch the walls of the room they are in, or otherwise engage with space through their elongated form. The extension provided by *fingergloves* is more incongruous than the seemingly interwoven hybrid *Unicorn*, as *fingergloves* may just as well be extending gloves that can be removed, as extended fingers. Yet this does not lessen the impact of the phenomenological experience of the *fingergloves*. Unlike *Unicorn* and *fingergloves*, the *Light Arrays* extend out perpendicular from the body. Horn’s *Pencil Mask*, (fig. 20, bottom) extrudes the face in a similar way, with pencils, yet it arguably relates more closely to *hipDrawing*, as the pencils do not extend out beyond standard pencil length, and when it connects the head to the architecture the wearer may use it to leave graphic traces of their movement.

¹³⁵ a reappropriation of Palazzi’s description of the role of the *Synchronous Objects*

¹³⁶ Zweite, Schmidt, and Drathen, *Rebecca Horn, Drawings, Sculptures, Installations, Films 1964-2006*.



Figure 20. Rebecca Horn, top, left: *Fingergloves* (1972), top right: *Unicorn* (1970)
bottom left+right: *Pencil Mask* (1973)



Figure 21. Hussein Chalayan and Moritz Waldemeyer
Readings Spring/Summer 2008 fashion collection

A parallel may also be drawn between the *Light Arrays* and the dresses from Hussein Chalayan's Spring/Summer 2008 collection *Readings* that incorporate servo-driven lasers and crystals (fig. 21).¹³⁷ *Readings* does not provide information on body motion; it does however provide a startling example of the aesthetic power of pairing lasers with the body. In Chalayan's work the lights are driven by servo-motors, to refract out from the body of the model into the space in dynamically changing directions. While highly engaging, this bears no relation to the underlying mechanics of the wearer's body. The *Light Arrays* use the movement of the body alone to affect changes in the direction of the lasers. This direct coupling of body position and light affords insight into the underlying mechanics of the movements of the wearer, by magnifying this movement. From a theoretical perspective, the *Light Arrays* are aesthetically more closely aligned

¹³⁷ Chalayan, Hussein and Moritz Waldemeyer, "Readings" (2008)
<http://www.waldemeyer.com/laser.html> see also: Hussein Chalayan, *Hussein Chalayan*, ed. Robert Violette (New York: Rizzoli, 2011); Hussein Chalayan, *Hussein Chalayan - from Fashion and Back* (Tokyo: Bss Bijutsu, 2011).

with the motivations driving Marey's chronophotographic experiments into locomotion, Horn's body-extension experiments and the post-produced dynamic-graphic-choreographic *objects* of the *Synchronous Objects for One Flat Thing, reproduced* project, than they are with Chalayan's seductively beautiful laser dresses, despite the visual similarities of the two works.

moving forward

The initial *Light Arrays* experiments pointed to two lines of research: (1) *augmented proprioception*, generated with an artificial visual feedback system, examined through the initial experiments, and (2) *enhanced body interaction* using an interactively augmented body with lights that reflect and respond to movement through time, as well as space. The second line of research required more complex technology development and an extended development timeframe. Accordingly, I spent twelve months at The University of Tokyo collaborating with Alvaro Cassinelli, a media artist expert in laser technology,¹³⁸ with the support of his Meta Perception research group¹³⁹ and the larger lab at The University of Tokyo.¹⁴⁰ My collaboration with Cassinelli seemed logical within the broader context of both of our research programs. His group investigates how to extend perception through technological mediation. Increasingly they have become interested in wearable works. Cassinelli's *Haptic Radar*, for example, is a spatial augmentation device for the visually impaired.¹⁴¹ It is a modular device that allows the wearer to perceive and respond to spatial information using haptic cues in an intuitive and unobtrusive way. The system is composed of an array of invisible lasers that simulate "optical-hair modules". Each laser senses range information, which it transduces as a vibro-tactile cue on

¹³⁸ Alvaro Cassinelli: <http://www.alvarocassinelli.com>

¹³⁹ Meta-Perception Research Group <http://www.k2.t.u-tokyo.ac.jp/perception/index-e.html>

¹⁴⁰ The Ishikawa Komuro (now Ishikawa Oku) Laboratory: <http://www.k2.t.u-tokyo.ac.jp/index-e.html>; The *Light Arrays* project page: <http://www.k2.t.u-tokyo.ac.jp/perception/lightArrays/index-e.html>

¹⁴¹ Alvaro Cassinelli, Carson Reynolds, Masatoshi Ishikawa, "Augmenting Spatial Awareness with Haptic Radar.," in *International Symposium on Wearable Computers (ISWC)* (Montreux: IEEE, 2006). [online] "Haptic Radar | Extended Skin" <http://www.k2.t.u-tokyo.ac.jp/perception/HapticRadar/index-e.html>

the skin below. It thereby operates as a kind of cellular cilia, insect antennae, or in the same way as the specialized sensory hairs of mammalian whiskers. This system complements the basic *Light Arrays* systems as, rather than reflecting the wearer's movement onto space, the *Haptic Radar* reflects the proximity of space, dynamically, onto the wearer.¹⁴²

The work undertaken in Tokyo is discussed in the next section, including focused development of more sophisticated *Light Arrays* interfaces, specifically for use in performance.

¹⁴² Danielle Wilde, Alvaro Cassinelli, Alexis Zerroug, Richard J.N. Helmer, Masatoshi Ishikawa, "Light Arrays: A System for Extended Engagement," in *8th International Conference Series on Disability Virtual Reality Associated Technologies*, ed. Paul M. Sharkey and Jaime Sánchez (Viña del Mar/Valparaíso, Chile: ICDVRAT/University of Reading, 2010).

2.2 The Extended Light Arrays

The *Light Arrays* project benefited from a sustained investigation. Working in Tokyo afforded deep understanding of the challenges and opportunities of extending any of the works in this thesis, and thereby allowed me to refine my research process. With the time and additional resources I was able to consider how best to develop solid, usable applications in disability and performance, though the ethics approval and time constraints were not sufficient for extensive research in a disability context. As a result I focused on creating for, with and through performance. Outcomes included a suite of garments, two independent performances, and presentations of different aspects of the work in a high-profile public forum.¹⁴³ I was also able to initiate ongoing discussions about this research in ArtAbilitation contexts.¹⁴⁴

In the following pages I describe the research outcomes, reflect upon my process and consider the relationship between body-worn technology and design-choreography, a process whereby the designs of artefact and movement evolve in a mutually interdependent fashion.¹⁴⁵ The *Light Arrays* as case study and applications in abilitation are discussed in section three.

¹⁴³ The Yebisu International Festival of Art and Alternative Visions: <http://www.yebizo.com>

¹⁴⁴ ArtAbilitation can be described as artistically engaged rehabilitation or abilitation for participants with a range of abilities and challenges.

Publications discussing the relationship of my work to ArtAbilitation include: Danielle Wilde, "Extending Body & Imagination : Moving to Move," *International Journal on Disability and Human Development* 10, no. 1 (2011); Wilde, "Light Arrays: A System for Extended Engagement."; Danielle Wilde, Melissa Miles, and Richard J.N. Helmer, "Extending Body & Imagination : Moving to Move.," in *8th International Conference Series on Disability Virtual Reality Associated Technologies.*, ed. Paul M. Sharkey and Jaime Sánchez (Viña del Mar/Valparaíso, Chile: ICDVRAT/University of Reading, 2010). A number of useful discussions were initiated at the ICDVRAT conference in Chile, and future collaborative projects are in the planning.

¹⁴⁵ Sietske Klooster and Kees C. J Overbeeke, "Designing Products as an Integral Part of Choreography of Interaction: The Product's Form as an Integral Part of Movement," in *1st European workshop on Design and Semantics of Form and Movement* (Newcastle: Northumbria University, 2005).

practical approach

To develop the *Light Arrays* beyond their initial iterations, a number of challenges needed to be addressed. Firstly my thinking around light extension benefitted from being revisited to identify which applications of the lights in phase one warranted further development, as well as other approaches that may not yet have been considered or trialed. On a practical level, more robust interfaces needed to be made to handle the rigors of rehearsal and performance. This required addressing technical issues including fit and function of the garments and modules, function and build of the technology, and also integrity of sensor/body relationship if the technology were to become more complex.

As a rule, my interfaces use the simplest technology necessary to afford the desired experience. The extension of the project afforded and also warranted the consideration of broader options. As noted in section one, the initial *Light Arrays* research pointed to two lines of research: (1) *augmented proprioception*, generated with an artificial visual feedback system, examined through the initial experiments, and (2) *enhanced body interaction* using an interactively augmented body with lights that reflect and respond to movement through time, as well as space. Following these lines of research will allow a more extensive examination of all four of my key research questions. The more complex and nuanced extension may facilitate more complex and nuanced (artistically-)poetic embodied engagement. It will afford a more refined examination of the impact of extension, including the choices made throughout the development process. The performative aspects of the work will also be explored in greater depth and consideration may be given to the most appropriate cultural artefacts that might result. More sophisticated, interactive technology would be necessary to examine this second line of research.

Many ideas were discussed and considered, but ultimately, three garment/interfaces were developed, and iterated for two choreographers, Alessio Silvestrin and Kentaro!!.¹⁴⁶ I chose to work with two choreographers to maximize the knowledge generated by observing their use of the garments. I was interested in the creative choices they made throughout the process, and how they responded to having technologically augmented garments and modules as initiators of performance. I hoped to challenge the way I was thinking about the light extensions, performance, and also body-worn technologies as performance generation tools.

The choreographers came from different backgrounds, had different approaches and also different experience with technology. Kentaro!!¹⁴⁷ is a young independent choreographer who had no prior experience with body-worn or interactive technologies in performance. His approach can be characterized as full of curiosity, energetic and fresh. Silvestrin also works independently, but importantly was a member Ballet Frankfurt directed by William Forsythe for some years, and continues to be associated with The Forsyth Company.¹⁴⁸ In comparison with Kentaro!!, Silvestrin has extensive experience of the use of technology in relation to dance. His association with Forsythe was particularly evident in his approach to working with the *Light Arrays*, which was far more analytical than Kentaro!!'s. In a review of Forsythe's *Improvisation Technologies. A Tool for the Analytical Dance Eye*,¹⁴⁹ Johannes Birringer writes:

¹⁴⁶ Alessio Silvestrin: <http://www.alessiosilvestrin.com>; Kentaro!!: <http://www.kentarock.com>

¹⁴⁷ <http://www.kentarock.com>

¹⁴⁸ <http://www.alessiosilvestrin.com>; Recent projects include *Skinslides*, created with Japanese media artist Richi Owaki and newClear: <http://newclear.jp/?p=90>;

<http://www.theforsythecompany.com/> <http://www.williamforsythe.de/>

<http://motionbank.org/en/>

¹⁴⁹ William Forsythe, *William Forsythe: Improvisation Technologies [CD-Rom]* (Ostfildern: Hatje Cantz Publishers) (1999/2000/2001)

Forsythe [...] is known for his revisionary approach to contemporary classical ballet and a uniquely rigorous vocabulary of choreographic principles that redefine body, space, time, and movement (inspired by Laban's space harmony and by post-modern architecture, linguistics, and mathematics). His demonstrations make excellent use of computer technology, [...] to make movement trajectories visible by drawing lines or connecting points in space, making explicit how planes and volumes, spatial compositions, or "writing in space" are manifested by moving bodies.¹⁵⁰

Beginning with a design or garment is an unconventional approach, though one that I had long found to be of interest.¹⁵¹ I wanted to see how the two choreographers might respond. Importantly, I implemented a double-layered design-choreographic process. Rather than giving the choreographers completed, fully functioning garments, we began with basic functioning prototypes, which evolved with and through the choreographic process. Klooster describes this interdependently evolving process as design-choreographies that emerge from, create and respond to vacuums for possibility.¹⁵² Normally in an evolving design-choreography the designer plays an important role in recognizing and shaping the movement exploration from within – as a participant – as I have done in the other works described in this exegesis. For the *Light Arrays* I wanted to shift this codependent evolution of elements by running two concurrent, interdependent design-choreographic processes: one in which I was the design-choreographer exploring and designing through movement and iterative artefact development;

¹⁵⁰ Johannes Birringer, "Algorithms for Movement CD-Roms by William Forsythe & Jo Fabian," *Performing Arts Journal (PAJ)* 71, (2002): 116.

¹⁵¹ In Melbourne, in 1992, I initiated and was Artistic Director of a series of (five) cabaret events called *Dodecaphonia*, in which each event was made up of performances that shared, and began with a common design constraint. Within each event I also authored and performed a solo work in response to a costume developed for me by theatre designer Anna Tregloan. *Dodecaphonia* took place at *Lounge*, and was part of *The 1992 Melbourne International Comedy Festival* and *The Melbourne Fringe Festival*. An excerpt shown on SBS TV Nomad can be seen here: http://www.youtube.com/watch?v=HmQweh8rdts&feature=player_embedded

¹⁵² Wilde, Schiphorst, and Klooster, "Move to Design • Design to Move a Conversation About Designing for the Body."

the other where the choreographers, Kentaro!! and Silvestrin, explored and impacted the design of the artefacts, and I, the designer, acting from an exterior perspective, evolved the design. I would do this as a provocation for, as well as in response to, their movement explorations and the emerging choreographies. I implemented this process to provide further depth and support for the conceptualisation and design of the body-worn, body-actuated interactivity.

The garments that resulted include *laser spine*, lifted almost directly from the phase one experiments, the *in-visible skirt* and the *intertia LEDs*.

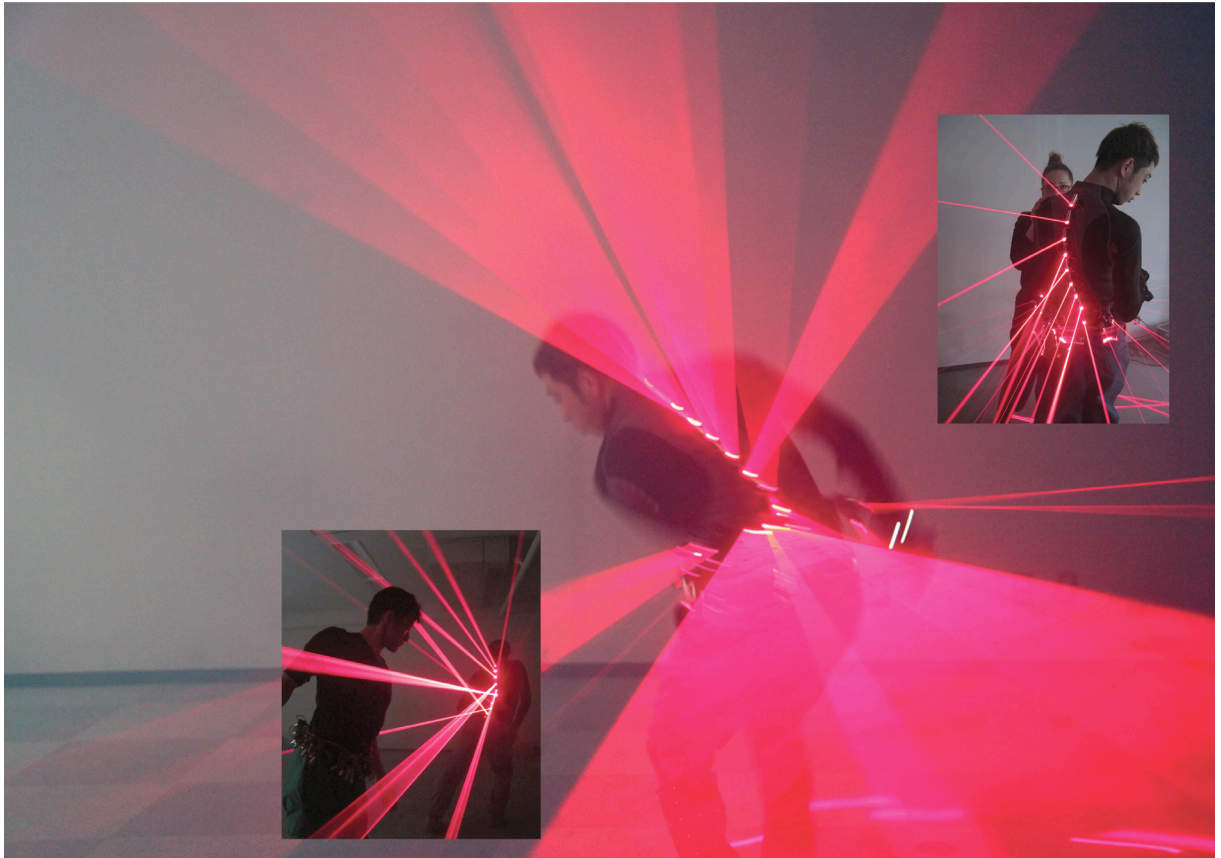


Figure 22. Danielle Wilde and Alvaro Cassinelli, *laserSpine* (2011)

laser spine is a garment with lasers that project perpendicular to, and down the length of the spine (fig. 22). The complex technology in this interface is the body. A number of interactive solutions were explored, using flex sensors, for example, to determine the curve of the spine so that the lights might respond to, or reflect this movement dynamically. However, it became clear quite quickly that adding technological nuance and control was not adding significantly to the dramatic impact of the outcomes. Though it is not always evident, the range of movement of the spine is remarkable. Magnifying and making visible the relative position and dynamic tilt of the spine is sufficient to bring attention in an intense and unique way to this part of the body. That the wearer of the garment cannot see the lights projecting from their back serves to intensify this focus. The whole seems to enhance the poetic valence of movement of the entire torso, with the spinal column demarcated as the experiential, physical and energetic core. Adding additional complexity through technology seemed redundant. The focus in the development of this garment was turned instead to the creation of a robust system, appropriate for the emerging choreographies.



Figure 23. Danielle Wilde and Alvaro Cassinelli, *in-visible skirt* (2011)

The second interface, the *In-visible Skirt*, is a belt with six evenly spaced motorised laser-modules and an independent controller, which sends and receives movement information to and from the belt. When activated, the belt with its protruding lasers gives the suggestion of a striped A-line skirt, which can move in response to the movements of the controller the way a skirt might move in response to body movement or other external factors (fig. 23). The controller may be worn and used by the wearer of the “skirt” or by another person, opening up the possibility of an extended body. The original experiments had one person’s hip movement mapped onto the skirt of another, but this quickly evolved into an exploration in which more abstract mappings could be made, for example, from the shoulder or from the head to the “skirt.” Such surreal mappings allow for highly abstract and playful explorations. The belt may also be removed from the body and placed on the ground or other surface. In this situation the “skirt” seems to behave like an organic creature. The qualities of the movement responses of the “skirt” to the controller may be programmed to be gentle and flowing, staccato, or anywhere in between, as appropriate or desired. For the performances *The in-visible skirt and other imaginary things*, presented at the 2011 Yebisu Festival, the two choreographers had identical skirt interfaces, with radically different behaviours. These behaviours emerged from their respective design-choreographic processes.



Figure 24. Danielle Wilde and Alvaro Cassinelli, *inertiaLEDs* (2011)
 top: Alessio Sylvestrin and Naoya Aoki
 bottom: Kentaro!!

The final garment/interface in the series, the *inertia LEDs*, are arrays of LEDs sewn into body-worn modules and garments that incorporate custom electronics programmed so that the lights reflect and respond to body movement through time (fig. 24). Current iterations include an elasticised belt, a front-of-torso array, and forearm and lower-leg bands. The hand-sewn LED arrays are controlled with arduino microcontrollers,¹⁵³ using movement and position data from an accelerometer and/or gyroscope. Each light is controlled independently, and can be operated so that a single light, or groups of lights seem to spiral around the arm, leg or body, bounce or respond in other ways to movement and acceleration. A number of different behaviours were incorporated into the garments, and the performers were able to cycle through these behaviours during performance. Two different iterations were used at Yebisu. A front of torso array was used in the duet,¹⁵⁴ and arm and leg bands were used in the solo performance.¹⁵⁵

¹⁵³ <http://www.arduino.cc>

¹⁵⁴ choreographed by Alessio Silvestrin, performed by Silvestrin with Naoya Aoki.

¹⁵⁵ choreographed and performed by Kentaro!!

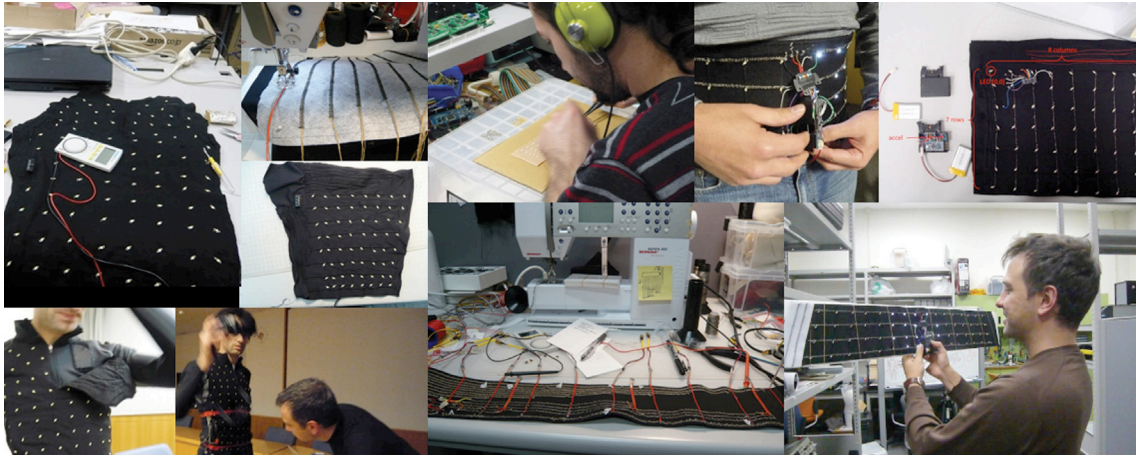


Figure 25. Danielle Wilde and Alvaro Cassinelli
Light Arrays development at The University of Tokyo (2010-11)

The evolution of each interface can be summarized as follows. With the *laser spine* I looked for complex interaction but came back to pair interactively simple technology with the complex dynamic capabilities of the spine. The *in-visible skirt* began sculpturally and mechanically, but was pared back to a very compact, and visually simple technological solution, which achieved nuanced differences in behaviour through programming. The *inertia LEDs* demonstrated the most complex range of behaviours incorporating time as a major element. They were the only interface that was iterated differently for the two choreographers.

