Connective Tissue: the flesh of the network

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Thank you Rachel and thank you Kim, for amazing feats of organization, particularly for dealing with jet lagged speakers who leave their power supplies at home. It is always a bit of a reality check when you realize that no matter how long you've been working with computers, something as daft as leaving the plug or the power supply on your kitchen table can still occur.

I am very happy to be here, and to be addressing a dance audience. My research is hybrid. Dance has never left my research, but over the past few years I've found myself addressing more video arts, visual arts or installation arts audiences, so I have this tremendous sense of coming home to a dance audience, it has given me a feeling of being grounded and being able to breathe. A few months ago I gave a keynote at a cyberarts conference in Bilbao, Spain. Some of what I'm going to talk to you about today I also presented in Bilbao, but without getting the feedback I desired. I was discussing a certain level of body knowledge and body networks. I was using, and you'll see me using, the concrete as well as the metaphoric senses of connective tissue as a way of understanding human networks, technological networks, social networks, and even though the audience was very interested and attentive, I did get the impression that a lot of what I was saying was just a little too body focussed for that crowd. At that time I knew that I would be addressing a dance audience soon, and that's …here.

I want to thank Kim for selecting a very topical and relevant title for this conference: the notion of rebooting, reinitialising the grid. The term grid might initially seem to be a bit harsh and a bit jarring, but I must say that about a year ago I addressed a different crowd at a different conference coordinated by the New Museum for

Contemporary Art in New York city at Cooper Union, which is a big architectural school, and the title of that conference was 'Living inside the Grid', and then of course at Bilbao we were talking about the notion of networks. What seems to be happening at the moment is that there's a need to redefine, reintegrate and recorporealise the meanings of the grid and the network. What do we want them to mean based on our knowledge of how we exist in society, and based on our understanding of how our body works?

I am currently based at the School for Interactive Art & Technology at Simon Fraser University in sunny Vancouver. This school integrates designers, computer scientists, engineers, and artists -- visual artists as well as dance artists. Working in this quite broadly based science / technological context gives me a new appreciation and a new perspective every day on our own formation, the formation of the dancer. Often I have to defend my position to a group of rather sceptical engineers or computer scientists who feel that what I do isn't research. It constantly makes me readdress my own formation, our own formation, keeping in mind the validity, keeping in mind where we might need to shift some of our assumptions, and also where we need to stand firm on what is valuable about our approach.

I'll begin with a bit of a contextual overview, and then I'm going to talk about networks and audience – performer relations, and finally I'll introduce a couple of projects. One is an installation piece called 'trajets' and the other is an ongoing research project in wearable computing called 'whisper[s]'.

broader implications of dance research

The current expansion of dance research into other fields arises, I'd say, not just out of interest but out of necessity. And I would say this necessity is less on the part of ourselves, than it is on the part of the other areas of knowledge and research. And these other areas, which I'll refer to just in brief as the ones I deal with most directly, include the broad area of design, by which I mean product design, as well as human interface design and human experience design, technologies, the creation of devices, the creation of mobile phones, PDA