Aesthetically I lean towards bold colours and dynamic forms. With the *Light Arrays* the garments devolved from initial experiments with a broad colour palette and sculpturally dynamic and mechanically complex forms to pared back, simplified silhouettes in black and grey with a subtle, compact technology form factor. This change / shift occurred for a number of reasons. Firstly the garments themselves were predominantly in the dark at the Yebisu Festival performance, so colour experiments seemed superfluous. Additionally, a clean silhouette allowed focus to be pulled solely by the lights. Finally both choreographers worked dynamically on the floor. The interfaces needed to be as compact and robust as possible to be able to survive this treatment and continue to function in reliable ways. Rather than focus on the sculptural profile of the costumes, the

focus was instead given to developing sufficiently robust soft electronic and hybrid textiles (fig. 25), and trying to understand how best to support poetic outcomes.

performance and body-worn technologies

As noted with the *gesture≈sound experiments*, development timelines for technology may differ radically from development timelines of dance and other forms of physical performance. The time taken to lift an arm, for example, is (typically) infinitely less than the time it takes to program a microcontroller to respond to sensor data on that arm, and provide technologically mediated feedback. This temporal mismatch was the prime motivation for developing the vocal- and multi-modal prototyping methodologies during the *gesture≈sound experiments*. It also prompted the development of the double-layered design-choreographic process for the *Light Arrays*. With *hipDrawing*, the process was quite different. The artefact was a remapping of an existing toy.¹⁵⁶ The performance was developed independently from the interface, after the system design was complete. Developing garments and interfaces in, through and for choreographies provides different research opportunities and outcomes than developing a performance for/from existing, completed artefacts or systems.

In the case of the *Light Arrays*, no elements of the choreography could be fixed until a sufficiently robust prototype, that responded to and incorporated each performer's physical and biomechanical attributes as well as the evolving design-choreographic attributes, was available. The impact of this approach was two-fold, and led to the two-tiered development process. Focused movement experimentation and garment/technology development needed to occur, to make possible, prepare for, and lay foundations for the cyclical development of performance and garment/interface. This process is atypical for performers and

¹⁵⁶ Ohio Art, "Etch-a-Sketch": <http://www.etch-a-sketch.com/>

may entail steep learning curves. It requires patience, commitment and *disponabilité* [the availability to be available].

The *design-choreography* approach presents opportunities and challenges for the choreographer and the costume/interface designer.¹⁵⁷ In the *Light Arrays* this process also presented challenges for the technical development team. It required ongoing prototyping and iterative development far in excess of common interactive technology development processes. Many of the decisions that would normally be made by members of the technical team, for example, required movement-based exploration with the dancers and choreographers before the next step in the process could be determined. This iterative development was also challenging for the choreographers, who were rehearsing with approximated and constantly evolving fit and functionality. Nonetheless, the dancers, designers and curator agreed that the final outcome warranted the unconventional process. It led to subtle, complex, nuanced and, perhaps most importantly, more integrated outcomes than would otherwise have been achieved.

theoretical implications.

If we refer directly to the poetics taxonomy outlined in chapter one, we can concur that the phase two *Light Arrays* outcomes poeticised the experiences of the participants. This view is supported by informal choreographer feedback throughout the process, as well as audience responses during the festival showings. The *Light Arrays* garments brought attention to the body in unusual or unexpected ways. They physically engaged the choreographers and also the audience in abstract narrative relationships. Members of the public found the works at times enchanting, and report that the costumes extended the way they saw, imagined and experienced what might be possible, technologically, as well

¹⁵⁷ Particularly if these roles are independent of each other or undertaken by different practitioners.

as how they viewed and imagined their embodied-ness.¹⁵⁸ During the festival the garments and interfaces were demonstrated, outdoors, on cold Tokyo winter afternoons, to hundreds of people eager to understand how the costume elements functioned and, where possible, to touch and play with them. Evening performances never lacked for an audience despite the fact that the works were shown outdoors in sometimes extremely windy and cold conditions.¹⁵⁹

The sophisticated interactive technologies developed for Yebisu – the extended body of the *in-visible skirt*, and the time-based interaction made possible with the *inertia LEDs* – were described by choreographers and audience alike with the same poetic valence as the phase one outcomes and the *laser spine*. This clearly demonstrates that the added complexity did not enhance the interfaces' ability to poeticise. Yet it complicated the research process. Delicate elements of the electronics failed one by one as the choreographers pushed themselves and the work physically – shaking their bodies (and the interfaces) and even leaping and landing on them at different points in their performances as the limits of their explorations were enlarged. The interfaces were continually iterated to enhance their robustness, but nonetheless this was an ongoing issue because the choreographers were excited to see just how far they could go, and pushed their limits with each use.

The extended body of the *in-visible skirt* was arguably not fully explored in the performances as the audience/performer divide, combined with the outdoor venue, limited the effectiveness of more subtle exploration, and occasionally, when conditions were extremely windy, the vertical extensions of the lasers were not adequately visible. Nonetheless, the artefact elicited much interest. In demonstrations, people lined up to play with the *in-visible skirt*, providing rich feedback through commentary and their modes of interaction. One audience

¹⁵⁸ Based on personal correspondence. Choreographer feedback is provided in Appendix C.

¹⁵⁹ The Yebisu International Festival of Art and Alternative Visions took place from February 18-27, 2011. We presented two performances at the opening event on February 17, then one performance per night on from 18-20 and 22-26. The venue was outdoors. It was windy, and occasionally rained or snowed before and after the performances (fortunately not during).

member, who came back to view the performances each night reported that it was radically different to what he imagined it would be like. He found it “breathtaking and magical” and said it changed the way that he viewed and imagined the body.¹⁶⁰ Described in this way, the work was experienced by him as a poetic enabler in the ways described in the taxonomy. The *inertia LEDs* were discussed in similar ways.¹⁶¹ The behaviours of the arms and legs were more readily coherent for the spectator than those of the torso, primarily because moving the arms and legs dynamically is much easier. Sensing and deciphering technological responses to this movement, as well as actuating readily coherent dynamic responses in the lights was therefore easier. The behaviours of the torso were complex and abstract. The resulting ambiguity allowed room for meaning-making.¹⁶² In comparison, the simplicity of the *laser spine* was readily transparent and gave direct access to the inherent poetics of the spine in movement. It also had limited potential for failure as the technology was comparatively very simple.

Audience members repeatedly described the *Light Arrays* as visceral, breathtaking, shifting the way they saw and experienced the body. Their feedback aligned with my definitions of poetic.¹⁶³ The level of complexity of the technology did not seem to privilege this outcome. The propensity for more delicate technologies to fail suggests that keeping technology as simple as possible, and thereby reducing the potential for system failure, is advisable. Yet this approach may also limit the breadth of nuanced and complex interactions that are supported. Ensuring robustness of body-worn technologies that encourage and require physical engagement is a challenging, and ongoing process. Playful, enchanting, poetic opportunities for interaction encourage engagement, which may also be understood as encouraging curious exploration of the limits of what a technology might afford. As people engage physically their

¹⁶⁰ Personal correspondence.

¹⁶¹ *ibid.*

¹⁶² William Gaver, Jake Beaver, Steve Benford, “Ambiguity as a Resource for Design,” in *CHI’03* (2003).

¹⁶³ Personal correspondence.

strength and dexterity increases, as does the breadth of the physical exploration they undertake. This can challenge the operational integrity of more complex technologies. A designer can never foresee every kind of interaction another person may conceive of. An interface can never be made sufficiently robust to withstand everything. As demonstrated by the *Light Arrays* experiments, a certain flattening of the final design was effected to achieve robustness. If we do not want to flatten all new designs to accommodate every possible use, then a certain amount of system failure must be accepted as inevitable during the research and development process. Limiting complexity may attenuate this propensity for system failure, while supporting technologically simpler, yet conceptually broader experimentation.

enhancing performativity.

Phase Two of the *Light Arrays* enabled me to address some of the issues that arose with the *hipDrawing* project. As discussed in chapter one, my performance experiments with *hipDrawing* left me with a general feeling of dissatisfaction for two reasons. Firstly, the performances were developed independent of the system, so the kind of nuanced interdependent discovery inherent in a design-choreographic process was not possible. Secondly, I was not able at any time to step outside of the *hipDrawing* development process to objectively observe the impact of different choices I was making, except to view video documentation of my experiments, after the fact, from a single, camera-centric perspective. For Phase Two of the *Light Arrays* I developed the two-tiered design-choreographic method described above, and gave the task of performance creation to two independent choreographers, specifically to allow me to objectively observe and reflect on the process and outcomes as they were happening. I was simultaneously immersed in a parallel process so could exchange bodily experiences with the choreographers, as well as with the design itself. Emergent bodily knowledge was an essential material of the design process.

Shared performative experiences have a uniqueness that is difficult to translate into traditional contemporary performance paradigms that maintain a separation between performer and audience. Blurring this distinction, as was done with *hipDisk*, seems to give participants access to more poignant felt experience. It also impacts the observer as the potential for their involvement becomes implicit. It supports what I have described elsewhere as a new kind of performativity that elicits empathic response in an observer and leads to a poeticisation of experience.¹⁶⁴

Tokyo-based Russian-American performance artist, Yelena Gluzman, argues that locating a work's operative structure in the difference between the performative action and its environment, rather than the difference between a performer and spectator, frees us to understand what is actually being performed by the system as a whole.¹⁶⁵ She draws on Niklas Luhmann's theories of Self-Organisation and Autopoiesis,¹⁶⁶ which normally exclude the human being from the social system in question¹⁶⁷ to suggest that we can circumvent an audience/performer impasse by "describing [a] system of performance in which human actors are elements in the system's environment, without constituting the system itself."¹⁶⁸ Doing so centralizes experience as subjective phenomenon, rather than keeping it as an objective, observable curiosity that remains distinct from the self. This phenomenologises the performative act.

Highly skilled, crafted movement explorations provide different experiences for an observer than clumsy, joyful explorations. Both of these approaches have proven to have poetic valence, but the clumsy and the joyful lead to a democratization of engagement, as demonstrated powerfully by *hipDisk*. John

¹⁶⁴ This relates to my analysis of Ashuach, Paek and Ikonen's work discussed in Chapter One. See also: Wilde, "A New Performativity : Wearables and Body-Devices."

¹⁶⁵ Yelena Gluzman, "One Acts: Reductive Performances Make a Difference," *Platform Journal of Theatre and Performing Arts Communities and Performance* 5, no. 2 (2011).

¹⁶⁶ *Ibid.*, 42-43.

¹⁶⁷ Niklas Luhmann, *Art as a Social System*, trans., Eva M. Knodt (Stanford: Stanford University Press, 2000).

¹⁶⁸ Gluzman, "One Acts: Reductive Performances Make a Difference."

Langshaw Austin's notion of "performative" describes speech as a form of action intended to change the environment in which it happens. Extending Austin's performativity beyond language affords a reconsideration of my research question: *What role, qualities and contexts for performativity, will most powerfully leverage what is made available by the interfaces?* It allows me to reframe this question independent of theatrical conventions.

My experiments to date show that combining a range of performative experiences within a single event, or in a series of events such as were realised at Yebisu Festival ¹⁶⁹ affords more diverse opportunities for engagement. Relationships to the body are highly idiosyncratic. Providing multiple points of entry and framing opens a work to a more idiosyncratic and broad-based audience.¹⁷⁰ To further examine this hypothesis, I undertook a project that focuses on participation as a means of co-creation and meaning-making; the *OWL project*, described in chapter three, developed in parallel with the extended *Light Arrays*.

The outcomes of the phase two *Light Arrays* experiments were successful on an artistic level. They also served to provide nuanced opportunities for reflection on questions of performativity, as well as to refine my research development process. In the next section I will discuss further the theoretical implications of this work, and propose a number of applications in abilitation and learning.

¹⁶⁹ *The in-visible skirt and other imaginary things* consisted of the performances, public demos of the garment/interfaces and an artist/researcher talk with a Q&A session. This allowed a range of complementary access points to the work. I had also hoped to organize workshop-style participatory events, particularly for groups of disabled participants. Unfortunately this was not able to be achieved.

¹⁷⁰ Wilde, "The Hipdiskettes : Learning (through) Wearables."

2.3 Useful • Repeatable

In this section I provide an overview of my process in relation to movement-based body-worn technology design. I consider how the *Light Arrays* compares and fits in with the other projects in this thesis, and the theoretical implications for my examination of the poetics of body-worn gestural, mechanical and sensorial extension. I also propose applications of the *Light Arrays* in a range of abilitation contexts.

Focusing on movement in the technology design process is not new. Caroline Hummels, Kees Overbeeke and Sietske Klooster have long championed the need for the designer as movement expert, and discuss the expressive power of gesture.¹⁷¹ Toni Robertson, Astrid Twenebowa Larssen and Lian Loke focus on bodily knowing, researching how dance and other somatic forms such as yoga and capoeira may inform design.¹⁷² Thecla Schiphorst and Kristina Andersen have used performance-based methods such as movement improvisation, to bring focus to the knowing body.¹⁷³ Andersen also champions the value of playful experimentation and fun as drivers to investigate affordances of physically interactive garments, objects and interfaces. ¹⁷⁴ Tom Djajadiningrat, Ben Matthews and Marcelle Stienstra¹⁷⁵ stress the importance of skilled action when designing interaction, bringing focus to the experience of use. Jin Moen developed

¹⁷¹ Caroline Hummels, Kees C. J Overbeeke, and Sietske Klooster, "Move to Get Moved: A Search for Methods, Tools and Knowledge to Design for Expressive and Rich Movement-Based Interaction," *Personal and Ubiquitous Computing* 11, (2007); Klooster and Overbeeke, "Designing Products as an Integral Part of Choreography of Interaction: The Product's Form as an Integral Part of Movement."

¹⁷² Astrid Twenebowa Larssen, Toni Robertson, and Jenny Edwards, "Experiential Bodily Knowing as a Design (Sens)-Ability in Interaction Design " in *DeSForM 2007: Design and Semantics of Form and Movement*, ed. L. Feijs, S. Kyffin, and B. Young (Newcastle: Northumbria University, 2007); Astrid Twenebowa Larssen, Toni Robertson, and Jenny Edwards, "Introduction to the Special Issue on Movement-Based Interaction," *Personal and Ubiquitous Computing* 11, (2007).

¹⁷³ Thecla Schiphorst and Kristina Andersen, "Between Bodies: Using Experience Modeling to Create Gestural Protocols for Physiological Data Transfer," in *CHI'04 Fringe* (Vienna, Austria: ACM Press, 2004); Wilde, Schiphorst, and Klooster, "Move to Design • Design to Move a Conversation About Designing for the Body."

¹⁷⁴ Kristina Andersen, "'Ensemble': Playing with Sensors and Sound," in *Computer Human Interaction (CHI 2004) Extended Abstracts* (Vienna, Austria: 2004).

¹⁷⁵ Djajadiningrat, Matthews, and Stienstra, "Easy Doesn't Do It: Skill and Expression in Tangible Aesthetics."

her theories for movement-based interaction, and the BodyBug concept, based on the experiences of technology students participating in dance classes.¹⁷⁶

What differentiates my approach is the fundamental interdisciplinarity of the work, the focus on creating open systems that provide the participant unique and novel opportunities for freeform physically-engaged creative exploration, and embracing clumsiness as a way to democratize skilled, unskilled and playful participation. Like Andersen, I champion the value of play, though Andersen's physically engaged work in this area is focused on children, who commonly engage daily in play, whereas I create opportunities for adults to engage in what tends experientially to be a less (or more distantly) familiar playful space. In some respects my process relates closely to Klooster's design-choreographies, as described above, with the addition of interactive and other digital technologies. Klooster's outcomes are stand-alone artefacts that embody specific movement variables, whereas my outcomes are worn technologies that embody a question by providing specific opportunities for unusual movement as an experiential process.¹⁷⁷ The body is implicit in both processes, but Klooster's artefacts can stand independent of the body, whereas mine cannot. My artefacts need the body to be complete.

My entire research process is characterized by a continual interweaving of ideation, textiles and materials research, electronics research, soft electronics development, garment engineering, movement explorations, participatory design processes and performative development. The result is an iterative process that concurrently and interdependently cycles through and across the different disciplines, maintaining embodied experience at its core. Throughout, questions related to poeticisation are foregrounded. This includes bringing attention to the body in unusual or unexpected ways, physically and creatively engaging wearer

¹⁷⁶ Jin Moen, "Kinaesthetic Movement Interaction: Designing for the Pleasure of Motion" (PhD diss., KTH Royal Institute of Technology, 2006).

¹⁷⁷ Wilde, Schiphorst, and Klooster, "Move to Design • Design to Move a Conversation About Designing for the Body."

and observer in pre-reflective or extra-discursive narrative relationships through the body, enchanting participants and observers, extending the way they see, imagine and experience the world, and/through their embodied-ness.

Importantly, participants are used in different ways throughout the development process – to afford verification of biomechanical aspects of the work, to allow assessment of the ability of different development choices to engage, stimulate or enchant, and at times simply to play and create in freeform ways. Their participation facilitates a global assessment of the research outcomes, in process, and supports the discovery of characteristics and attributes that may not have been intentionally built into the work.

the *Light Arrays* in context

The *Light Arrays* support fluid and graceful, at times seductively beautiful movement explorations.¹⁷⁸ Notions of beauty are often predicated on the visual, yet my research focus is on the unspoken beauty and poetic valence of the experience of embodied, and often clumsy, interaction. In *hipDisk* and *hipDrawing* for example, I use clumsiness as a direct design material, to democratise skilled, unskilled and ungainly, awkward or inelegant use through play. This creates an environment in which people feel free to participate, and in which they bypass usual habits of self-censorship. This is particularly relevant for participatory design and social play, and can serve as rich material for performance. In the case of the *Light Arrays*, though, such an approach seems far removed from the graceful beauty of the outcomes.

Engaging in skillful activities is clearly pleasurable. My research challenges the dominance of this idea. The systems I create are open, the interfaces unrefined and the mappings often simplistic or awkward. This combination of design qualities seems to oppose traditional notions of aesthetics, and is more closely

¹⁷⁸ Based on responses from observers of the live events, as well as participants and viewers of video documentation.

related to art and play than purposefulness. It supports broad applications of movement-based design developed for, with and through the body in motion. As I wrote in the beginning of this exegesis, John Cage speaks of “the purposeful purposelessness” of play as “an affirmation of life – not an attempt to bring order out of chaos nor to suggest improvements in creation, but simply a way of waking up to the very life we're living”.¹⁷⁹ Bill Gaver also reminds us that ludic design can support values such as curiosity, play, exploration and reflection, values that are not only important, but essential to wellbeing.¹⁸⁰ Play is an important element of my design process. I use play to bring participants present to the poetics of their experiences.

*By privileging bodily experience over externalised notions of beauty a design can prompt different qualities of awareness in relation to the body.*¹⁸¹

One application of the *Light Arrays* that may add interest and complexity to the visual beauty of the work, and also bring the notion of democratizing different skill levels to the fore may be to develop movement outcomes that render atypical body movement seductively beautiful. The premise is that the observer would see the *Light Arrays* and be seduced by the visual beauty before they realize that it was generated by a gesture, body shape or movement outside of societal norms for beauty. I hope eventually to explore this premise with disabled and alternately abled participants to discover how this might be achieved, and the impact of this approach.

¹⁷⁹ Richard Kostelanetz, ed. *John Cage* (London: Allen Lane, The Penguin Press, 1971).

¹⁸⁰ Gaver, "Designing for Homo Ludens."

¹⁸¹ Wilde, Schiphorst, and Klooster, "Move to Design • Design to Move a Conversation About Designing for the Body."

...abilitation

The *Light Arrays* have not yet been developed for use in abilitation contexts, so the impact of the following applications are yet to be tested. Nonetheless, improvements in outcomes for patients and participants with physical challenges seem possible. As discussed in the *International Journal for Disability and Human Development*,¹⁸² all of the projects developed within this PhD show promise when considered for use in a range of abilitation contexts.

In the following pages I propose a number of uses for customized *Light Arrays*. I begin by discussing specific applications, for vestibular disorders¹⁸³ and to assist healing and rehabilitation with venous leg ulcers. I then go on to discuss broader consideration of the work in abilitation and learning.

...analogue balance correction

Disorders of the vestibular system may be characterized by disorientation and loss of balance. A custom, waist- or hip-worn *Light Array* may assist a sufferer to reorient themselves, as well as to (re)familiarize themselves with the feeling of different kinds of balance. The lights coming out from the body, perpendicular to the torso, would amplify the horizontal tilt of this part of the body. By analysing the tilt of the *array* as the lasers hit walls or objects in the surrounding environment, the wearer could objectively determine if they are standing upright or if and how they might be otherwise balanced. This knowledge could then be mapped back onto the body to assist the wearer to (re)learn the feeling of different balance points, and so strengthen their ability to find balance from within, without the support of their *Light Array*.

The incongruity of light extension for daily activities blurs boundaries between art and everyday life. This may be perceived as a playful way to deal with a

¹⁸² Wilde, "Extending Body & Imagination : Moving to Move."

¹⁸³ The vestibular system, located in the inner ear, is responsible for balance and spatial awareness.

condition, which must at times be disorientating for the sufferer. It could also be reframed in a similar way to Auger-Loizeau's vestibular replacement projects, *Artificial Horizon helmet* [sic] and *Earlids*.¹⁸⁴ The first offers sufferers of motion sickness a constant view of true horizontal through a head-mounted two degree of freedom gyroscope and cross hairs, the second allows the wearer to turn on and off their sense of hearing at will. Auger-Loizeau describes these projects as "analogue precursors to potential digital future enhancements."¹⁸⁵ They offer the wearer "an opportunity to experience the benefits of upgrading the body through electronic implants before going through with invasive surgery."¹⁸⁶ The three projects, *Artificial Horizon helmet*, *Earlids* and the proposed *Light Array* for vestibular augmentation can be characterised as rehearsal devices for yet-to-be imagined technologies, a notion that will be discussed further in chapter three.

...rehabilitating physio

In a more pragmatic consideration of applications of the *Light Arrays*, we can look to physiotherapy. Studies have shown that the time spent by patients in therapeutic activities is low and levels of engagement poor despite evidence that intensive rehabilitation speeds recovery from acute illness.¹⁸⁷ It is recognized that performance goals that are meaningful for a patient are beneficial,¹⁸⁸ and that enhancing patient engagement in self-managed care would be welcome.¹⁸⁹ Customised *Light Arrays* could be used to inspire people to engage their bodies through imaginative tasks that are personally meaningful and relevant to their

¹⁸⁴ Auger-Loizeau are James Auger and Jimmy Loizeau. Project descriptions are taken from <http://www.auger-loizeau.com/index.php?id=3>

¹⁸⁵ Ibid.

¹⁸⁶ Ibid.

¹⁸⁷ J. Ellul and others, "Increasing Patient Engagement in Rehabilitation Activities," *Clinical Rehabilitation* 7, (1993).

¹⁸⁸ E. Wressle and others, "Improved Client Participation in the Rehabilitation Process Using a Client-Centred Goal Formulation Structure," *Journal of Rehabilitative Medicine* 34, (2002); Elizabeth A. Townsend, ed. *Enabling Occupation: An Occupational Therapy Perspective* (Toronto: Canadian Association of Occupational Therapists, 1997).

¹⁸⁹ J.E. Jordan and others, "Enhancing Patient Engagement in Chronic Disease Self-Management Support Initiatives in Australia: The Need for an Integrated Approach," *Medical Journal of Australia* 189, no. 10 (2008).

physiotherapeutic needs. Applications may be developed for short-term care, as well as to enhance patient engagement in chronic disease self-management.

Venous leg ulceration presents a compounded example of the benefits of engaging a patient in this way. The condition is common, debilitating and chronic, characterised by slow healing, social isolation, pain and frequent recurrence.¹⁹⁰ Ankle motility has been identified as an important factor in healing, as well as preventing recurrence.¹⁹¹ Yet not all patients are mobile, and it is not typically easy to maintain regular, random movement of the ankle (or any isolated body part) over extended periods without external stimulation to maintain interest. In situations where a patient may not be able to walk, alternative methods, which engage the patient imaginatively as well as physically, are needed to improve ankle motility otherwise healing may be delayed and ulcers recur.

To this end, a custom, foot-based *Light Array* could be developed, and the patient guided to use it to engage their body on a regular basis through imaginative tasks, such as drawing objects, writing lists or otherwise mapping out things that they are interested in or passionate about. These tasks might include: writing the names of grandchildren; mapping out a favourite walk; relationships between friends; plants in the garden; tools in the shed, etc. Participants could also be asked to follow the contours of the room with their lasers; or to trace out different objects in the surrounding environment. They might be asked to solve complex mathematical equations; to draw pictures or to write out musical scores. The role of the health practitioner would be to assist the patient in finding tasks that resonate for them emotionally and imaginatively, and thereby to assist the patient to maintain engagement over an extended period. In the case of leg ulcers, this enhanced engagement would lead to beneficial results in the healing

¹⁹⁰ K.R. Vowden and P. Vowden, "Preventing Venous Ulcer Recurrence: A Review," *International Wound Journal* 3, no. 1 (2006).

¹⁹¹ J.R. Barwell and others, "Ankle Motility Is a Risk Factor for Healing of Chronic Venous Leg Ulcers," *Phlebology* 16, no. 1 (2001); J. Brooks and others, "Nurse-Led Education Sets out to Improve Patient Concordance and Prevent Recurrence of Leg Ulcers," *Journal of Wound Care* 13, no. 3 (2004); Vowden and Vowden, "Preventing Venous Ulcer Recurrence: A Review."; *ibid.*

process, as well as lowering the probability of recurrence. These improved outcomes would not only impact patients, but also carers and the health service in general in terms of cost, staff requirements and nursing time.¹⁹²

...broader implications

The *Light Arrays* devices provide free-form expressive spaces that encouraged different qualities of attention: on the task at hand, the actions and gestures of the body, as well as on the results of those actions as presented through the laser extensions. By focusing on the results of actions, rather than on the actions themselves, participants may be able to enhance their ability to learn physical skills.¹⁹³ Bringing focus back to the body can enhance self-awareness. The resulting increase in physical dexterity and range may also impact positively on the individual's ability and ease communicating.¹⁹⁴ In the other projects in this PhD, participants have been prompted by the affordances of the wearable interactive systems to explore and test the possibilities for action in their body.¹⁹⁵ Doing so engages them in a process of creating and reflecting on new modes and patterns of bodily experience, facilitated by the interaction between body movement and the effects of the technology. As I have demonstrated, such relationships are consistently experienced as poetic.

The openness of the *Light Arrays* affords the generation of activities, pitched at an appropriate level, to target specific outcomes. Practitioners may work with participants to design individual programs, and guide them as they invent their own games. Benchmarks may be set on an individual, case-by-case basis. The devices may thus be used by people with different challenges and unconventional abilities to achieve a range of results at a speed or pace appropriate to the

¹⁹² Barwell and others, "Ankle Motility Is a Risk Factor for Healing of Chronic Venous Leg Ulcers."

¹⁹³ Richard J.N. Helmer, "Position and Motion Sensing for Sport, Entertainment and Rehabilitation," in *3rd International Conference on Smart Materials Structures and Systems (CIMTEC)* (Acireale, Sicily, Italy: 2008).

¹⁹⁴ Gallagher, *How the Body Shapes the Mind*.

¹⁹⁵ Danielle Wilde, "Swing That Thing: Moving to Move : Extending Our Poetic and Expressive Potential," *Second Nature International Journal of Creative Media* 2, no. 1 (2010).

individual. Tasks can also be designed for personal idiosyncrasies. Outcomes provide access to the inherent aesthetics of different movements, as well as novel ways of seeing and experiencing the body. Those with low- or unconventionally-functioning bodies may be encouraged to use the neglected parts of their body willingly, inspired by the expressive potential of the light extensions as their attention shifts away from their bodies to the aesthetically refined results of their actions. Doing so may allay further muscular degeneration through extended engagement and lead to greater physical control. Highly positive results have been seen when this technique has been used by elite athletes to improve precision¹⁹⁶, when children and adults with cerebral palsy have undertaken intense dance training,¹⁹⁷ and, when children in neuro-medical and oncology wards have engaged in what Lisa Dowler describes as “shared dancing.”¹⁹⁸ The Extended Light Arrays System provides an alternative to sports and dance, whereby participants can engage expressively through their bodies in a multitude of personalisable ways.

James J. Gibson writes of perception leading to an awareness of affordances.¹⁹⁹ If we consider that perception is a skilled activity,²⁰⁰ turning attention to and through the body by augmenting perception may lead to opportunities to learn new somatic techniques and increase specific skills and/or range of movement. Alva Nöe insists that “perceiving is something we do”, and that perceptual awareness depends on the perceiver's having “sensorimotor knowledge” – an implicit understanding of the way sensory stimulation varies with movement.²⁰¹ By providing novel opportunities to experience in and through the body, and gain

¹⁹⁶ Richard J.N. Helmer and others, “Physiological Tracking, Wearable Interactive Systems and Human Performance,” in *20th International Conference on Artificial Reality and Telexistence* (Adelaide, Australia: The Virtual Reality Society of Japan, 2010).

¹⁹⁷ Neil Genzlinger, “Learning His Body, Learning to Dance,” *The New York Times* November 25 2009, C1, <http://www.nytimes.com/2009/11/25/arts/dance/25palsy.html>.

¹⁹⁸ Lisa Dowler, “Improvising on the Ward,” *animated Winter 2009 Foundation for Community Dance*, UK, 31-33.

¹⁹⁹ James J. Gibson, “The Theory of Affordances,” in *Perceiving, Acting, and Knowing: Toward and Ecological Psychology*, ed. R. Shaw and J. Bransford (Hillsdale, NJ: Erlbaum, 1977).

²⁰⁰ Francisco Varela, Evan Thompson, and Eleanor Rosch, *The Embodied Mind*.

²⁰¹ Alvar Noë, *Action in Perception* (Cambridge, MA: MIT Press, 2005).

insight into the body's capacities and affordances when contexts for engagement are shifted, I would hope that people will be able to develop their sensorimotor knowledge and skills. Artist and ischemic stroke sufferer Sandra Hewitt-Parsons speaks of the advantages of tactile media aids to maintain and strengthen motor skills and eye/hand co-ordination, to simulate the sensory system and improve visual-spatial awareness.²⁰² The *Light Arrays* are intangible, but visible. I am curious to discover if they might lead to similar or complementary outcomes. This development would be relevant to people with many different physical abilities and challenges. I look forward to being better placed to explore this premise in the future.

²⁰² Sandra Hewitt-Parsons, "Unintentional Therapy, Unexpected Results: My Artistic Life to This Point," in *ArtAbilitation*, ed. AL Brooks (Esbjerg, Denmark: 2006).

conclusion

In the core research, a number of common themes have emerged:

- the impact of playful opportunities for physically and creatively engaged interaction.
- the broad range of promising applications in re- and other forms of (h)abilitation
- the value of privileging low-tech and clumsy mappings
- the necessarily interdisciplinary, and interdependent, cyclically iterative nature of body-worn technology development
- the impact of different approaches to ideation

A large part of this research has focused on investigating process. It began with, and was driven by a consideration of the impact of different choices in the development of body-worn technologies. My key research questions have been interrogated through a range of extending technologies, as well as through a range of participatory techniques. The systems that have been described thus far use off-the-shelf technologies and bespoke interfaces, including readily available sensor elements and experimental textile sensors.²⁰³ An approach to embodied ideation has also been articulated, building on Klooster's technique of design-choreography.²⁰⁴ Participation has been an integral part of the development of this approach, and has included designer participation, as well as involvement of the general public and targeted users through the different stages of development.

To complement this work and both test and clarify my conclusions I devised one additional experiment: *The OWL project*. The aim of *The OWL project* is to examine how designers might leverage the embodied knowledge of people outside the design process, to assist in the conception, development and evaluation of technologies that don't yet exist. The project requires ideation to be undertaken entirely by participants. The results act as a lens through which to reconsider the other research outcomes. *The OWL project* is the final project in this thesis.

²⁰³ Helmer and others, "Physiological Tracking, Wearable Interactive Systems and Human Performance."

²⁰⁴ Hummels, Overbeeke, and Klooster, "Move to Get Moved: A Search for Methods, Tools and Knowledge to Design for Expressive and Rich Movement-Based Interaction."; Klooster and Overbeeke, "Designing Products as an Integral Part of Choreography of Interaction: The Product's Form as an Integral Part of Movement."; Wilde, Schiphorst, and Klooster, "Move to Design • Design to Move a Conversation About Designing for the Body."

Chapter: 3

To the future

An important part of this research project has been the investigation of process. In the previous chapters I discussed projects that began with a desire to provoke movement in a specific part of the body,²⁰⁵ as well as projects that began with a technology, and examined how this technology might be used to support more generalized physical engagement.²⁰⁶ I provided an extended discussion of phase two of the *Light Arrays*, which straddles both of these approaches, and described the development of vocal- and multi-modal prototyping methodologies, specifically for gesture to sound and sound to gesture mapping.²⁰⁷ Through this praxis I have been able to examine the impact of a range of choices and processes in body-worn technology development, implementation and use. Importantly, I have also examined the impact of designer and end-user participation throughout the design process.

The *OWL project* operates somewhat differently from the other works in this thesis. Rather than providing an open system that technologically extends the body to provoke and also support physically engaged creative expression, the project engages participants in co-creation and collaborative imagining of body-worn extensions that incorporate or embody functionalities of technologies that do not yet exist. The *OWL project* emerged out of a desire to discover what might happen if designers access the embodied experience and imagination of people outside of the design process, to assist in the creation of unknown technologies. The hope was to challenge designer assumptions, leapfrog ordinarily incremental technology development, and propose speculative devices that suggest large technology shifts. A traditional design approach is to design from and for scenarios of use. Yet thinking in terms of scenarios of use makes it difficult to make radical conceptual leaps. The *OWL project* asks if Arthur C. Clarke's third rule of technology prediction, that "any sufficiently advanced technology is

²⁰⁵ *hipDisk* and *hipDrawing*

²⁰⁶ *gesture≈sound* and the *Light Arrays* phase one experiments

²⁰⁷ *gesture≈sound experiments* see also Bencina, "Gesture≈Sound Experiments: Process and Mappings."

indistinguishable from magic”, holds an important key.²⁰⁸ Might magic and desire facilitate such leaps?

The OWL project has two parts. Phase one consists of a series of open and speculative (technology-free) body-devices designed without a pre-defined function and tested or 'probed' to ascertain imagined functionality. The 'probing' is done through an extensive series of physically engaged interviews. The second part of the project is a series of workshops, called *OWL circles* – similar in form and construct to sewing circles, yet highly structured to support specific types of exploratory outcomes. Inviting people into the design process, and leaving the technology to their imagination, rather than providing or proposing existing technologies with known uses and/or clearly defined parameters, affords wild thinking from participants as they envision potential use. The openness afforded by the *OWL* structure, discussed below, supports open imagining from and through the body and desire instead of thinking constrained or initiated by technological capability or project requirements. While not necessarily anti-design, the *OWL* methodology contrasts dramatically with traditional design processes, where the purpose and broad functionality of “that which is being designed” is usually known in advance. This approach aligns with aspects of the embodied ideation techniques explored in the other projects, yet more strongly calls into question the validity of a traditional approach through its focus on trying to bring into being what Clarke describes as “sufficiently advanced technology.”²⁰⁹

The project is a collaboration with Kristina Andersen, the head of research and communication at STEIM.²¹⁰ Like all of the collaborations discussed in this exegesis, ours is characterized by dialogical exchange. Our processes and outcomes embody shared and complementary research concerns. Importantly, I report here outcomes and reflections based on my direct experience with

²⁰⁸ Arthur C. Clarke, *Profiles of the Future* (New York, NY: Holt, Rinehart & Winston, 1984).

²⁰⁹ Ibid.

²¹⁰ Kristina Anderson: www.tinything.com; STEIM: www.steim.org;

participants, though use the pronoun “we” to emphasise the dialogical nature of our process.²¹¹ Development of the project has been extended and geographically distributed.²¹² Studio and fieldwork has been undertaken in a range of countries and socio-cultural contexts. This has afforded broad as well as deep consideration of the applications and implications of the evolving methodologies.

In the following section I discuss the conceptual and theoretical drivers of *the OWL project* and present the phase one methodology, which includes the development of a series of interrogatory *bodyProps* and an interview process. The interview outcomes are presented and analysed in section two. The project was subsequently developed into workshops. The reasoning for this development, and the outcomes, are provided in section three. In this final section I also discuss how my thinking has shifted through this project and the implications for my PhD, as well as the broader design communities touched by this research.

²¹¹ Aspects of this project are also reported in: Kristina Andersen, Danielle Wilde, "Doing Things Backwards: The Owl Project Interviews," in *The Australasian Computer Human Interaction Conference (OZCHI09)* (Melbourne, Australia: ACM Press, 2009); Kristina Andersen, Danielle Wilde, "The Owl Bodyprops Fitting Sessions," in *Participatory Design Conference (PDC)* (Sydney, Australia: ACM Press, 2010); Kristina Andersen, Danielle Wilde, "Circles and Props - Making Unknown Technology," in *International Symposium for Electronic Arts (ISEA2011)* (Istanbul: 2011); Danielle Wilde, Kristina Andersen, "Doing Things Backwards: The Owl Project," in *The Australasian Computer Human Interaction Conference (OZCHI09)* (Melbourne, Australia: ACM Press, 2009); Danielle Wilde, Kristina Andersen, "Doing Things Backwards: The Owl Project Interviews," in *Tangible & Embedded Interaction Conference (TEI)* (Boston MA: 2010); Danielle Wilde, Kristina Andersen, "The Owl Project Exhibition," in *The Art of Participatory Design in Participatory Design Conference (PDC)* (Sydney, Australia: 2010); Danielle Wilde, Kristina Andersen, "Part Science Part Magic: Analysing the Owl Outcomes," in *The Australasian Computer Human Interaction Conference (OZCHI10)* (Brisbane, Australia: ACM Press, 2010).

²¹² The project began in Amsterdam in May 2009, with the construction of the *OWL bodyProps* and the first experimental interview. Fieldwork was subsequently undertaken in Europe, Australia, North America and Asia, and was completed with a series of workshops, an exhibition, a conference poster and series of demos at the Participatory Design Conference in Sydney in December 2010. Kristina and I worked together in Amsterdam, as well as in Tokyo and Sydney. We also engaged using online technologies such as Skype.

“How will you go about finding that thing
the nature of which is totally unknown to you?” ²¹³

²¹³ Meno, from Plato's dialogues in Rebecca Solnit, *A Field Guide to Getting Lost* (New York: Viking Penguin, 2005), 15.

3.1 Finding what you cannot yet imagine

In his book, *Where Good Ideas Come From*, Steven Johnson discusses Stuart Kauffman's theory of the adjacent possible, arguing that it concerns first order iterations, and "captures both the limits and the creative potential of change and innovation".²¹⁴ According to Johnson we have a natural tendency to romanticize breakthrough innovations, imagining that momentous ideas transcend their surroundings, yet all ideas emerge from existing knowledge. The adjacent possible speaks to that which is right next to us, that which we can imagine, that which, once imagined, we can bring into being. It speaks to what is viable, even if it does not yet exist. It speaks to, through and from existing knowledge. *The OWL project* asks how we might enlarge and move through the adjacent possible very quickly, even bypass it, to arrive at *what we cannot yet imagine*. The aim of the project is to develop appropriate structures and circumstances to leapfrog the adjacent possible, and bring previously unimaginable possibilities within reach.

The nineteenth century inventor, Charles Babbage, considered the father of modern computing, earned his title through the invention of two machines, the Difference Engine, a fantastically complicated calculator,²¹⁵ and the Analytical Engine, the first programmable computer. Though he did not build either of them, they provide a useful, as well as relevant example of the advantages and challenges of thinking beyond the adjacent possible. Radical as it was, Babbage's Difference Engine could have been built with technologies and knowhow that existed in Victorian England at the time, or were on the cusp of invention.²¹⁶ The

²¹⁴ Steven Johnson, *Where Good Ideas Come From. The Natural History of Innovation* (New York: Riverhead Books (Penguin Group USA), 2010); see also Stuart A. Kauffman, *Investigations* (New York: Oxford University Press, 2000).

²¹⁵ Johnson describes it as: "a fantastically complex fifteen-ton contraption, with over 25,000 mechanical parts, designed to calculate polynomial functions that were essential to creating the trigonometric tables crucial to navigation. (...) The world's most advanced mechanical calculator. When the London Science Museum constructed one from Babbage's plans to commemorate the centennial of his death, the machine returned accurate results to thirty-one places in a matter of seconds. Both the speed and precision of the device would have exceeded anything else possible in Babbage's time by several orders of magnitude." Johnson, *Where Good Ideas Come From. The Natural History of Innovation*, 37.

²¹⁶ As discussed in *ibid*.

Difference Engine gained government support for its construction and “engendered an immediate series of refinements and practical applications”.²¹⁷ It was well within the adjacent possible of existing technology. In contrast, Babbage’s Analytical Engine was “ahead of its time” and effectively disappeared from the map despite the fact that Babbage developed detailed blueprints for its construction. Many of the pioneering insights associated with the Analytical Engine had to be rediscovered, a hundred years later, when they began to move into the adjacent possible. The Analytical Engine was a design for the computer age imagined a hundred years too soon.

The *OWL project* attempts to understand how we might have an idea equivalent to Babbage’s Analytical Engine, and, importantly, support and develop this idea sufficiently that it may be evaluated. The intention then would be to use the knowledge generated, as well as the ongoing inspiration of the original idea, to spearhead innovation. The project asks how might we imagine technologies that are not yet possible, *and knowingly move towards their realisation, no matter how fantastical they might be?*

As suggested by an OWL participant: It would be like prompting someone 200 years ago to imagine a vacuum cleaner.²¹⁸ Then to take their idea (of a stick that you point at the dirt to make it go away) seriously enough that deep thinking around this idea prompts fast-tracking of technology development, such that the vacuum cleaner comes closer into being and other technologies that may not have been imagined previously do also. What might the world look like if we fast track through the adjacent possible? Might we be able to bring into being a future predicated on magic and desire, rather than adjacent possible iteration / that which we already know?

²¹⁷ Ibid.

²¹⁸ Personal correspondence.

Throughout, the *OWL project* draws on Polish anthropologist Bronisław Malinowski's idea of magical thinking in which words and sounds are thought to have the ability to directly affect the world.²¹⁹ John L. Austin, the highly influential British philosopher of Language, developed this idea into a systematic and formal theory of acts-through-language,²²⁰ including *performative acts* wherein saying something makes it so (as in when a bride or groom says "I do" or an employer says "you're fired"). Austin asserts that the circumstances under which the utterance takes place are important, and the speaker himself or other persons should also perform certain actions, whether 'physical' or 'mental' or even the further uttering words.²²¹ The *OWL project* provides clearly structured circumstances in which participants explore and discover by thinking through the body. The project thus extends Austin's ideas beyond the linguistic to allow for other forms of action and sources of agency. The embodied processes assist participants to discover, give form to, and retrospectively name their ideas, and in the naming to help us, as designers, move towards understanding. If we can understand, we can evaluate. If we can evaluate we can move closer to bringing ideas into being.

In a critical reflection on appropriations of the "cultural Probes" methodology,²²² Gaver et al suggest that analyzing, and thereby rationalizing the Probes is misguided. The probes are uncontrolled and uncontrollable and this is, in fact, their strength. According to Gaver et al, the Probes "embod[y] an approach to design that recognizes and embraces the notion that knowledge has limits. It's an approach that values uncertainty, play, exploration, and subjective interpretation

²¹⁹ Bronisław Malinowski, "The Problem of Meaning in Primitive Languages," in *The Meaning of Meaning*, ed. C.K. Ogden and I.A. Richards (New York: Harcourt, Brace and World, 1923); Bronisław Malinowski, *Coral Gardens and Their Magic* (London: Allen and Unwin, 1935); Bronisław Malinowski, *Sex and Repression in Savage Society* (London: Routledge and Kegan Paul, 1960).

²²⁰ John L. Austin, *How to Do Things with Words*, ed. J.O. Urmson and Marina Sbisa (Cambridge, MA: Harvard University Press, 1962); John L. Austin, *How to Do Things with Words*, 2nd Edn., ed. J.O. Urmson and Marina Sbisa (Cambridge, MA: Harvard University Press, 1975). Quoted in Alessandro Duranti, ed., "Agency in Language," in *A Companion to Linguistic Anthropology* (Oxford: Blackwell Publishing, 2005).

²²¹ Austin, *How to Do Things with Words*, 6-8.

²²² William Gaver, Anthony Dunne, and Elena Pacenti, "Cultural Probes," *Interactions* 6, no. 1 (1999).

as ways of dealing with those limits.”²²³ As discussed in this exegesis, my own processes value uncertainty, play, exploration, and subjective interpretation. In many respects this description characterizes the *OWL project*. The *OWL* process takes its origin in the cultural Probes. It attempts to both subvert and build on the cultural Probes process. Like the Surrealists, with *OWL* (and, to differing degrees, all of the projects discussed in this exegesis), the aim is to use games, play, techniques of surprise and methodologies of the fantastic to subvert academic modes of enquiry, and undermine the complacent certainties of the reasonable and respectable.²²⁴

beginning with the body

The intention of this project was to begin with the body and design backwards: to develop a structured process for embodied cognitive reflection, and thereby arrive at outcomes that may be retrospectively described, and eventually evaluated. This has afforded further testing and refinement of the processes that I have been exploring throughout this thesis. The approach references, in particular, the approach taken with *hipDisk*.

Kamran Sedighian and Maria Klawe identify three key elements in interaction design for provoking reflective thought: representation, interaction protocol and feedback. Andersen describes these protocols in relation to the wearables she created for her *ensemble* children’s dress-up project:²²⁵

²²³ William Gaver, Andy Boucher, Sarah Pennington, Brendan Walker, "Cultural Probes and the Value of Uncertainty," *Interactions* 11, no. 5 (2004).

²²⁴ Alistair Brotchie and Mel Gooding, *A Book of Surrealist Games* (London: Redstone Press, 2004). Also quoted in Gaver, "Cultural Probes and the Value of Uncertainty." The *OWL project* is the only project which blatantly “undermine[s] certainties” and “subvert[s] academic modes of enquiry”, as it confronts the design process head-on. Yet all of the projects included here defamiliarise, destabilise, put into question and thereby examine traditional approaches and ways of being. In many respects this may be considered subversive.

²²⁵ Kamran Sedighian, and Maria M. Klawe, "An Interface Strategy for Promoting Reflective Cognition in Children," in *CHI '96 Companion* (Vancouver, BC Canada: 1996). Described in Andersen, "‘Ensemble’: Playing with Sensors and Sound."

- The sensors are *represented* by the garments in such a way that the garments act as larger scale image of the function of the sensor.
- The physical attributes of the garments are used as clues to the *interaction protocol* in order to provide a tangible interface to the sensors.
- The *feedback* consists of a tight link between physical manipulation of the garments and immediate [technology] response. There is no perceivable lag between the garments and the [technologically] response.

In the case of *hipDisk*, the disks, with their highly visible conductive tabs, represent the device functionality. As the wearer moves, the tight coupling of the disks with the body suggests that moving the body may enable the disks to touch. As the disks touch, sounds are immediately triggered, and the three elements – the representation of the sensors, the interaction protocol and the feedback combine to support engagement with the device. Emergent understanding of these key elements is embodied by the interface itself, as well as by the embodied discovery process the interface engenders.

These protocols were developed by Sedighian and Klawe to support learning in children, nonetheless they are readily adapted to embodied discovery in adults.

With *OWL*, Andersen and I began with the body and moved through an embodied discovery process to create a series of emergent objects, or *representations*. The resulting *bodyProps* were then used to bring participants to, and support them through, their own embodied discovery. The *interview* process was structured to take participants deep into reflective thought and encourage them to suggest *interaction protocols* and *feedback*.

To make the *bodyProps*, instead of beginning with a design brief or a particular set of technologies, Andersen and I began by looking for opportunities for action in the body and affordances inherent to our physicality. We carefully avoided consideration of technological functionality – we did not want our understanding of the adjacent possible to interfere with or guide the outcomes. Guided by insights gained from the other projects in this praxis, we made objects that require the active presence of the body to complete them. We also worked from the premise that as a form developed out of, and in response to the body, protocols for physical interaction might emerge, including eventually, opportunities for feedback, sharing and feeding forward, as discussed in chapter two.

Through this process a small series of upholstered fabric objects that could act as placebos were created.²²⁶ These *bodyProps* were to be worn on the body in such a way that they would challenge the wearer and might provoke or support a strong emotional reaction. They were designed to be exposed and evaluated through a fitting and interviewing process that was structured to encourage and record elements of lateral thinking and subconscious associations, and support a shift in focus from internal responses through to shared reflections and outward representation.

This process takes its origin in the "cultural Probes".²²⁷ The aim was not just to collect inspirational data, but rather, in keeping with the methodologically subversive nature of the original probes,²²⁸ to allow that data to guide the project. Unlike the Probes, we would be present and actively involved in the process of Probing. As we were attempting to move across methodologies from Probe to placebo (as described below), from embodied experience to technology brief, it was important to pay very careful attention to the process.

²²⁶ Anthony Dunne and Fiona Raby, "The Placebo Project," in *Designing Interactive Systems (DIS 2002)* (London, England: ACM Press, 2002).

²²⁷ Gaver, Anthony Dunne, and Pacenti, "Cultural Probes."

²²⁸ Kirsten Boehner, Janet Vertesi, Pheobe Sengers, Paul Dourish, "How HCI Interprets the Probes," in *CHI 2007 Designing for Specific Cultures* (San Jose CA, USA: ACM, 2007).

By beginning with the body rather than with a technological brief we were essentially “designing backwards.” This process can be imagined as if we carefully turn the habitual relationship to the body (and the clothed or augmented body), as well as to the design process (in relation to the clothed and technologised body), inside out. The placebo devices that resulted from this process were used to support cognitive reflection in participants, so that they might assist us in our goal of discovering and imagining technologies and scenarios that do not yet exist.

...placebos

Like medical placebos, design placebos can be created to shift the way that people think about a situation. Rather than altering reality in any scientifically tangible way, they provide psychological comfort as people develop narratives that explain how their world is different as a direct result of what the placebo is imagined to be doing. Design placebos must be open-ended enough to prompt stories but not so open as to bewilder.²²⁹ They need to engage users in questioning what they do and how they might do it. Like Dunne and Raby, (and Gaver et al with the Probes) we were not interested in eliciting truths with our *bodyProps* (our *OWL* placebos); rather we were interested in the narratives that people would develop to explain and relate to them, and to the notion of augmenting or extending their bodies with imaginary body-worn devices. The aim was to encourage the willing suspension of disbelief and thereby engage people in the active re-imagination of the world. Leaning on narrative and meaning-making would assist us in assessing the artistic-poetic valence of the outcomes. To facilitate our process we continued to draw inspiration from the concepts of enchantment, “magical thinking” and defamiliarisation, or “making strange.”

²²⁹ Dunne and Raby, “The Placebo Project.”

...making enchantment, magic and strange

As discussed in chapter one, Jane Bennett describes enchantment as being “both caught up and carried away”.²³⁰ Enchantment occurs at thresholds and assists us to shift, blur or traverse these thresholds. According to McCarthy et al., “when it comes to experiences such as enchantment feelings are as important as thoughts, sensation is as important as cognition, and emotional consciousness is as important as will”.²³¹ In this exegesis I have demonstrated embodied engagement as a valid pathway for enchantment. McCarthy argues that it is depth that supports enchantment in human-computer interaction. Yet by substituting conceptual openness for McCarthy’s concept of depth, I have been able to bring into being an emptiness that allows space for emotional responses. Open systems create vacuums for self-discovery through movement.²³² The openness supports playful engagement,²³³ rather than a competitive mindset. Playfulness affords enchantment. Importantly, enchantment engages directly with paradox and ambiguity, and ambiguity in turn leaves space for meaning-making.²³⁴ By designing objects with an openly ambiguous core, and supporting embodied cognitive reflection through these objects, we rely on enchantment to allow people to fill that space. The process that the *OWL project* proposes is not just encouraging the willing suspension of disbelief but is also attempting to engage subjects in the active re-imagination of the world. To facilitate this unusual shift, we draw additional inspiration from the concepts of “magical thinking” and defamiliarisation, or “making strange.”

“Magical thinking” can be described as basic misinterpretation of the causal relationships between emotions and desires, words and actions, and finally

²³⁰ Bennett, *The Enchantment of Modern Life: Attachments, Crossings, and Ethics*, 5.

²³¹ McCarthy and others, “The Experience of Enchantment in Human–Computer Interaction,” 373.

²³² Wilde, Schiphorst, and Klooster, “Move to Design • Design to Move a Conversation About Designing for the Body.”

²³³ Cailliois, *Man, Play and Games*.

²³⁴ Gaver, “Ambiguity as a Resource for Design.”

objects and people. According to the eminent Scottish anthropologist, Sir James Frazer, magical thinking depends on two laws: The law of similarity where the effect resembles its cause and the law of contagion, where things which were once in physical contact maintain a connection even after physical contact has been broken, as in voodoo.²³⁵ The basic premise is that "like affects like," or that one can impart characteristics of one similar object to another. Lars Erik Holmquist²³⁶ makes the case that certain design practices actively create "cargo cults" – elaborate instances of magical thinking.²³⁷ The *OWL project* is attempting to deliberately engage that type of process in order to ascertain new, out of the ordinary interpretations of body-worn technological devices. The process of investigating the devices privileges the knowingness that emerges from embodied engagement.²³⁸ It leans directly on the notion of making strange,²³⁹ through embodied defamiliarisation.²⁴⁰ As discussed in section 1.2 defamiliarisation is a key concept of Russian Formalism, and has been used as a basic strategy in artistic expression throughout the twentieth century.²⁴¹ The concept is centered on the idea that the act of experiencing something occurs in the moment of perception and that the further you confuse or otherwise prolong the moment of arriving at an understanding, the deeper or more detailed that understanding will be. Sheets-Johnstone's theories about making strange build out of defamiliarisation, bringing focus to and through the moving body and the power of embodied interaction.²⁴²

²³⁵ James Frazer, *The Golden Bough: A Study in Magic and Religion. Third Edition* (London: Macmillan, 1911-1915).

²³⁶ Director of The Future Applications Lab at The Swedish Institute for Computer Science: <http://www.sics.se/fal/who.html>

²³⁷ Lars E. Holmquist, "Prototyping: Generating Ideas or Cargo Cult Designs?," *Interactions* 12, no. 2 (2005).

²³⁸ Maxine Sheets-Johnstone, *The Primacy of Movement* (Amsterdam: John Benjamins Publishing Company, 1999).

²³⁹ Sheets-Johnstone, "Emotion and Movement: A Beginning Empirical-Phenomenological Analysis of Their Relationship."

²⁴⁰ Shklovsky, *Art as Technique. In Russian Formalist Criticism: Four Essays*.

²⁴¹ Arthur C. Danto, *The Transfiguration of the Commonplace : A Philosophy of Art* (Cambridge, MA: Harvard University Press, 1981).

²⁴² Sheets-Johnstone, *The Primacy of Movement*.

...probing

Humour, passion and empathy are obviously desirable attributes through which to engage people. Cultural Probes are purposely uncontrolled and uncontrollable, yet remain mindful of this in the way that they stress empathy and engagement.²⁴³ The Probes amass fragmentary clues about people's lives and thoughts rather than comprehensive information. Inspired by the Surrealists, they value uncertainty, play, exploration, and subjective interpretation.²⁴⁴ Using cultural Probes as a starting point, the *OWL* enquiry technique uses the *bodyProps* to gain clues about people's thinking through design. In contrast to cultural Probes, the *OWL bodyProp* probes are used to elicit personal responses to, as well as through, the *bodyProps*, and they are also the final designs. Their functionality is not known and cannot be tested, it can only be imagined, or surmised. In this way, the *OWL project* can arguably be described as "probing backwards" as we both "probe" and imbue functionality after the design is solidified, rather than before it has been conceptualised. We thereby conflate, as well as upend two different stages of the probing process.

Gaver et al propose that "ambiguity is a property of the interpretative relationship between people and artefacts, rather than a property of things" and that ambiguous situations require people to participate in making meaning because they thwart easy interpretation. The more ambiguous a work, the more it sets the scene for meaning making. The work of making an ambiguous situation comprehensible can be both inherently pleasurable and lead to a deep conceptual appropriation of an artefact.²⁴⁵ This appropriation was viewed as an important part of the *OWL* discovery and imagining process, and has been consciously supported.

²⁴³ Gaver, "Cultural Probes and the Value of Uncertainty."; Gaver, Anthony Dunne, and Pacenti, "Cultural Probes."

²⁴⁴ Brotchie and Gooding, *A Book of Surrealist Games*.

²⁴⁵ Gaver, "Ambiguity as a Resource for Design."

...process and making

Development of the *bodyProps* was undertaken at STEIM, in Amsterdam.²⁴⁶ The first stage of the OWL project, the creation of the body-devices, was a sculptural process to create distinct, carefully executed and provoking objects. The objects were intended to be surreal in the sense that they both engage and confuse the expectations of the wearer. They were purposely designed to encourage a state of enchantment and wonder, to allow the subject to transcend the everyday and reach for new possible meanings. Rather than embody a ready-made experience, we left an empty space where normally a narrative would reside. We achieved this outcome by engaging in an intuitive process led by, and engaged in and through the body. As the other works in this thesis demonstrate, open systems create vacuums for self-discovery through movement. In a similar way, designing through movement also creates vacuums for artefacts to come into being. *hipDisk* is an apt example of this. When engaged in an embodied exploratory process, evolving artifacts position themselves in vacuums in the movement, to fit into and also elicit the movement.²⁴⁷

Our process, informed by this knowledge, was intuitive and sculptural. Sewing provided a readily available, relatively low-tech prototyping technique that required direct physical engagement, which was coherent with the project aims. Since we wanted to create outcomes that might elicit a broad range of responses rather than lead participants in a particular direction, it became immediately important not to make assumptions about the purpose or functionality of any of the devices. By forming and sewing directly on each other, while asking very few or no questions inside the process, we found we could support the emergence of more intuitive results. The work evolved very quickly and directly. No mirrors were used to observe and analyse the fit or form of a device, instead every fitting

²⁴⁶ <http://www.steim.org> the same organisation who hosted the *gesture≈sound experiments* and the *hipDrawing* performance development and video shoot for the 5 Days Off Festival and NIMK exhibition. 5 Days Off Festival: <http://www.5daysoff.nl>; NIMK: <http://www.nimk.nl>

²⁴⁷ Wilde, Schiphorst, and Klooster, "Move to Design • Design to Move a Conversation About Designing for the Body."

was done by feel and on-the-body adjustments so that every aspect of the process was informed by the body.²⁴⁸ The final outcomes were six body-devices that can be described, and paired as follows:²⁴⁹

²⁴⁸ This process echoed the development of *hipDisk*, which had proven to be both surprising and strikingly novel, while also communicating its own internal logic, in line with Sedighian and Klawe's reflective cognition protocols: Sedighian, "An Interface Strategy for Promoting Reflective Cognition in Children."

²⁴⁹ The objects are described here in order of their presentation during the interviews



Figure 26: Danielle Wilde and Kristina Andersen, *OWL bodyProps* (2009)
left: *wingpad* right: *hand*

Wingpad and *hand* both give and make pressure, pressing from and towards the body (fig. 26). They represent the breadth of the investigation, from the core to the periphery. It is a gentle beginning as both the back and the hand are normally exposed and touched by others in the normal course of affairs. Working with these parts of the body is not confronting, rather it brings the attention of the wearer to their body in in-habitual, yet accessible and acceptable ways.



Figure 27. Danielle Wilde and Kristina Andersen, *OWL bodyProps* (2009)
left: *armpit* right: *heel*

Armpit and *heel* both raise the bar as they destabilise the wearer, literally, by shifting the body's axis off centre (fig. 27). These two devices are slightly more invasive than *wingpad* and *hand* as they alter the posture of the wearer and bring attention to notions of comfort and discomfort as well as thresholds and intimacy. Our armpits and our bare feet are incredibly intimate and vulnerable parts of the body when exposed. Destabilising the body through asymmetry lead to a heightened kind of attention.



Figure 28. Danielle Wilde and Kristina Andersen, *OWL bodyProps* (2009)
left: *uterus* right: *owl*

Finally, *uterus* and *the owl* are body mutations that extend and distort while hugging the body in unconventional ways (fig. 28). *Uterus* is a kind of extended padding for the upper back and neck that has mutated beyond what one would normally engage with. *The owl* places an unexpected pressure on the side of the neck and can appear, and be perceived from both without and within, as a kind of growth almost independent of the body, yet whose roots seem to be embedded through the shoulder into the torso, or the core of the body.

The pairs of devices are incrementally stranger in the way they relate to and sit on the body. They are made of soft, neutral-coloured linen with elastic and lingerie attachments that are at once made banal by their use and somehow made intimate through reference and recontextualisation. Lawrence Crawford's conflation of defamiliarisation and *différance* (the French term made famous by Jacques Derrida relating both to differing and deferring in English) is useful to explain this.²⁵⁰ The idea is to at once alter the perception of a concept (to defer), and force one to think about the concept in different terms (to differ). The *OWL bodyProps* were made to "turn" people's attention to the body in these ways, shifting the quality of their attention and offering new perspectives.²⁵¹ The devices are a clear attempt to bring awareness and articulation closer to 'magical thinking'.

...investigating through interview and probes

As I described at the beginning of this section, the *bodyProps* were designed to be used in interviews as technology-free placebo objects, with which each participant could be probed to discover a yet-to-be-imagined technology. In order to draw out each participant's personal response to this proposition, a highly specific interview process was required. As a result, the interview structure is formalized to highlight the ambiguous nature of the request, as well as of the devices themselves. At the same time it remains open, to shift in response to participants' reactions and needs. The aim has been to create an emergent, imaginative space where people will both discover and articulate what each body-device is, rather than to lead too heavily in any particular direction. The role of the interviewee, or test subject, is to try to connect with whatever the objects foster experientially, and to communicate their experience within the guidelines and contextual framework provided. This requires each test subject to

²⁵⁰ Lawrence Crawford, "Viktor Shklovskij: Différance in Defamiliarization," *Comparative Literature* 36, no. 3 (1984).

²⁵¹ Shklovsky, *Art as Technique. In Russian Formalist Criticism: Four Essays*.

discover and create for themselves the space in which to feel confident to navigate personal as well as shared contexts.

The interview has three sections that are cycled through for each of the devices. In the first section, the *bodyProp* is fitted onto the standing interview subject and they are asked simple questions like: How does it feel? What is it? What does it do? They are encouraged to reflect deeply, to walk around, move, physically test and explore. This section attempts a shift from the banality of everyday to a more fantastical mindset where our subjects can give themselves extra ordinary powers in response to what they imagine the body-devices might allow them to do.

Desire

Once the test subject has exhausted their responses to the above questions, a second element is introduced to the interview process: A series of paper strips on each of which is written the name of a basic human desire. American professor of psychology and psychiatry Steven Reiss proposes that human behaviour is guided by a limited number of basic desires.²⁵² These sets of motivations read as a surprising shorthand for a complex emotional field and as such provide the *OWL project* with a useful list of provocations or “words” to relate the *OWL* devices to.

²⁵² Steven Reiss, *Who Am I: The 16 Basic Desires That Motivate Our Actions and Define Our Personalities* (New York: Tarcher/Putnam, 2000).

The list of desires are:

- Acceptance, the need for approval
- Curiosity, the need to learn
- Eating, the need for food
- Family, the need to raise children
- Honor, the need to be loyal to the traditional values of one's clan/ethnic group
- Idealism, the need for social justice
- Independence, the need for individuality
- Order, the need for organized, stable, predictable environments
- Physical activity, the need for exercise
- Power, the need for influence of will
- Romance, the need for sex
- Saving, the need to collect
- Social contact, the need for friends (peer relationships)
- Status, the need for social standing/importance
- Tranquility, the need to be safe
- Vengeance, the need to strike back/to win

These concepts are used to “seed” the interpretations of the devices. They slow down the process of experience and speed up the lingual labeling during the probing process. They encapsulate the power of language as a performative utterance,²⁵³ because, although they do not do what they say (as in “I do” or “you’re fired”), nonetheless they transform the situation in which the participants find themselves. The “words” act upon the participants, bringing their attention out of the deeply reflective space of the first section, and their thinking into a relation with another’s definition of the world.

Self-portraits

The third task for each *bodyProp* is a “self-portrait”, which is posed and framed by the test subjects to create an image for each body worn device. The role of the portraits is to allow another form of expression for subjects’ responses to the *bodyProps*. It also encourages ownership of the emergent relationships as, rather than the focus being inwards towards the device, the body and internal responses; or in collision with another’s definition of the world; the portraits bring the focus outwards to a physical and visually representational space and the gaze of the other. The test subjects’ control of their representation gives them both ownership of and responsibility for it.

The interview process

The interviewer, wearing a utilitarian apron, lays out a table with the sixteen desires, small blank forms and a pen. Making sure the test subject is comfortable, the interviewer explains that the intention of the project is to “design backwards,” to discover what things do starting from within an embodied experience, and to encourage magical thinking.²⁵⁴ The interviewer then gives a short overview of the interview process:

²⁵³ John L. Austin, “Performative Utterances,” in *Philosophical Papers* (London: Oxford University Press, 1970).

²⁵⁴ all interviews discussed here have been conducted by the author

1. You will be invited to try on the devices one at a time. There are six in total.
2. With each device we will speak about what it feels like to wear, and I'll ask you what kind of magical powers it might give you if it contained yet-to-be-imagined technology.
3. You will then be invited to sit and write your thoughts on that device, answering the questions: What is it called? and What does it do?
4. I will then ask you to choose one or more desires that you feel are associated with the object. The desires don't have to be coherent with the other comments or responses, we're looking for associations between object and desire.
5. We then do a self-portrait with the object. You will choose your pose and how the image should be framed. You can look at the results on the camera to confirm that the image is appropriate.
6. We repeat this process with all six objects.
7. To finish you will be asked to sign a research consent form indicating that we can use the material you have provided.²⁵⁵ The interview can be stopped at any time and permission can be withdrawn, in part or in full up until the point of publication.

²⁵⁵ in line with the ethics approval of this PhD

Once the overview has been provided, the first *bodyProp* is taken out of a bag and fitted on the test subject. All devices are kept hidden until they are to be fitted, and are replaced into the bag after use. In this way only one device can be seen and handled at any time. Each device appears, to be imagined, and then, outside of this imagining no longer exists. The interviewer and test subject discuss at length what it feels like to wear each device. The aim is for this conversation to extend beyond a simple answer, allowing the test subject to discover deeper responses as they deepen their relationship to the object. As discussed, above, they are encouraged to move around and to find ways of understanding and articulating what the *bodyProp* feels like, as well as what kind of magical powers it might give them if it contained some yet-to-be-imagined technology. The open ambiguity of the device creates a vacuum for their movement. Their movement, in turn, creates a vacuum for their imagination, just as it would create a vacuum for an artifact if the artifact did not yet exist. Their embodied engagement facilitates the discovery process. The discussion is recorded using an audio recording device. It is not filmed.²⁵⁶ As the subjects then sit at the table and answer the questions *What is it called?* and *What does it do?* on a small business card-sized form, the contrast between the amount of space they are given to write and the time they were given to verbally respond, shifts them from a free ranging reflective space into a more precise selection and articulation process, in preparation to choose from the desires.

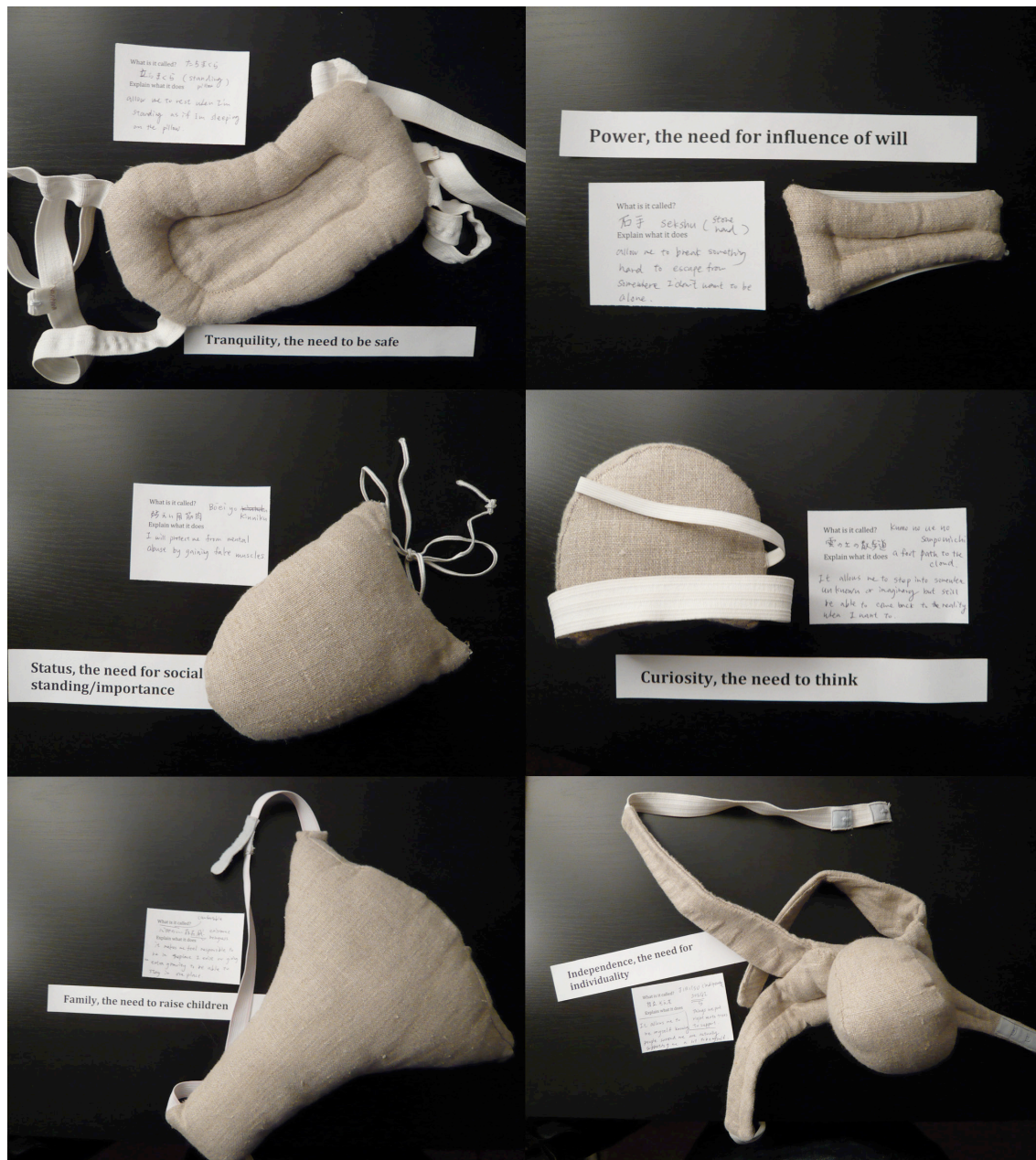
The test subjects prepare and pose for their “self-portraits.” The control they have of their representation in this final phase gives them both ownership and responsibility for the entire imaginary story with which they have imbued the device (fig. 28). After a small debriefing, the interview is complete.

²⁵⁶ This decision was based on the concern that video had the potential to depersonalize or interfere with a test participant’s ability to articulate their private thoughts, as they reflected deeply on how the body devices felt. The first stage of the interview process, in particular, seemed intensely private. After each interview I enquired whether it would have been ok to have used video. Without exception every test subject said that they felt it would have interfered with the intensely personal nature of the interview process.

The *OWL interviews* begin with devices that complete and are completed by the body, to arrive at a space that invites contemplation about that body in turn. In the next section I present the outcomes of the interview process, as well as a custom methodology that has been developed specifically to analyse the highly personal, idiosyncratic responses of the different test subjects.



Figure 29. Danielle Wilde and Kristina Andersen. The *OWL project*
Participant self-portraits with *bodyProp* (2009)



3.2 Part Science Part Magic

The processes and methods described in the previous section are built on and aim to test the knowledge gleaned from the phase one experiments, as well as the *Light Arrays*, which evolved in parallel. The *Light Arrays*, described in chapter two, followed a technology-driven approach (the technology–light–was known in advance), and generated poetic outcomes by engaging in a multi-tiered embodied process, developing applications for a known context–performance. As the performances evolved, complementary presentation aspects were conceived, such as participatory public demos. These were conducted so as to be experienced in concert with the emerging performances. This multi-faceted approach to presentation aimed to address issues and concerns raised throughout phase one in relation to participation and performativity. The outcomes afforded and encouraged use of the body-devices by the public, and thereby encouraged them to actively participate rather than passively observe. This approach also afforded parallel reflection on applications of the *Light Arrays* in abilitation contexts, described in section 2.3.

In some respects, *OWL* sits as a polarised complement to the *Light Arrays*. Neither the technology, nor the context for the outcomes are known. The work aims to be completely exploratory, led by an embodied approach. This process builds on the *hipDisk* development process, yet is aimed specifically at critically investigating the approach itself, as well as its ability to address my key research questions.

Would this ambiguous form of extension (artistically-) poeticise embodied engagement? How might the different choices made in the development process support such an experience? How might I support the inherent performativity of the emerging body-devices, in line with full participation? And, finally, what would constitute a valid stand-alone cultural artefact when undertaking such a process-driven approach?

In the previous section I discussed the conceptual and theoretical drivers and the phase one *OWL* methodology. A set of processes were developed to support magical thinking, and thereby encourage the conception and development of technologies that we cannot yet imagine, to the point where they can be evaluated. The work continues to be grounded in the idea postulated by Clarke, that any sufficiently advanced technology is indistinguishable from magic.²⁵⁷ The problem of developing “sufficiently advanced technology” has been approached from two different perspectives: the development of placebo objects and devices, and probe-like enquiry through one on one interviews.

Thirty-one interviews were conducted, including the first interview, which served to test the validity of the interview structure, and the final four interviews, which were conducted simultaneously with four members of a dance company. I will not include the final group interview(s) in the following analysis as they represent a rogue structure that warrants further exploration before their relationship to the other outcomes may be understood. My reflections, rather, are based on the one-on-one interviews.

interview outcomes

The *OWL interviews* took place between June 2009 and October 2010 in Europe, Australia, North America and Japan. Participants were from a range of backgrounds, cultures and age groups. The youngest person interviewed was nineteen, the eldest sixty-five. Responses were often highly idiosyncratic, yet patterns were, nonetheless, able to be identified. New processes demand new techniques. The approach to analysis presented here draws on well-established methods that have been subverted to support the projects’ needs.

²⁵⁷ Clarke, *Profiles of the Future*.

Many of the responses are fantastical and elude easy categorization. In this way the response data is not dissimilar to cultural Probes returns that are meant as inspiration for design rather than hard ethnographic materials. According to Gaver et al:

The Probes simultaneously make the strange familiar and the familiar strange, creating a kind of intimate distance that can be a fruitful standpoint for new design ideas. They produce a dialectic between the volunteers and ourselves. On the one hand, the returns are inescapably the products of people different from us, constantly confronting us with other physical, conceptual and emotional realities. On the other hand the returns are layered with influence, ambiguity and indirection, demanding that we see the volunteers through ourselves to make any sense. This tension creates exactly the situation we believe is valuable for design, providing new perspectives that can constrain and open design ideas, while explicitly maintaining room for our own interests, understandings, and preferences.²⁵⁸

Cultural Probes are generally developed for, and sent to volunteers from a specific community or cultural group. The probes are left with these volunteers for an agreed time, during which they (ideally) complete the probe tasks. They are then collected, or returned by post. The designer is not present while the probe activities are undertaken. In contrast, the *OWL bodyProps* have been designed without a distinct test subject in mind, are identical for all test subjects, and the probing is done with the presence and participation of the interviewer.

²⁵⁸ Gaver, "Cultural Probes and the Value of Uncertainty," 55-56.

...dealing with unconventional data

When confronted with outcomes that resist categorisation, existing methodologies may be employed as a starting point, or scaffold from which to develop a viable, custom approach. Card sorting is a technique used to understand how people think about content and categories.²⁵⁹ As a process, it seems to parallel many aspects of the OWL interview process. It is a low-tech method for finding solutions in the design of technological systems. It is an embodied process that supports instinctive, tangential responses that need not adhere to a clearly articulated logic. The logic, rather, is extrapolated from the final results in any way that is useful. Card sorting is applied when the variety in the items to be organised is so great that no existing taxonomy is accepted as organizing the items; when the similarities among the items make them difficult to divide clearly into categories; and when members of the audience that use the environment being designed may differ significantly in how they view similarities, as well as appropriate groupings of the items.²⁶⁰

Many of these aspects resonate well with the *OWL interviews*. The *bodyProps* are technology-free, and are used as a mode of enquiry about the conception and design of body-worn technologies. The interview process employs disruptive techniques such as asking a participant to consider where an emotion might live in their body; to identify magical powers that emerge from the experience of an inanimate object; to summarise thoughts articulated during a fifteen minute reflective process onto a very small (business card-sized) piece of paper, etc. These techniques destabilise logical systems that may be overlaid on the process, and thereby support the imagination of unfamiliar and, as yet, unknown solutions and responses. There are also clear parallels between when card sorting is used, and the kind of data we have for *OWL*.

²⁵⁹ Jakob Nielsen, "Card Sorting to Discover the Users' Model of the Information Space" <http://www.useit.com/papers/sun/cardsort.html>; Donna Spencer, *Card Sorting* (New York: Rosenfeld Media, 2009).

²⁶⁰ Donna Spencer, Todd Warfel, "Card Sorting, a Definitive Guide" http://www.bboxesandarrows.com/view/card_sorting_a_definitive_guide.

The decision to use card sorting as a basis from which to design a unique methodology was instinctive, and founded on the reasoning provided above. Crabtree et al.²⁶¹ discuss some dangers in reappropriation and partial or selective use of ethnomethodologies in design. Citing Button, they caution that it can result in “little more than ‘scenic features’ of action and interaction” and “sensitizing designers to little more than the grossly observable features of a setting or culture.”²⁶² A major critique they bring is that embodied design research processes are not sufficiently explicated. They apply HCI and Computer Science reasoning to design approaches, and thereby, unfortunately, utilise little more than “surface descriptions” to accuse the critiqued processes and approaches of providing little more than the same. They thereby fall prey to their own accusation.

New approaches do have limitations, and certain risks are attached to them, especially where understanding the real world, real time nature of action in new contexts is at stake.²⁶³ But existing approaches also carry these risks, with the added problem that they have become too familiar, and so often stand unquestioned. By re-appropriating, selectively or partially using ethnomethodologies in design, and doing so with extreme care, it is possible to defamiliarise processes and outcomes. The Crabtree paper generated strong reactions from the CHI community when it was presented, and continues to do so.²⁶⁴ Nonetheless I cite it here as I believe the authors make important points that they inadvertently demonstrate as they conduct their analyses. Mindfulness is warranted, and care should be taken when reappropriating and partially or selectively using any kind of methodology, particularly one from, or applied to a different discipline.

²⁶¹ Andy Crabtree and others, "Ethnography Considered Harmful," in *Computer Human Interaction (CHI 2009)* (ACM Press, 2009).

²⁶² Graham Button, "The Ethnographic Tradition and Design," *Design Studies* 21, (2000): 883.

²⁶³ Crabtree and others, "Ethnography Considered Harmful," 887.

²⁶⁴ Personal correspondence.

The *OWL project* intentionally disrupts the instinct to draw on experience and interpret the world based on what we know. Like card sorting, it is both action and process. Such embodied techniques support lateral, instinctive connections. By looking at card sorting as an analysis method (rather than as a tool with which to interrogate user groups), we have been able to support an instinctive analysis of the interview data.

A case study analysis

The analysis presented here is based on twenty-two completed interviews with specific responses to the six different OWL objects. Five additional one-on-one interviews, conducted at a later time, have been compared with, and used to verify this approach to analysis. Each response discussed consists of a photo and a written description in the format: Name, function and associated desire. Faced with this odd set of data each response was printed out on paper and hand sorted (fig. 31).



Figure 31. Danielle Wilde and Kristina Andersen. The OWL project grouped and sorted OWL interview responses (2010)

There was something about the manual handling of these little slips of paper that was appealing. One could venture that the *OWL* process started to such a high degree as an embodied and hand crafted experience that the manual handling of the data seemed a logical choice. Each response was sorted by device and by continent (Europe, Australia, North America and Japan). Each set was physically stuck together so that they could be read separately from the other sets. It quickly became clear that while the data was divergent, there were certain things that could be deduced. Inspired by traditional statistical terms such as mean, mode and standard deviation, or outlier,²⁶⁵ we identified the following:

tendency A and B: most devices have one or two interpretations that reoccur and can be grouped into two tendencies.

outlier: there was usually one significantly different response

desires: a simple count of which desires were chosen could be conducted to find tendencies

consensus: the general direction of the interpretation could be identified

As we began the sorting process, we added an additional category: “most striking name”. Our criteria for creating and also choosing this category were instinctual and subjective, yet we consistently agreed on the outcome. *OWL* outcomes are unexpected, and from a traditional design standpoint, un-sortable. Including this category brings to the fore the anomalous nature of participant responses, and allows for the (artistic-)poetic and variable nature of their responses.

²⁶⁵ For a simple example of how these terms are used in descriptive statistics, see: <http://www.ltconline.net/greenl/courses/201/descstat/mean.htm>. Importantly, we are not dealing with statistical numerical data, nonetheless these mathematical processes have provided useful structures to support analysis of our wild data.

If we take the example of “the hand”, we can see how this plays out. “The hand” is in many ways the simplest of the body devices, an elongated padding that fits inside the palm of the hand. It buffers the hand from touched objects and it encourages closing the hand into a fist. Visually it references bandaging, protective work and sports gear. Like all the devices “the hand” generated interview written responses in the format: Name, function and associated desire as well as a self-portrait for each device. When analysed as described above “the hand” yields the following terms:

tendency A: Care. Defensive. Sensitive Memory [Brings forth sensitive memories, long forgotten, and inspires activity] Protection [I feel like my entire life is consumed by the protection of Kayla]

tendency B: Action. Offensive. Fist [Configures hand as a fist] Strike [Enhances my ability to strike at injustice. Gives me power - secret power.]

outlier: Emits ultrasonic disorientation ray

desires: Power [7], Tranquility [5], Physical activity [3], Independence [3], Family [2], Curiosity [2], Acceptance [1], Order [1], Idealism [1]

consensus: Force and protection

most striking name: Stone Hand

Where “the hand” is perhaps the least challenging of the devices there is no question that “the Owl” is the hardest one to wear and come to terms with. The owl sits on the shoulder, tightly attached to the chest with straps, it is touching the side of the neck, forcing the wearer to slightly crook their head. It is deliberately designed to be uncomfortable. The data for “the owl” reads:

tendency A: Support advisor [ever present personal advisor consistent and confident]

tendency B: destruction [Sucks blood and makes me disappear] Self hate [Makes you see and feel all your weakness and darkness - can see and feel the murky self hate of others as well]

outlier: Allows you to hear long distance as well as various pitches.

desires: Social Contact [4], Tranquility [4], Independence [3], Idealism [3], Power [2], Order [2], Vengeance [2], Curiosity [2], Status [2], Romance [1]

consensus: comfort and destruction

most striking name: Human Wart, Octopus Arma

Data sets like these give very clear directions. The function of “the hand” is centered on notions of force and power. Its functionality would be that of facilitating an active channeling of energy outwards as action or inwards as protection. The device will probably “push back” inside the hand and its identity will be close to that of a weapon or an amulet.

The owl is a much darker object, and it remains much harder to “design.” The owl is an invasion, a burden and a hindrance. So how will it advise and give you new abilities [such as hearing long distances, etc]? Can we re-design it so that it stays negative but, through giving body to that negativity, allow for some release? Or is the release of taking it off sufficient? How do we design objects that are hard to use? Many everyday tools and devices are hard on the user, and many need to be. Some things should only be used for a very short time, as they expose the wearer to harmful environments or activities. Can we look at “the owl” as a possible HazMat device?

Results for the other four body props follow:

Wingpad

tendency A: Strength [gives the wearer super strength; doubles the speed of your nervous system]; Flight [provides flight for body and mind]

tendency B: self-confidence [helps me to disappear inside and fly; gives me a warm feeling of safety and security ... secure in my inner strength]

outlier: Gives that feeling of wanting sex.

desires: Tranquility [4+1], Order [4+1], Power [4], Independence [2+1], Physical Activity [2], Saving [2], Curiosity [+1], Family [1], Status [1]

consensus: comfort and flying

most striking names: angel wing; standing pillow (たちまくら、立ち枕)

armpit

tendency A: asymmetry [disrupts the symmetry of the body; makes me invisible]

tendency B: power [gives you superhuman strength]

tendency C: magic and emotional [taking me away, securely to aspects I have not known; allows one to cry easily]

outlier: Airborn, waterborne, anti-gravity device.

desires: Order [4], Tranquility [3], honour [2], saving [2], Status [2], Idealism [2], Physical activity [2], Power [1], Independence [1], Eating [1], Curiosity [1], Social contact [1]

consensus: strength; spiritual and emotional support; emotional discomfort

most striking name: skraffle

heel

tendency A: curiosity [passport to another dimension [where] I am able to create any world I choose]

tendency B: magical power [allows person to jump up unimaginable heights or run at great speeds effortlessly]

tendency C: centring [fills you with compassion when you are finding it hard to find; keeps me present in the moment, thoughtful in my action – not doing it by rote]

outlier: Stop button: Halts some current activity that you wish to change or halt: change red light or render someone unable to speak

desires: Curiosity [5], Tranquility [4], Physical Activity [4], Vengeance [2], Power [2], Independence [2], Idealism [2], Social Contact [1], Acceptance [1]

consensus: jump and alter world

most striking name: A footpath to the cloud (雲の上の散歩道/くものうえのさんぽみち)

uterus

tendency A: relief [unburdens your body from burdensome stresses]

tendency B: mnemonic; seer [reminds you of whatever you choose, of anything you ever knew or needed; it can see, write and smell the future]

outlier: it is a playful opponent. One which doesn't have the upper hand. One that is trying to catch me but can't

desires: Power [5], Status [3], Independence [3], Family [2], Order [2], Tranquility [1], Curiosity [1], Acceptance [1], Vengeance [1], Idealism [1], Physical Activity [1], Social Contact [1], ALL DESIRES [+1]

consensus: empowering; future and past memories

most striking name: Wisdom's giraffe

...discussion

Bell, Blythe and Sengers suggest that the power of defamiliarisation is as a means of understanding.²⁶⁶ As can be seen in the extended quote from Gaver et al., above, cultural Probes make strange as a way to support empathic engagement between designers and users. The aim is not to become the other but to make sense of the other through oneself. The *interviews* provide a setting for people to provide highly intimate information about how they see and experience the world, yet they are never asked any of these things directly. By defamiliarising the way we think about technologies, we open up an intimate space between the participant and the interviewer that naturally lends itself to an empathic connection, without which the interview itself stalls. A natural result of this is that the interview responses are highly personal and idiosyncratic.

The *OWL project* exists to examine and question the methodologies we use to develop technologies, and to create new methods that can support a move towards the creation of non-incremental outcomes. It builds on my phase one exegesis discoveries, to develop a structured methodology that assists in the creation of such outcomes. From the outset we have been cautious about (a) preempting our development process, by making gratuitous decisions in order to find ways to move forward, and (b) doing what we know. This echoes the caution of the *gesture≈sound* prototyping methodology. New settings do not necessarily require new methods,²⁶⁷ yet if we want to shift the kind of outcomes we are gaining from exploratory research, then we do need to shift our approach. If for no other reason than to keep our minds open to unexpected, even un-sortable, outcomes.

²⁶⁶ Genevieve Bell, Mark Blythe, Phoebe Sengers, "Making by Making Strange: Defamiliarization and the Design of Domestic Technologies," *TOCHI* 12, no. 2 (2005).

²⁶⁷ See my discussion above

Card sorting and basic statistics were inspirations and instinctive starting points for our *analysis*, but any other method may have worked. What was important was finding a way to move forward, so that we could understand what choices might be appropriate. This knowledge needed to emerge from an embodied process, in accord with the way the *OWL project* has been supported to evolve from the outset. We could not in good faith have conducted a real card sorting much less a statistical analysis on the interview results. Too much poetry and variation would have been lost.

In this section I have discussed the interview outcomes and *the OWL analysis* methodology, based on card sorting. Test subject responses were at times wild and radical. Phase two of *the OWL project* emerged from these interviews, as my various reflections coalesced into a single thought: If participants could make their own devices, what would these devices be? The workshops, or *OWL circles*, which I describe in the next section, are informed by the knowledge and understanding accrued over the course of these interviews, as well as by the rest of this exegesis. The *circles* take a slightly different approach to the problem of “finding that thing the nature of which is totally unknown,²⁶⁸ through embodied engagement, and demonstrate how I deepen my investigation of how body-devices might be used to (artistically-)poeticise experience. In contrast to the interviews, which begin with a designed object, the *circles* support participants to make their own exploratory devices, and thereby extend and challenge the way that I have been thinking about technology conception and design.

In the next section I discuss the structure and evolution of the *OWL circles*, the impact on my thinking in regard to processes and participant engagement, and the implications for this PhD and the broader design communities touched by this research.

²⁶⁸ Meno, from Plato's Dialogues, in Solnit, *A Field Guide to Getting Lost*, 15.

3.3 Circling Forward

“how will you go about finding that thing
the nature of which is totally unknown to you?”²⁶⁹

It is almost impossible to imagine what lies ahead. What will the future bring? How could life be different? Our imaginations are informed, and also limited, not only by what we know to be possible but also what we find socially plausible. Kevin Kelly claims that we cannot simply have anything that we can imagine.²⁷⁰ The videophone, for example, emerged into our consciousness moments after the birth of the telephone, yet it failed dismally when it was taken to market.²⁷¹ Despite living in people’s imaginations as a fantasy for almost a century, the device was unable to gain a foothold in the way people imagined their real lives.

Asking people to imagine yet-to-be-imagined technologies poses a difficult question not only in relation to the design process that may be called on to bring the imaginary technology into being, but also in terms of the person being asked. What do you really want, if you could have anything? is an imponderably difficult question that leads more often than not to simple, modest answers. Through embodied processes, *OWL* attempts to elicit nuanced, imaginative and implausible responses to these questions. These responses may be used as provocations to develop satisfyingly implausible designs that challenge, and hopefully stretch, what we consider to be possible.

²⁶⁹ Meno, from Plato’s *Dialogues* in *ibid.*

²⁷⁰ Kelly, *What Technology Wants*, 181.

²⁷¹ *Ibid.*, 177.

OWL uses the body, enchantment, ambiguity and play, as vehicles through which to contemplate Meno's question,²⁷² and thereby support the conception of "sufficiently advanced technology".²⁷³ In phase one, the *bodyProps* served to focus participants' thinking. As the purpose of the *circles* is to have people outside of the design process conceive of devices, we use structured techniques to assist them, by focusing thinking in appropriate ways. We are thus able to bypass first, rational responses, so that the otherwise implausible may emerge. The *OWL circle* workshops were purposely designed as a way to sneak up on ourselves, to be caught unaware and unself-conscious for a moment so that we would dare to begin.

Circle setup and structure:

The *circles* are hosted in a neutral, utilitarian space, containing a large worktable with various tools and lights, and another table, off to the side, containing various neatly presented recycled materials. Neutral colours predominate. The materials afford a large range of structural possibilities and aesthetics. A small area is also set up for video interviews, with a video camera on a tripod facing a black wall. Ideally, the *circles* are conducted with approximately twelve participants and two workshop facilitators.²⁷⁴ The format evolved until it was reduced to the following, strict sequence of conceptual shifts:

²⁷² Meno, from Plato's Dialogues in Solnit, *A Field Guide to Getting Lost*.

²⁷³ Clarke, *Profiles of the Future*.

²⁷⁴ This ratio changed radically throughout the development process. The smallest circle had five participants, the largest eighteen, and only one facilitator.

Introduction: Welcome and brief introduction including the quotes from Arthur C. Clarke and Meno.²⁷⁵

The Desires: A list of common desires are read aloud and placed on the table.²⁷⁶ Participants are asked to choose one.

Transfer to body: Participants decide in which body part their chosen desire resides.

The Material Switch: Participants choose materials they find appealing.

Thinking with the hands: Without knowing what to do in advance, participants begin making.

Being “done”: When they recognise that they are done, each participant is led to the video interview corner

Description: While being fitted with a microphone participants are given their instructions, to tell the video camera: their name, their desire, what their object is called and what it does. The answers are then filmed in one take.

Debrief: a short debrief is performed to complete the process

²⁷⁵ Clarke, *Profiles of the Future*. and Meno, from Plato's dialogue, in Solnit, *A Field Guide to Getting Lost*, 15.

²⁷⁶ Reiss, *Who Am I: The 16 Basic Desires That Motivate Our Actions and Define Our Personalities*.

In the following I explain the background for each conceptual shift and attempt to outline how and why they may work.

The Introduction: The drawing of a circle. The beginning of a game.

The introduction serves a number of functions. In a theatrical sense it declares that a game is beginning. As discussed in the introduction of this exegesis, Caillois specifies a number of characteristics for games: they are engaged in by choice; they are separate from the routine of life, and occupy their own time and space; games are uncertain: the results cannot be pre-determined, players' initiative is therefore required; games are unproductive: they create no wealth and end as they begin; games are governed by strict rules that suspend ordinary laws and behaviours; and, finally, they involve make-believe that confirms in players the existence of imagined realities that may be set against "real life."²⁷⁷ By framing the *circle* as a game Caillois' characteristics automatically come into play. This liberates qualities of attention and engagement that are useful when trying to find "that thing the nature of which is unknown"²⁷⁸ Clarke's assertion that "any sufficiently advanced technology is indistinguishable from magic"²⁷⁹ further emphasize the game-like quality of the *OWL circle*, at the same time as it focuses the quest in the realm of technology.

The Desires:

The list of desires we use is borrowed from the motivational psychology research of Professor Steven Reiss.²⁸⁰ Reiss's desires are usefully provocative. As discussed in section 3.2, they reduce a complex emotional field down to someone else's shorthand definition of the world. In the

²⁷⁷ Caillois, *Man, Play and Games*.

²⁷⁸ Meno, from Plato's Dialogue, in Solnit, *A Field Guide to Getting Lost*.

²⁷⁹ Clarke, *Profiles of the Future*.

²⁸⁰ Reiss, *Who Am I: The 16 Basic Desires That Motivate Our Actions and Define Our Personalities*.

circle, they also introduce language before we know what we might be describing, and thereby provide an uncommon point of departure for an embodied discovery process. Choosing to approach a difficult subject in a difficult or convoluted manner is a common strategy of fine art. The underlying assumption is that to “free up” the creative and expressive body to respond to the unanswerable, we must first “busy” the reasoning part of the brain so that it will not interfere.²⁸¹ The sparse, yet strict instructions that we provide act as a structure that engages the reasoning part of the brain, and frees participants to be spontaneous, follow their intuition, aesthetic scents and creative whims.²⁸² It allows them to trust and follow their instincts. The list of desires acts as the first estrangement, or seed, and are followed very closely by the next conceptual shift: the transfer to body. Importantly, the facilitators remain neutral throughout, accepting all choices as equally valid.

Transfer to Body:

Where in your body does your desire reside? This question acts as a second estrangement switch, transferring from, and connecting, desire to body. It is a nonsensical question that draws heavily on surrealist art strategies, liberating in their absurdity.²⁸³ “If you were a colour what colour would you be?” Many children know this game and have answers for these types of inquiries. The switch between an abstract desire, defined very strictly by someone else and the feeling that this word does indeed reside within your body, allows the participants to begin to work. The question is no longer abstract, it has been made concrete and physical. A clear concept now becomes the participants’ guide in the work.

²⁸¹ Rollo May, *The Courage to Create* (New York: W. W. Norton & Company, 1994).

²⁸² Bogart, *A Director Prepares, Seven Essays on Art and Theatre*.

²⁸³ Brothie and Gooding, *A Book of Surrealist Games*.

BLESS ALL SEAFARERS.

**THEY exchange not one LAND for another, but one ELEMENT
for another. The MORE against the LESS ABSTRACT.²⁸⁴**

²⁸⁴ Wyndham Lewis, "Bless England," in *Manifesto: A Century of Isms*, ed. Mary Ann Caws (Lincoln, NE: University of Nebraska Press, 2000 (1914-1915)), 344.

The Material Switch: “Find the material that works for you.”

Making this switch allows the physical making to begin as participants find physical form and texture for the body-feeling that has been identified. Again the decisions made here are not reasonable, rather participants continue their line of absurdist questioning by asking: If this feeling had a texture and a shape what would it be? Once they have chosen materials they can begin building and thereby discover how to support their burgeoning concept.

Thinking with your Hands: Making as research.

By thinking through the making process the work is one further step removed from reasoning and habitual thinking. The participants have until this point made three very large leaps of faith: choosing a desire, connecting this desire to their body, and their until now unnamed feeling to a material texture and expanse. These three switches have occurred in less than fifteen minutes allowing no time to re-consider or back out into careful reasoning. In a sense, participants are not completely committed at this point, simply because they do not know what it is that they are making. The work that follows is instinctual and effective. The conversation around the table is practical: “Can I have the scissors?” “How do I make this stick out to the side?”²⁸⁵ Kelly claims that the divorce of the hands from the head puts a strain on the human psyche.²⁸⁶ This suggests that bringing them back together again through embodied processes releases strain. Having viewed numerous *circle* participants engage in this process I suggest that the state that it engenders is tranquil: focused, efficient, relaxed and also gently energetic. Thinking as an emergent bodily process allows us to access knowledge, expertise or

²⁸⁵ Personal Correspondence.

²⁸⁶ Kelly, *What Technology Wants*, 193.

connoisseurship that otherwise eludes articulation.²⁸⁷ The *OWL* processes lean heavily on this idea.

Being Done: The Decision of “ready.”

Knowing when a device is “done” is an instinctual knowing. The *circle* structure removes the reasoning part of the brain from the imagining and creating process, and thereby frees the participant to trust in their ability to recognise what it is they are doing as it emerges, including when it is “done”. This knowing “when” is something we all have experienced. Henri Cartier Bresson called it “the decisive moment” the moment when the trigger on the camera is pushed. This moment relies on the photographer’s ability to see and record an event literally taking form. For Cartier-Bresson, failure and chance were a source and not a deterrent to learning how to see with clarity and simplicity. Photographers who follow this style become risk-takers, constantly discovering and capturing fleeting moments that otherwise would have gone unseen.²⁸⁸ Cartier-Bresson’s moment was tied to a particular approach to photography, nonetheless it is useful to provide ways of thinking around the notion of making a device which is yet to be imagined, and knowing when it is “done.” In musical improvisation the knowing where to go next becomes a series of small decisions made in a hyper aware state of flow in which the musician “knows” both the minds and desires of his or her fellow musicians, and also holds the experience of the audience as an almost physical “thing” which can be examined, turned, changed, and at some point is “done.”²⁸⁹

²⁸⁷ Wilde, Schiphorst, and Klooster, “Move to Design • Design to Move a Conversation About Designing for the Body.”

²⁸⁸ Jack Zichittella, “The Decisive Moment Revealed,” *Arts and Activities* 123, no. 5 (1998).

²⁸⁹ Joel Ryan, “Knowing When,” in *The Vibrancy Effect* ed. Chris Salter (Rotterdam: V2_ Publishing, 2011 (forthcoming)).

Description:

The interview is filmed in one take. Participants are required to think on their feet, to not let their inner dialogue drown out their ideas. We began with language, with the desires. Here we return to language. The process between is embodied. It is non-lingual, or mute. As language floods in, it takes over, surprising the participants.

Excluding language from the central part of our structure allows a very intuitive and productive process to emerge and only at the end is reasoning allowed back into the experience. For this process to appear “on camera” we ask the participant to speak in one-take. This achieves two things: first it allows the process to remain personal and introverted, as the camera operator is just that, an operator facilitating the participant to self-record their piece; and secondly, the switch between an intuitive and wordless making process to a reasoned presentation happens “on camera” with many participants only realising what they have built as they name it. The naming and describing fulfill the function of a performative speech act, wherein saying something makes it so.²⁹⁰ To make this final switch more distinct we ask strict, product like questions. Instead of: how did you feel? We are asking: what does it do? The strictness of this line of enquiry allows the sometimes hazy decision making process that has come before to crystallise. The “product” is described and the participants are thereby brought back into the everyday world. The circle is broken and the game is over.

²⁹⁰ Austin, “Performative Utterances.”

Debrief:

As a postscript to the overall workshop experience each participant is debriefed before leaving the workshop space. This allows us to close any conceptual holes and attend to any concerns the participant might have and is an important part of us taking responsibility for the emotions and questions that may arise in such an intense experience. It is also where we can explain a little bit more about the reason and backgrounds for the project.

The workshop takes two hours including the recording of all twelve participants' work. In that time we have opened a bubble in time in which we were allowed to physically build what does not exist, and in turn to meditate over our desires, and how they might be met or mitigated.

Nine *circles* were conducted: three in Tokyo and six in Sydney. Five of the Sydney workshops were targeted towards specific social or community groups: artists with disabilities and their carers; design academics; young children; performing artists; librarians. Outcomes were exhibited as part of the 2010 Participatory Design Conference, in Sydney.²⁹¹ A participatory lecture that borrowed heavily from the *circle* structure was also conducted in Yamaguchi, Japan, with sixty housewives.²⁹² This breadth of participants and contexts afforded deep reflection, and the development of the strict structure described above. Surprisingly, even when participants behaved in predictable ways, it was impossible to preconceive their outcomes.

²⁹¹ The 11th Participatory Design Conference: <http://www.pdc2010.org>; The Art of Participatory Design, exhibition: <http://www.pdc2010.org/art-of-pd/>

²⁹² YCAM, Yamaguchi Centre for Art and Media: <http://www.ycam.jp/en/index.html>; Media Kitchen: *Re-evaluating contemporary connections between clothing and technology*: <http://www.ycam.jp/en/education/2010/04/ycam-media-kitchen---annual-le-1.html>

Participants in the *OWL circle* do not know what they are making. They commonly follow the affordances of the materials they choose as a support for their exploration. Yet this does not prescribe the outcome. In two different *circles*, for example, two participants chose similar materials, yet arrived at radically different outcomes.



Figure 32. Danielle Wilde and Kristina Andersen, the *OWL circle* (2010)
 left: *OWL circle* participant. 間 time/space interval.
 right: *OWL circle* participant. family.

They both chose a two-metre long cardboard pole, and cream coloured fabric. The first participant, a Japanese male in his twenties, was drawn to the desire for *physical activity*. He placed the cardboard pole along his shoulders, behind his head, and the fabric hung down in front of his body. He called his device “ma” or 間, which means interval in space or time (fig. 32, left). He explained, and demonstrated how his device allowed him to fight with and make friends with the wind. When wearing it he was dynamic and agile. The other participant, a Japanese woman in her late forties, also placed the cardboard pole along her shoulders, behind her head, and had the fabric hang down in front of her body. She supplemented this set-up with a headpiece and hand-held fan-like extensions created with a cream pleated card (fig. 32, right). Her desire was *family*. Rather than supporting dynamic, flowing movement, her device signified the heavy, yet joyous responsibility of love and family. When wearing her device she was solid

and static, like a monumental statue. Viewed from a visual and material perspective, the materials they chose led them to an almost identical outcome, yet the dynamic aesthetics of their devices were radically different. The gestalt reflected deeply felt, idiosyncratic embodied understandings of their chosen desires.

The amount of time invested by participants is also not indicative of the valence of their experience. For example, in one of the first *circles* in Japan, one woman completed her device and interview within twenty minutes. I suspected this indicated difficulty engaging with the process, yet she not only completed her device and interview, but remained at the venue until after the entire *circle* had finished, watching the other participants develop and describe their outcomes. The woman's device consisted of a fabric element with a small loop at each end – one for her hand and one for her foot. It was unobtrusive, soft, flat, able to be folded (fig. 33). The woman explained that she had not exercised for a year and often felt guilty about not doing so. The device was to be used to briefly lift her foot several centimeters, a number of times, whenever she felt guilty. To my surprise, she explained that the device would not magically exercise her or make her fit – she didn't actually care to exercise. Rather it would magically eliminate her guilt. When I spoke with her independent of her *circle* process to discover what the experience was like for her she became very animated and explained that it was one of the most profound experiences she had ever had. At first, she had no idea what she was doing, then suddenly it became clear and she was done, which was why she finished so quickly.²⁹³

²⁹³ personal correspondence



Figure 33. Danielle Wilde and Kristina Andersen, the *OWL circle* (2010)
OWL circle participant. *physical activity*.

The woman's experience contrasted with my assumptions and expectations on a number of levels. First I mistakenly presumed that she had been bored, and unable to engage, but did so out of politeness. Then I presumed that the magic would be to exercise her, as the device was made in response to the fact that she had not exercised for more than twelve months. I was mistaken on both counts. Even within the carefully articulated, defamiliarising process developed for the *OWL circles*, assumptions may come into play. Constant vigilance is needed.

...reflections

Throughout the *OWL interviews* and *circles* I have repeatedly been surprised by the rich and imaginative responses from participants, and the idiosyncratic nature of both experience, and how experiences are expressed. When conducting research concerned with the relation of subjective experience or opinion, it may be difficult to allow the full range of responses to be present and accounted for, as tidy data is much easier to deal with. Yet *OWL* demonstrates, as *hipDisk* did in a different way, that the idiosyncratic nature of our humanity is deeply felt, and may be touching for observers, as well as participants. Providing opportunities to engage directly with such deeply felt experiences has consistently been reported as significant by *OWL* participants.²⁹⁴ Such outcomes suggest that acknowledging and working with the full range of data is valuable.

In the closing chapter of *What Technology Wants*, Kelly suggests that technology brings to us, individually, the possibility of finding out who we are, and more important, who we might be.²⁹⁵ By not prescribing pathways to knowledge, or outcomes to aim for, *OWL* leaves space for each participant's idiosyncratic self, allowing preferences and tendencies to be discovered, or uncovered, during the making and imagining process. That this process is embodied rather than intellectually navigated allows failure and chance to be sources for learning how to see with clarity and simplicity, just as they were for Cartier-Bresson with his

²⁹⁴ Personal correspondence

²⁹⁵ Kelly, *What Technology Wants*, 349.

“decisive moment”,²⁹⁶ though in the case of *OWL* to “see” can be taken to mean “understand.” *OWL* participants, in their modest way, like photographers who follow Cartier-Bresson’s lead, become risk-takers, discovering and capturing fleeting moments that otherwise may have gone unseen.

Judith Butler claims that:

ethics requires us to risk ourselves precisely at moments of unknowingness, when what forms us diverges from what lies before us, when our willingness to become undone in relation to others constitutes our chance of becoming human. (...) If we speak and try to give an account from this place, we will not be irresponsible, or, if we are, we will surely be forgiven.²⁹⁷

The *OWL* processes support “speaking and giving account from this place”²⁹⁸ throughout the different phases of the *circles* and of the *interviews*. Participants speak through the exploratory devices they make during the *circles*. They also speak and give account at each step along the way from their first choice of a desire, through the choice of body-desire pairing, materials, and at the end during the video interview, through words, when they declare their newly imagined reality to be so. A similar speaking and account giving occurs throughout the *interviews*: when participants articulate their inner experiences; name and describe the imaginary reality they construct for each *bodyProp*; choose desires; and construct self-portraits.

These processes shift the way that participants think about, imagine and also experience their bodies in relation to technology and desire. The structures afford the courage to discover, as well as to articulate discoveries. As Rollo May

²⁹⁶ Henri Cartier-Bresson, *Henri Cartier-Bresson (Masters)* (New York: Aperture, 2005).

²⁹⁷ Judith P. Butler, *Giving an Account of Oneself*, 4th ed. (New York: Fordham University Press, 2005), 136.

²⁹⁸ aka *ibid*.

describes it, they afford “The Courage to Create.”²⁹⁹ The results are enchanting, deeply felt, and continue to resonate long after the immediate experience.³⁰⁰ When considered through the lens of my taxonomy, the OWL project: the *interviews*, exploratory body-devices made in the *circles*, video interviews, and the *circle* itself may be described as (artistically-)poetic.

Souvenirs of the future

Susan Stewart, in her book *On Longing*, proposes that souvenirs are objects of desires that assist in the formation of continuous personal narratives that connect the present with the past.³⁰¹ *OWL* objects and devices connect participants through their imaginations and desires, as well as through the objects themselves, from the present to the future. They give form to, and assist in the formation of continuous, or ongoing personal narratives that support this connection. In chapter one I discussed the role of ongoing narrative in the formation of artistic-poetic experiences. If narrative experience evolves in ways that are surprising, unexpected, less than obvious or indirect, to result in the kind of suggestion, allusion, signification, juxtapositions and slippages that support multiple interpretations, the outcomes can generate poetic experiences. *OWL* devices embody imaginative futures that surprise the participants as they take form and are given meaning. They suggest, allude to and signify fulfilment of desires, in ways that are highly idiosyncratic, yet leave room for multiple interpretations.

Desire assists participants in maintaining a connection, throughout this process, to their re-imagining of that future. According to Solnit, we treat desire as a problem to be solved by focusing on the object of desire, rather than on the nature and sensation of desire. Yet with a slight adjustment of perspective desire

²⁹⁹ May, *The Courage to Create*.

³⁰⁰ Personal correspondence.

³⁰¹ Stewart, *On Longing: Narratives of the Miniature, the Gigantic, the Souvenir, the Collection*, in ch5, pp134-151 Stewart provides an extended discussion of souvenirs in relation to the past that can be mapped throughout to the OWL project outcomes in relation to the future.

could be cherished as a sensation on its own terms, since it is, she claims, inherent to the human condition.³⁰² She suggests that desire can only be displaced, not assuaged. Perhaps this is why the *OWL projects* are so satisfying? They give material form to desires and thereby displace them. But are participants merely displacing their desires? Or is something else happening?

When Kevin Kelly asked George Lucas “Do you think technology is making the world better or worse?” Lucas replied:

If you watch the curve of science and everything we know, it shoots up like a rocket. We’re on this rocket and we’re going perfectly vertical into the stars. But the emotional intelligence of humans is equally if not more important than our intellectual intelligence. We’re just as emotionally illiterate as we were 5,000 years ago; so emotionally our line is completely horizontal. The problem is the horizontal and the vertical are getting farther and farther apart. And as these things grow apart, there’s going to be some kind of consequence of that.³⁰³

Kelly believes we underestimate the strain of that gap. The *OWL* project attempts to close the gap by supporting participants in the envisioning of technologies they dream of, which are not adjacent possible and not necessarily what technology wants, at least not in any obvious or direct sense. The project affords a gentle confrontation of desires, bodies and dreams about technology. It effects a displacement of desires, by giving them form, but it also affords speaking and giving account from the place Butler speaks of, related to our inherent humanity.³⁰⁴

³⁰² Solnit, *A Field Guide to Getting Lost*, 30.

³⁰³ Kelly, *What Technology Wants*, 196.

³⁰⁴ Butler, *Giving an Account of Oneself*, 136.



Figure 34. Danielle Wilde and Kristina Andersen, *OWL circle* (2010)
 top: *OWL circle* participants, l-r: *sting* (vengeance); *whole in the shell* (curiosity); *hugging* (saving)
 bottom: *OWL circle* at The Interactivation Lab in Sydney. *the masticator* (eating); *the ring*

Conclusion

The *OWL* circle is a live volatile process, understood in the sense of John Dewey's notion of "experience:" immediate, continuous and involved in the very process of living.³⁰⁵ It is characterized by successive parts that flow freely into each other without seam and without unfulfilled blanks. There are pauses, places of rest, but they serve to punctuate and define the quality of movement, to sum up what has been undergone and prevent its dissipations and idle evaporation.³⁰⁶

The *OWL* devices may also be characterized as expressive objects, through which the artist and the active observer encounter each other, their material and mental environments, and their culture at large.³⁰⁷ Expression, Dewey writes, signifies both an action and a result.³⁰⁸ The *OWL* processes embody and bring into being such objects and experiential processes. The participants become both artists and active observers of their personal embodied discovery processes as they give form to their body-technology-desires.

By mixing ethnography ("science"), art and magic, the *OWL project* supports people through these embodied processes so that the processes may result in surprising, enchanting and deeply felt, (artistic-)poetic outcomes. Mixing art and science is not new, what is new is how people's relationship to art/science confluences has shifted.

Art and science may indeed be distinct disciplines, but they share a fascination with, and love of, the unknown. The scientist, J. Robert Oppenheimer once remarked, "live always at the 'edge of mystery' - the boundary of the unknown".³⁰⁹ In Shklovsky's view, "the purpose of art is to impart the sensation

³⁰⁵ John Dewey, *Art as Experience* (New York: Putnam, 1958).

³⁰⁶ *Ibid.*, 36.

³⁰⁷ *Ibid.*, 82-105.

³⁰⁸ *Ibid.*, 82.

³⁰⁹ Solnit, *A Field Guide to Getting Lost*, 5.

of things as they are perceived and not as they are known,"³¹⁰ and Solnit says that "it is the job of artists to open doors and invite in prophecies, the unknown, the unfamiliar."³¹¹ They therefore make comfortable bedfellows when attempting to explore unknown spaces and states of being. If, in fact, that thing the nature of which is totally unknown to us is what we need to find, then finding it is a matter of going beyond what we know. Whether we use the vehicles of art, science, magic or an idiosyncratic conflation of them to bring comfort is up to the individual. My research demonstrates that doing so has great value.

Through the *OWL project* I have been able to examine imaginative, as well as speculative extensions of the body. I have also closely examined and refined choices throughout the development process. The natural performativity of the body-devices has been given form through embodied interview processes, as well as in the video interviews. The results surprise and delight. With regard to my question concerning what might constitute a valid, stand-alone, cultural artefact when undertaking this kind of research, I suggest that exhibition of the exploratory devices as well as the videos is one approach.³¹² Another, quite different response may be found if we acknowledge the strength of blurring art and everyday life, as suggested by the use of the *Light Arrays* and other extending interfaces in abilitation and learning.³¹³ The *OWL project* may not quite afford the development of what Arthur C. Clark describes as "sufficiently advanced technology."³¹⁴ Nonetheless, participants are consistently strongly engaged in co-creation and collaborative imagining of "that which does not yet exist."³¹⁵ The embodied processes support the kind of experiences that Rollo May speaks of in *The Power to Create*,³¹⁶ and which I describe in this exegesis as (artistic-)poetic.

³¹⁰ Shklovsky, *Art as Technique*. In *Russian Formalist Criticism: Four Essays*, 16.

³¹¹ Solnit, *A Field Guide to Getting Lost*, 5.

³¹² See Wilde, Danielle, Kristina Andersen. "The Owl Project" Exhibition. In *The Art of Participatory Design in Participatory Design Conference (PDC)*. Sydney, Australia.

³¹³ See section 2.3, as well as: Wilde, "Extending Body & Imagination : Moving to Move."

³¹⁴ Clarke, *Profiles of the Future*.

³¹⁵ Meno, from Plato's *Dialogues*, in Solnit, *A Field Guide to Getting Lost*, 15.

³¹⁶ May, *The Courage to Create*.

This completes my discussion of the praxis. I will now provide a synthesis of my conclusions, and the contributions I have made through this thesis – the exegesis and praxis combined. I will also speak of future directions for this research.

CONCLUSION

The Poetics of Embodied Engagement

The aim of this investigation has been to posit a poetics of embodied engagement. To this end, I have interrogated the approach of practitioners and theorists in a broad range of disciplines, and have undertaken numerous practical experiments. Physically engaging body-worn technologies are not only artefacts, they are hybrid systems that are informed by Interaction Design, HCI, architecture, fashion, performance and technology research, as well as by individual project, practitioner and participant concerns. Importantly, in and within every activity a person undertakes, embodied experience is integral.

Movement is at the core of life. We come into the world moving.³¹⁷ Yet articulating deeply felt physically engaged experiences can be challenging. As Maxine Sheets-Johnson articulates:

What is experientially felt in both an affective and kinesthetic sense clearly poses a challenge to language not only because such experiences are dynamic, but because language is not experience in the first place.³¹⁸ Indeed, we experience the world and ourselves in wordless ways before we come to language experience, whether for our own benefit or communicatively for others.³¹⁹

In acknowledgement of the immanent struggle to engender clearly articulated outcomes from an embodied process, my emergent definition of poetic began with language. I drew heavily from discussions of poetic versus “natural” language, leaning on Shklovsky’s definition of “natural” as a signifier for a naturalistic, direct, everyday approach or experience.³²⁰ In no way did I intend to suggest that a pristine truth exists beyond language, rather I wanted to maintain

³¹⁷ Sheets-Johnstone, “Why Is Movement Therapeutic?: Keynote Address, 44th American Dance Therapy Association Conference, October 9, 2009, Portland, OR,” 1.

³¹⁸ This may seem to contradict Austin’s notion of “performative utterances,” yet a performative utterance is not an experience in and of itself. It is a speech act that brings experience into being. Austin, “Performative Utterances.” Performative utterances also constitute only one kind of speech act, there are many other forms of linguistic expression that conform more comfortably to Sheets-Johnstone’s assertion. The possible contradiction should, therefore, not be viewed as problematic.

³¹⁹ Sheets-Johnstone, *The Primacy of Movement*, 364.

³²⁰ Shklovsky, *Art as Technique. In Russian Formalist Criticism: Four Essays*, 16.

centrality of the body, placing embodied experience before language. By doing so I was able to reflect on the importance of action, narrative and meaning-making in experience; and on the qualities of attention that may be brought to the body as a result of wearing or viewing a physically engaging body-worn system or device. I could also contemplate how the nature or quality of embodied engagement might relate to or shift experiential and conceptual thresholds; and consider the ability of a body-worn device to engage the imagination or enchant the wearer or viewer. Finally, I was able to reflect on how the nature or quality of physically interacting with the effects of technology might extend the way we see, imagine or experience the world through our bodies, and consider how this might shift relationships to our bodies, as well as to body-worn technologies.

Through a carefully considered combination of practical experiments I was able to test my ideas as they developed, and in doing so arrive at a taxonomy of poetics in relation to physically engaging body-worn devices.³²¹ I used this taxonomy as a yardstick, to analyse and reflect on the poetic valence of the different praxis outcomes, as they reflected and responded to the different points in a variety of ways.

These points have proven to be useful in the development of embodied interactions that resonate poetically for a broad range of participants and applications. They emerged from the praxis and have been tested by and through that same praxis in a reflexive, as well as reflective process. I hope they will be taken up and further tested by other designers in contexts I have not envisioned.

Throughout this research process I have worked with a range of collaborators and participants from many cultural and socio-economic backgrounds. Some of the research was undertaken in French, and some in Japanese with translation. Interviews, discussions and experiments have been conducted in The United Kingdom, France, The Netherlands, Germany, Australia, The United States,

³²¹ Summary provided on pp58-59

Canada, Japan, South Korea and Hong Kong. The cultural breadth has allowed me to test broad applications and responses to my outcomes, taking into account the nuanced understandings and expressions engendered by the different contexts.

As discussed in this document, I have undertaken a range of projects and experiments. Together the outcomes represent a systematic examination of gestural, sensorial and also mechanical extension of the body. This research has been driven by, and distilled the following questions:

- 1. how might extending the body, gesturally, mechanically, sensorially, through the use of body-devices (artistically-) poeticise embodied engagement? (and what might this mean?)*
- 2. what are the impacts of different development choices of body-worn technologies on qualities of experience and engagement (for both wearers and observers)?*
- 3. What role, qualities and contexts for performativity, will most powerfully leverage what is made available by the interfaces?*
- 4. What constitutes a valid, stand-alone, cultural artefact when undertaking this kind of research?*

The answers to these questions are not simplistic. Nor are they necessarily the same for each project or context in which research is undertaken. What I have proven is that careful consideration of the proposed poetics taxonomy can guide the researcher to meaningful, and poetic outcomes as they engage with these questions.

In chapter one, I demonstrated that beginning with the body to arrive at a technologically facilitated opportunity for engagement leads not only to rich opportunities for playful interaction, but also affords access to complex and

idiosyncratic information about how people learn in, through and about their bodies. *hipDisk* afforded a multi-faceted examination of my third and fourth research questions: Performativity was examined in a range of contexts that led to the formulation of hypotheses regarding participation, that were able to be tested through the rest of the praxis. The work performed best as a participatory device for use in social contexts (i.e. with multiple players). *hipDisk* is now planned for development as a kit, that will support learning about electronics and the body, as well as body worn technologies, before the participant even puts it on. Once built and activated participants will then be able to play and learn further about their bodies and experience, ideally, through playful engagement with others.

Importantly, what *hipDisk* has to offer may only really be accessed through experience. *hipDisk* emerged from an embodied process and supports embodied cognitive reflection. It proved a rich foundation from which to conduct this investigation.

In chapter one I also discussed the *gesture≈sound experiments* and *hipDrawing*. *gesture≈sound* afforded focused development of vocal- and multi-modal prototyping methodologies for the generation of physically engaging gesture≈sound mappings. The aim was to develop a tool for use by electro-acoustic composers – for the development and performance of works. The outcomes deepened my understanding of how to support embodied cognitive reflection, and also suggested uses with people with autism and other spectrum disorders. *hipDrawing* allowed me to consider what might happen if performance and tool development are separated. The approach taken with *hipDrawing* facilitated nuanced investigation of performance with strict performer/audience separation. The outcomes led to a desire to step out of the process and observe how a choreographer or other performance practitioner might create work for physically engaging body-devices.

The *Light Arrays* project, discussed in chapter two, began as a simple experiment with passive light-based extensions and evolved into a year-long interrogation of the opportunities that might be presented by extending the body with light. This project serves as a case study for extended development of all of the phase one praxis outcomes.

The initial *Light Arrays* experiments pointed to two lines of research: (1) *augmented proprioception*, generated with an artificial visual feedback system, and (2) *enhanced body interaction* using an interactively augmented body with lights that reflect and respond to movement through time, as well as space. By following these lines of research over an extended period I was able to determine that complexity of technology does not affect poetic valence, rather it is the nuanced use of the technology in line with my taxonomy that leads to poetic outcomes.

Through the extended *Light Arrays* I was able to develop and test an interwoven, two-tiered design choreographic process that built on the approach taken with *hipDisk*, and also *gesture≈sound*, and that aimed specifically at supporting poetic outcomes. This approach was highly unusual, and challenging for the choreographers. Nonetheless the outcomes demonstrated that the approach was not only viable, but it was valuable. It led to viscerally engaging, poetic outcomes that were tested in the context of an international festival, with a broad audience.³²² I was also able to reflect at length on applications of the *Light Arrays* in abilitation contexts, and thereby build on the outcomes suggested by *hipDisk*, *gesture≈sound* and also *hipDrawing*.

³²² Every year the Yebisu International Festival of Art and Alternative Visions commissions an outdoor work, including performance, public demos and talks, as well as an interactive installation. The work is available to the public for free, so commands a broad audience. I was fortunate to be commissioned, with my collaborator Alvaro Cassinelli, to be the feature artist at the festival in 2011.

This investigation concludes with a final project that was undertaken concurrent with the *Light Arrays*. The *OWL project* was designed to undermine and challenge the assumptions that I might bring as a designer to the technology development process. The *OWL project* had several phases of development, each focused on refining methodologies for embodied cognitive reflection. The methodologies built on everything that had been learned throughout this investigation, as well as some of my original inspirations including the work of Bill Gaver et al on cultural Probes, ambiguity, playfulness and uncertainty,³²³ and the work of Dunne and Raby on design placebos.³²⁴ The *OWL project* brings together and carefully re-appropriates elements from these two methodologies, as a way to reflect upon traditional design methods, as well as how designers might support large technology shifts by bringing magic and desire into the mix, with art and technology.

future directions

This research has opened up several exciting possibilities for future / ongoing development. The first involves an investigation of volumetric extension of the body, to understand if this is a potent approach to bring people present to the affordances and openings of the body in motion. The second extends the *OWL project* to develop processes for embodied reflection about body-desire relationships and future technologies with people in palliative care. Both of these research projects are participatory, performative, and build on notions of extension and a poetics of embodied interaction.

Building on the praxis outcomes described in this document, it would be valuable to investigate whether volumetric extension might provide a novel basis for movement exploration for artistic purposes, as well as for open, creative

³²³ Gaver, "Designing for Homo Ludens."; William Gaver, "Curious Things for Curious People," (in Press) [online] <http://www.gold.ac.uk/media/36.gaver.curiousThings.inPress.pdf>, (2006); Gaver, "Cultural Probes and the Value of Uncertainty."; Gaver, Anthony Dunne, and Pacenti, "Cultural Probes."; Gaver, "Ambiguity as a Resource for Design."

³²⁴ Dunne and Raby, "The Placebo Project."

expression by people with motor impairments. As an example, if the shoulder blades are both extended with forms that overlap slightly, when the shoulders are brought forward and the back extended laterally, these forms could separate at the centre, above the spine. Similar openings may be highlighted at elbows, knees, wrists and fingers, as well as on or around the torso and other core areas of the body. My proposal is to investigate the poetic valence of bursts of colour, light or sound, which could be revealed by such openings, and their ability to prompt, or invite participants to explore through movement.

Drawing on the knowledge gleaned from each of the projects elaborated in this investigation, subtle and complex combinations could be explored. The intention is to understand how best to support nuanced movement explorations, and alternate interpretations of the poetic valence of atypical movement, such as is the norm for people with de-abilitating neurophysical conditions such as cerebral palsy or other motor impairments. Inviting otherly-abled participants into the development process would assist in the development of appropriate, as well as surprising avenues for exploration. It would also afford further investigation of the role that participation may play in both development and outcomes.

The second research direction I aim to pursue is to develop the *OWL* process for people in palliative care. Based on my discussions with members of the medical community,³²⁵ embodied cognitive reflection would be welcome by carers, as well as patients, friends and family in this area. In many respects death is the last taboo in western society. We do not have a single shared ritual to assist us with dealing with death. Rather, in developed Western countries people who are dealing with death can choose from a plethora of religions, rituals, idiosyncratic approaches to spirituality – found in self-help books or on the internet – or rituals that are embedded strongly in cultures which may or may not be their own. Yet the only two things that all people on the planet share is that we are born and we die. Such seminal moments afford heightened reflection. Supporting

³²⁵ Personal correspondence.

embodied reflection about body-desire relationships and future technologies with people who are free to dream about a future that, for them, will never come to be, risks being touching and deeply felt beyond that which has been experienced to date with *OWL*. If a person who is dying is supported to give free reign to their imagination, might their re-imagining transform how we think about the body, technology, and desire not only as we move towards that future, but also as we stand here today?

It is impossible to cover everything in an investigation of this scope, considering the fundamentally hybrid nature of the subject area. Nonetheless, by experimenting broadly as well as deeply, and referencing practitioners from a range of relevant fields, I have made contributions to readings of phenomenology in relation to body-devices; understanding how to support a poetics of embodied engagement when developing body-worn technologies; and addressing why doing so is essential if we desire to move beyond base functional concerns.

By developing processes that support embodied cognitive reflection, and retrospectively analyzing the outcomes, surprising opportunities for learning come into being. Open systems for embodied creative expression democratize engagement, giving equal value to atypical body schemas and motor capabilities. Learning and creative expression is thereby available for everyone. The payoff for the inclusive nature of this approach may be experienced across the fabric of society. Importantly, my approach is underpinned by the idea of engaging the body through the imagination and the imagination through the body, no matter the context or application. By maintaining the centrality of this idea, interwoven with all of the above concerns and considerations, I am able to consistently support a poetics of embodied engagement.



Figure 35. Danielle Wilde, *hipDisk* (2007-11)
the *hipdiskettes* take a bow

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praxis outcomes from the "Swing That Thing: moving to move" investigation
are also documented at: <http://www.daniellewilde.com>

APPENDIX: A

Residencies and Fellowships

February – March 2009

Visiting Research Fellow (eSense Project)

Pervasive Interaction Lab.

The Open University, Milton Keynes, Dept of Maths and Computing

The University of Sussex Creative Systems Lab Milton Keynes and Brighton, UK

April – May 2009

Inaugural International Visiting Research Fellow

Wearable Technologies, and TechTextiles.

Centre for Smart Materials.

Nottingham Trent University, Nottingham UK. Dept Design, Architecture and the Built Environment

21-22 May 2009

Guest artist, Ukiyo Project.

Brunel University, Digital Arts and Performance Lab

2007 and 2009 (4 occasions)

Artist in Residence, STEIM, Studio for Electro-Instrumental Music, Amsterdam.

July and September 2007: *gesture≈sound experiments* with Ross Bencina and Somaya Langley

May – June 2009: *the OWL project* with Kristina Andersen

July 2009: *hipDrawing*

March 2010 – March 2011

Australian Prime Minister's Australia Asia Endeavour Research Scholar

Ishikawa Komuro (now Ishikawa Oku) Lab, The University of Tokyo

Meetings and Lab Visits

Throughout the research I met with leading researchers and practitioners in my field(s). I requested their considered opinion of where technology in relation to the body might be heading, and how their research and thinking was evolving in relation to this question. I also enquired how they set-up their lab, school or current work environment, and functioned a day-to-day basis in the context of the funding, operational, cultural and social opportunities and constraints that affected them.

The conversations were open-ended and guided by the discussant. They assisted me in the considered development and understanding of my own operational environments, and provided a lens through which to better understand and discuss my outcomes in relation to each other, as well as the broader context of related research.

I list first the interviewees and discussants with whom I conducted lab visits and/or formal interviews:

- 2007 Prof. Tony Dunne and Fiona Raby, of Dunne and Raby, and the Royal College of Art Department of Design Interactions.
James Auger. Auger-Loizeau, the Royal College of Art Department of Design Interactions, and Philips Research, Eindhoven
Terry Rosenberg. Goldsmiths, Design. London, UK
Yvonne Rogers, Pervasive Interaction Group, Open University, UK
Nadia Berthouze, UCL Interaction Centre, London, UK
Joslin McKinney Emergent Objects Group, Leeds University, UK
Sabine Seymour Fashionable Technology, Parsons School of Design, NY
Jüssi Angesleva, Art+Comm and Universite de Kunst, Berlin
- 2009 Bert Bongers (Interactivation), UTS, Sydney, AU
Prof. Ross Harley, Head of New Media, COFA. Sydney, AU
Jane Harris, director Textile Futures Research Group, CSM, London
Johannes Birringer, Brunel University, Digital Arts and Performance Lab

DK Arvind, Speckled Computing, Edinburgh University
 Anne Marie Shillito, Haptics Lab, Edinburgh College of Art
 Caroline Naphegyi, le Laboratoire, Paris
 Pascale Lecoq and Krikor Belekian. Ecole Int. de Théâtre Jacques Lecoq, Paris
 Godfried Willem-Raes, Logos Foundation, Gent, Belgium
 Sergi Jorda and Martin Kaltenbrunner. ReacTable, Music Technology (MTG)
 Pompeu Fabra University, Barcelona
 Pedro Soler. Hangar Cultural Production Organisation. Barcelona
 2010 Prof. Skip Rizzo, Belinda Lange, and Sheryle Flynn, Institute for Creative
 Technologies, University of Southern California, Los Angeles, CA
 Prof. Mike Eisenberg, Craft Technology Group and Katie Siek, Wellness,
 Innovation and Interaction Lab, University of Colorado, Boulder
 Nwanua Elumeze, Aniomagic, Boulder, Colorado
 Joey Berzowska, XS Labs and Barbara Lane, Studio subTela, Hexagram
 Institute for Research-Creation in Media Arts and Technologies, Concordia
 University, Montréal
 Daniela Rosner, iSchool and Berkeley Institute of Design, UC Berkeley
 Adrian Freed Centre for New Music and Audio Technologies, UC Berkeley
 Kristin Kneidlinger, California College of Art, San Francisco, CA
 Murat Konar, Pixar, Oakland, CA
 Prof. Terry Winograd, Dept of Computer Science; d.school (guided tour),
 Stanford University
 Jon Cates, Head of New Media, School of the Art Institute of Chicago
 Sabrina Raaf, University of Illinois, Chicago, IL
 Tom Igoe, NYU, Interactive Telecommunications Program (ITP)
 Marko Tandefelt, Eyebeam Centre for Art and Technology, New York

 I also visited, and participated in the guided tour of d.school, at Stanford
 University.

In February 2010 I participated in the Graduate Student Consortium (GSC) at the TEI conference, at MIT Media Lab, Boston. The GSC consisted of two days of intense discussion with facilitators and other graduate student participants:

facilitators:

Ellen Yi-Luen Do, College of Architecture & College of Computing, Georgia Institute of Technology, Atlanta GA

Mark Gross, Computational Design Lab, School of Architecture, Carnegie Mellon University, Pittsburgh PA

Ian Oakley, Department of Mathematics and Engineering, University of Madeira, Portugal

Ivan Poupyrev, Walt Disney Imagineering, Pittsburgh PA

other graduate student participants:

Soumitra Bhat, Delft University of Technology

Peter Bennet, Sonic Arts Research Centre, Queens University Belfast

Elisabeth Eichhorn, Potsdam University of Applied Sciences, Potsdam

Natalie Freed, Personal Robotics Group, MIT Media Lab Boston
Staas de Jong, LIACS, Leiden University

Heekyoung Jung, School of Informatics (HCI Design) at Indiana University

Chris Kiefer, School of Informatics, University of Sussex, UK

Hyunjung Kim, Dept. of Industrial Design, KAIST, South Korea

Lillian Spina-Caza, Rensselaer Polytechnic Institute, Troy, NY

Emi Tamaki, Graduate School of Interdisciplinary Information Studies, The University of Tokyo, Japan

Andy Wu, Synaesthetic Media Lab, GVU Center, Georgia Institute of Technology

Jasmine M. Williams, Georgia Institute of Technology

Less formalised, but no less important were my discussions about research undertaken with:

- 2007 Kristina Andersen, STEIM, Studio for Electro-Instrumental Music, Amsterdam³²⁶
Atau Tanaka, Prof. Interaction design, Newcastle University, UK, at the time, co-artistic director, STEIM, and senior researcher at Sony CSL, Paris
Monika Hoinkis Art+Comm, Assoc. Prof. Universite de Kunst, Berlin
Professor Andrew Brown, Professor of Digital Arts, Griffith University, Brisbane, at the time, QUT and the Australasian CRC for Interaction Design³²⁷
Régine Debatty, we-make-money-not-art.com
Sabine Seymour, Fashionable Technology, Parsons School of Design, NY
Stajn Wijnans, Creative Music Technology, Bath Spa University, Bath
Nancy Mauro-Flude, Piet Zwart Institute, Rotterdam.
Jennifer Sheridan, Black Dog Interactive; Lancaster University; reActor2.
Dherera Hansika PhD candidate Deakin University and London Metropolitan University
Rachel Wingfield, Loop.ph, and Textile Futures Research Group, Central Saint Martins, London
Terry Rosenberg, Head of Design, Goldsmiths, London
Tobie Kerridge, Biojewellery, and Interaction Research, Goldsmiths, London
Ulli Oberlack, Central Saint Martins
Atau Tanaka, Director, Culture Lab, Newcastle University, UK
- 2009 Prof. Guillaume Paris Ecole Nationale Supérieure de Beaux Arts. Paris, F
Pau Alsina, Open University of Catalunya
Anne Priest, Deputy Vice Chancellor, Art and Design, Nottingham Trent University
Rory Hamilton, Live Work, London, UK.
Ann Light, Reader in Interaction, Media and Communication at Sheffield Hallam University, UK.

³²⁶ This meeting led to our eventual collaboration on the *OWL project*.

³²⁷ I had numerous valuable conversations with Andrew Brown throughout this investigation

Sophia Lycouris, Edinburgh College of Art

Anne Sarah Lemeur, the Sorbonne University Paris I

Susanne Jaschko, curator Netherlands Institute for Media Art

Julian Eichhoff, Head of Smart Textiles / Joining Technologies. RWTH Aachen University

Mick Finch, Head of 2D Pathways, Central Saint Martins, London

Helen Sloan, Director of SCAN, UK

Sally Jane Norman, Culture Lab, Newcastle University, UK

Stephen Barras (of UC, Canberra), IRCAM, Paris

Yukiko Shikata, curator at NTT ICC Contemporary Arts Centre

Georg Tremmel and Shiho Fukuhara of Biopresence, Japan

Prof. Anne Cranny-Francis (transforming Cultures), UTS, Sydney

Margie Medlin, Creative Path Choreographic Research Centre, Sydney

Martyn Jolly, Head of Photography and New Media Arts, ANU, Canberra

Paul Hay, Sculpture, ANU, Canberra

Stephen Barrass, New Media, UC, Canberra

2010 Prof. Liz Bradley, Clayton Lewis, Swamy Ananthanaraya, University of Colorado, Boulder

Hugh Herr. Director Biomechatronics Group, MIT Media Lab Boston

Prof. Terry Winograd Dept of Computer Science, Stanford University

Gordon Kummel, independent technologist, Chicago

Paul Catanese, Columbia College, Chicago

Shane Mecklenburger, Jenny Vogel, David Stout, University of North Texas

Dima Strakovsky, University of Kentucky

Jim Jeffers University of Massachusetts Lowell

Jonah Brucker-Cohen NYU Interactive Telecommunications Program

Tom Burtonwood, School of the Art Institute of Chicago

Cameron Tonkinwise, Sabine Seymour and Katherine Moriwaki, Parsons and The new School University, New York

Katherine Behar, Pace University, New York

APPENDIX: B

Research Presentations

2010 OZCHI, Australasian Computer Human Interaction Conference, Brisbane, Australia
PDC, Participatory Design Conference, Sydney, Australia
Hong Kong Baptist University Academy of Visual Arts, Hong Kong, China
YCAM, Yamaguchi Centre for Arts and Media, Yamaguchi, Japan, an OWL participatory lecture
ISWC, The International Symposium for Wearable Computing, Seoul, South Korea
DAP, The Devices That Alter Perception Workshop, Seoul, South Korea
ISMAR, International Symposium for Mixed and Augmented Reality, Seoul, South Korea
Hongik University, WCU Lab for the Convergence of Digital Technology and Art, Jochiwon, South Korea
ICDVRAT, International Conference Series on Disability, Virtual Reality and other Technologies, Viña del Mar, Chile
Geijutsu University Of The Arts (Gedai) Dept Of Film And Media Studies, Yokohama, Japan
Tokyo University (Todai) Dept Of Creative Informatics, Tokyo, Japan
GM Projects, Azabu-Juban, Tokyo, Japan.
Pace University Dept Of Fine Art. New York, New York, USA
Upgrade! Chicago / School of The Art Institute Of Chicago, Dept Film, Video And New Media, USA
California College of Art, Graduate Design Program. San Francisco, California, USA
University Of California Berkeley Berkeley Institute Of Design, Berkeley, California, USA
Concordia University Design And Computational Arts. Montreal, Canada
MIT Media Lab, Boston USA, TEI09, Tangible And Embedded Interaction. Graduate Research Consortium

- 2009 Monash University Performance Research Unit : Asking Questions Of
Performance As Research
Monash University Art & Design. Graduate Research Consortium
Victorian College Of The Arts, Melbourne, Australia. Re:Live Media Art
History Conference
Melbourne University, Melbourne, Australia. Ozchi, Interaction
Conference
Bmw Edge, Melbourne, Australia. Superhuman Revolution Of The Species
Dancehouse, Melbourne, Australia. Time Transcendence, Performance
Conference
Monash University, Melbourne, Australia. Time Transcendence,
Performance Conference
Creative Path, Sydney, Australia. Seam Spatial Phrases Symposium
University Of Technology, Sydney, Creativity And Cognition Studios
Tokyo University, Ishikawa Komuro Lab
Netherlands Institute For Media Art, Wearable T echnology: Powered Art
& Fashion Design.
Melkweg, Five Days Off Festival. Amsterdam, NL
Kampnagel Contemporary Arts Centre, Girl Monstar Future Feminist
Event. Hamburg, D
Dana Centre, London Science Museum, Surface Tension. London, UK
London Knowledge Lab, Ioc, London, UK
Brighton University, New Media, Brighton, UK
Lighthouse Arts Centre, Brighton, Uk. Royal College Of Art Design
Interactions, London UK
Open University Hci Seminar, Pervasive Interaction Lab, Milton Keynes,
UK
Queensland University Of Technology, Brisbane, Australia
- 2008 James Cook University, Cairns. Ozchi08 The Australasian Computer
Human Interaction Conference
University Of New South Wales, Sydney. The ARC Research Network in

Human Communication (HCSNet)
 Monash Faculty Of Art And Design
 Monash Faculty Of Art, Communication & Media Studies, Drama &
 Theatre Studies Depts, Melbourne
 QUT. Queensland Institute Of Technology: Fashion And Technology
 Helpmann Academy, University Of South Australia: Panel: Collaboration
 In New Media Art.
 CSIRO Textile And Fibre Technology, Belmont, Australia: The Future Of
 Wearables – Seeding Innovation.
 Uts Sydney. Music, Sound, Design Symposium: Panel: Instrument
 Building, Interactivity And Performance

2007 RMIT Melbourne. Embodied Interaction Design Symposium. Invited
 Speaker And Participant.
 University of Canberra. New Media Seminar
 This Is Not Art : Electrofringe, Newcastle, Australia. Panel: Wearnow,
 Wearable Technologies.
 STEIM, Amsterdam, The Netherlands. wiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii
 Workshop. Gesture≈Sound Experiments
 Open University, Milton Keynes, Uk. Hci Seminar And Demonstration Of
 Gesture≈Sound Experiments
 Leeds And Leeds Metropolitan Universities, Uk (Re)Actor2, The 2nd
 International Conference On Digital Live Art. Hipdisk: A Most Undignified
 Musical Instrument
 Australian National University, Canberra. Acmc07 – The Australasian
 Computer Music Conference. Hipdisk:An Interactive Sonic System
 Inspired By Core-Body Gesture
 Dorkbot Melbourne: DBM5,13+17. Three Different Presentations About
 Wearable Technologies
 DEST Science Group, The Australian Federal Dept Of Education, Science
 And Training, Canberra
 The National Museum Of Australia, Canberra. Wearnow Symposium.

Conference Attendance

(attended without presenting)

- 2010 CAA, College Art Association Annual Conference, Chicago, IL
New Media Caucus Annual Conference and Symposium, Chicago, IL
Humantific and NextD Sensemaker Symposium with Richard Saul
Wurman, Parsons/The New School. NY, NY
- 2009 Tangible Interaction Conference, Microsoft Research. Cambridge, UK
TechTextil and Avantex Textile and Material Fairs, Frankfurt Messe,
Frankfurt D
- 2007 Touch, Textiles and Technology Seminar, Constance Howard Research
Centre, Goldsmiths, London, UK
European Textile Network Digital Craft Conference, London Metropolitan
University, London, UK

APPENDIX: C

Light Arrays Choreographer feedback

(responses received by email)

Alessio Sylvestrin:

what was it like to choreograph, when an essential focus was placed on the costumes and their interactions?

Since the costumes had precise contact with the body anatomy, the costumes have been orienting a movement research, which could become coherent in a specific situation. By considering the reaction from the body to the costume and how the costumes could stimulate physical reaction as well, the act of self observation of results deriving from light movements replying to the body requested a particular kind of attention and time reaction since the creative process started. As well, the frame for presentation of the performance had as well integrate the spiral of Fibonacci sequence which gave to the performance structure another score for the physical reading of the dancers and the presentation in real space of the costumes.

what was it like to develop a work while these costumes were still being developed?

In such situation an experimental presence is probably preferable to allow the contents of the work to extend and because it was not always possible to see the real result as in the performance the act of imagination became quite a relevant aspect in taking decisions with out having the clear view of the possible results.

what was it like to create for and with and through the three different kinds of garment/interfaces we gave you : the laser spine, the in-visible skirt and the inertia LEDs ?

The three different kinds of garment/interfaces have been placed in different body parts and different problems had to be solved in function to the decision of placing the garment/interfaces in a specific body part. I will mention short

observations to each of the three garment/interfaces, which will not fully explain and just present some details. The laser spine, is not directly visible to the performer's eye and therefore an internal eye which orients the body from the dancers inside awareness needs to be open. The in-visible skirt, it is actually very visible and very present all around the body and it comports more concerns in the fact of wearing and object too. The inertia LEDs, confronted the reaction to dropping and swinging wait and time reaction to such kind of motion.

having done it, do you wish the garment/interfaces were different? if so, in what way?

The activation of the garment/interfaces with the manual control and the switch comported some extra actions which were not always spontaneous in performance and it forced some cut of the actions and in the flow of the all event. We have been able to activate mostly with our hands and I wonder if there would be a possibility to avoid it, or that another option to such gesture could be considered.

is there anything you didn't like or were frustrated by?

In some cases we wanted to keep the rigor of the actions as in rehearsal so to keep the choices of moving specific. In fact such choice of movements is more related to transfer of physical tensions rather than sustain forms or shapes carried in space and this can become more demanding to the eye of an audience not used to look at motions under such consideration. The fact that the garment/interfaces have been still developing during the performance period to create some non expected moments, which we could not always control in a productive way in the experiment.

if you could do it again, would you do it differently? if so, how?

Inside space is quite important to control better all elements necessary of the performance

how could the entire process change to better work for you as a choreographer?

The process gave interesting materials to work with as well for the kind of presence and approach is needed in works involving new media in dialogue to the body. Rather than a change the work offer the possibility of reconsider values and potentiality of existing motions placed and shared in a different balance.

and how do you think we could move from this experiment to the creation of a full evening length (approx 60min) dance/performance work?

I believe it can be possible to expand the work to a longer duration and I would need to consider a plan in indirect dialogue with an eventual context and space of presentation, since the surrounding in such work shapes the with strong influence all the elements involved in the work.

is there anything else you would like to say about the process? what was it like for you?

An intense period, offering great chance to discover interesting thought from other artists shearing their intention in unusual stimulating frame.

*Kentaro!!*³²⁸

What was it like to choreograph, when an essential focus was placed on the costumes and their interactions?

I was working to choreograph so the movement may enhance the aesthetic of the light, as well as to not be influenced by the excess light that comes randomly.

明かりがきれいに見えるような動きとランダムな余り明かりに左右されない振りを意識しました。

What was it like to develop a work while these costumes were still being developed?

I think it was difficult to create as we went along. But we were able to go to the next stage, because there was no way of knowing how it would turn out.

やりながら作るという難しさはあったと思います。ただやってみないと分からないことでしたので、次のステップにはなりました。

What was it like to create for and with and through the three different kinds of garment/interfaces we gave you : the laser spine, the in-visible skirt and the inertia LEDs?

This was not a problem.

特に問題なくできました。

Having done it, do you wish the garment/interfaces were different? If so, in what way?

It was not so hard to dance in. but yes, being able to dance in it was an important factor.

そこまでおどりにくくなかったですが、踊りやすさは重要です。

³²⁸ Translation of my questions into Japanese, as well as Kentaro!!'s responses into English provided by Kenichi Eguchi. Japanese translation of questions not included in this document, but available on request.

Is there anything you didn't like or were frustrated by?

It would have gone smoother without the light problems occurring during the performance.

やはり本番の最中に明かりのトラブルがない方がスムーズだとは思いますが。

If you could do it again would you do it differently? If so, how?

This, I can't think of yet.

これはまだ思いつきません。

How could the entire process change to work better for you as a choreographer?

Nothing specifically, but maybe to choreograph it so that it would maximize the variation of lights, or to maybe bring in something unexpected.

特にはないですが、明かりのバリエーションを活かす振付でしょうか。あと意外性??

And how do you think we could move from this experiment to the creation of an evening length (approx. 60min) dance/performance work?

It would be nice to have the progression and narrative that will keep their attention.

飽きさせない展開とストーリー性があると良いと思います。

Is there anything else you would like to say about the process?

Nothing specific. とくにないです。

What was it like for you?

It was very different from the way I normally work, so it was a great experience.

普段の作業とかけ離れているので、非常に勉強になりました。

APPENDIX: D

Funding Awards

- 2011 Bunkacho Agency for Cultural Affairs, Japan: project funding
The University of Tokyo: research and travel costs
Yebisu Int. Festival of Art and Alternative Visions: commission
- 2010-11 Prime Minister's Australia Asia Endeavour Award: stipend, travel and
research funding
- 2010 National Science Foundation of America: travel funding
- 2007-11 Australian Government Postgraduate Award (APA): stipend
CSIRO Textile and Fibre Technology APA top-up: stipend, materials
budget and travel award
- 2009 Ubicomp Grand Challenge Early Career Exchange Award: Stipend and
accommodation costs, Open University Fellowship
The Open University Pervasive Interaction Lab AHRC-funded eSense
project: research costs, Open University Fellowship
British Council Australia Design Researcher Award: stipend, travel
and research costs, Nottingham Trent University Fellowship
- 2008 Monash University Deputy Vice Chancellor (International), European
Travel Grant: 2009 research trip: Europe and Japan
- 2007 Monash University Postgraduate Research Travel Grant: 2007
research trip: Europe
(re)Actor2, the 2nd Int. Conference on Digital Live Art. Leeds, UK:
travel funding, conference attendance

other award:

- 2011 ABC TV NEW INVENTORS Invention of the Year finalist:
hipDisk (winner of episode 22, on air 6 July 2011)

APPENDIX: E

Associated Publications

Invited Article:

Wilde, D. Schiphorst, T. Klooster, S. Move to Design • Design to Move: a conversation about designing for the body. Interactions 18, no.4. New York: ACM Press. July+August 2011

Peer-reviewed Journal Articles:

Wilde, D. Extending Body & Imagination : moving to move. International Journal on Disability and Human Development 2011;10(1):31-36 ©2011 Walter de Gruyter, Berlin, New York. DOI 10.1515/IJDHD.2011.004

Wilde, D. Swing That Thing... moving to move: Extending our poetic and expressive potential. Second Nature International Journal of Creative Media, Vol. 2, 1. pp. 164-197. April 2010

Wilde, D. Body≈Sounds : an emergent sonic practice. Scan Journal of Media Arts Practice, Vol. 6, 2, September 2009. Available at:
http://scan.net.au/scan/journal/display_synopsis?j_id=17

Wilde, D. hipDisk: using sound to encourage physical extension, exploring humour in interface design International Journal of Performance Arts and Digital Media (IJPADM). Volume 4 Number 1. pp7-26. Intellect Ltd. 2008. DOI 10.1386/padm.4.1.7/1

Peer-reviewed Conference Papers:

Andersen, Kristina, Danielle Wilde. "Circles and Props - Making Unknown Technology." In *International Symposium for Electronic Arts (ISEA2011)*, (forthcoming). Istanbul, 2011.

Helmer, R., Mestrovic, M., Taylor, K., Philpot, B., Wilde, D., Farrow, D. Physiological Tracking, Wearable Interactive Systems and Human Performance. In Proc. 20th International Conference on Artificial Reality and Telexistence, Adelaide, Australia, December 2010. pp 57-62. Tokyo: The Virtual Reality Society of Japan.

Wilde, D., Andersen, K. Part Science Part Magic: Analysing the OWL Outcomes. In Proceedings of The Australasian Computer Human Interaction Conference (OZCHI10). Brisbane, Australia. November 2010. pp188-191. New York: ACM Press.

Andersen, K., Wilde, D. OWL_bodyprops_fitting_sessions.pdf Proc. Participatory Design Conference (PDC), Sydney, November 2010

Wilde, D. Devices that Alter.... A potted inquiry Proc. Devices That Alter Perception (DAP) Workshop at the International Symposium on Mixed and Augmented Reality (ISMAR), Seoul, South Korea, October 2010

Wilde, D. The Poetics of Extension : using art & design ideation techniques to develop engaging body-worn devices. paper & video Proc. The International Symposium for Wearable Computing (ISWC), Seoul, South Korea, October 2010

Wilde, D., Cassinelli, A., Zerroug, A., Helmer, R J N., Ishikawa, M. Light Arrays: a system for extended engagement. Proc. International Conference on Disability, Virtual Reality and Other Technologies (ICDVRAT) with ArtAbilitation Viña del Mar/Valparaíso, Chile. September 2010

Wilde, D, Helmer, R J N, Miles, M. Extending Body & Imagination : moving to move. Proc. International Conference on Disability, Virtual Reality and Other Technologies (ICDVRAT) with ArtAbilitation Viña del Mar/Valparaíso, Chile. September 2010

Wilde, D. Swing That Thing : Moving To Move Tangible & Embedded Interaction Conference (TEI) Graduate Research Consortium, Boston MA. January 2010

Wilde, D. Andersen, K. doing things backwards_theOWLproject interviews.pdf Tangible & Embedded Interaction Conference (TEI), Boston MA. January 2010

Wilde, D. A New Performativity : wearables and body devices. In Proceedings of Re:live Media Art History Conference. Melbourne, Australia. November 2009.

Wilde, D., Anderson, K. Doing things backwards: theOWLproject. In Proceedings of The Australasian Computer Human Interaction Conference (OZCHI09). Melbourne, Australia. November 2009.

Andersen, K., Wilde, D. doing things backwards_theOWLproject interviews.pdf. In Proceedings of The Australasian Computer Human Interaction Conference (OZCHI09). Melbourne, Australia. November 2009.

Wilde, D. Using technology to poetically extend the dynamic moving body. SEAM 2009 Spatial Phrases symposium Sydney. September 2009.

Wilde, D. Swing That Thing... Cross-pollinating Art, Design and Science to Develop and Evaluate Sensory Augmentation & Body Memory technology.pdf. a position statement for the Workshop on Key Issues in Sensory Augmentation. [<http://www.esenseproject.org/keyIssuesInSensoryAugmentationWorkshop.html>]. Sussex, UK. March 2009

Wilde, D. The hipDiskettes: Learning (through) Wearables. In Proceedings of The Australasian Computer Human Interaction Conference (OZCHI08). Cairns, Australia. December 2008.

Wilde, D. Swing That Thing: the dynamic moving body in interactive, body-centric elements and systems. Workshop on Embodied Interaction in Mobile, Physical and Virtual Environments. The ARC Research Network in Human Communication (HCSNet) SummerFest. Sydney. December 2008.

Bencina, R., Wilde, D., Langley, S. Gesture \approx Sound Experiments: Process and Mappings In Proceedings of The 8th International Conference on New Interfaces for Musical Expression (NIME08), Genova, Italy, June 2008. p197 - 202. ISBN: 13-978-88-901344-6-3

Wilde, D. Extruding the Body with Light to Make Visible the Spatial Relationships inherent in Gesture and Posture Workshop on Pervasive Visual, Auditory and Alternative Modality Information Display. The 6th International Conference on Pervasive Computing (PE08). Sydney. May 2008.

Wilde, D. hipDisk: a most undignified musical instrument. In Proceedings of (re)Actor2. The Second International Conference on Digital Live Art. Leeds UK. September 2007.

Wilde, D. hipDisk: an interactive sonic system inspired by core-body gesture. In proceedings of The Australasian Computer Music Conference 2007 (ACMC07), Canberra, Australia. June 2007.

Wilde, D. hipDisk: an interactive sonic system inspired by core-body gesture.(with ammendments) Published by Craft Australia at <http://www.craftaustralia.com.au/research/20070826.php> [posted 26 august 2007]

APENDIX F

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gesture≈sound experiments

~ a collaboration with Ross Bencina and Somaya Langley

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Michael Borthwick: video and editing, second Dancehouse performance

JoAnne Fishburn and Xanthe Beezley: feedback

The Light Arrays

the basic Light Arrays, Australia:

Monash University Faculty of Art and Design

Karen Berger, Tim Page and Elijah Ungvary: performance

the extended Light Arrays, Japan:

~ a collaboration with Alvaro Cassinelli

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Yebisu International Festival of Art and Alternative Visions

Bunkacho. Japanese Agency for Cultural Affairs

concept and direction: Danielle WILDE and Alvaro CASSINELLI

garment design and construction: Danielle WILDE and Alvaro CASSINELLI

interaction programming : Alvaro CASSINELLI and Danielle WILDE

traditional electronics: Alexis ZERROUG, Danielle WILDE and Alvaro CASSINELLI

soft electronics: Danielle WILDE

PCB design and construction : Michael BORTHWICK

performance lighting design: Yu Endo

duet:

Choreography : Alessio SILVESTRIN

dance : Alessio SILVESTRIN and Naoya AOKI

sounds : Piers MORGAN

solo performance:

choreography, dance, sound : Kentaro !!

光らせん • Corasen : (performance décor and interactive installation)

concept and direction: Alvaro CASSINELLI and Danielle WILDE

spiral base : Alvaro CASSINELLI and Alexis ZERROUG

dynamic structure : Danielle WILDE

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~ a collaboration with Kristina Andersen

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Richi Owaki: video, Studio Imaichi

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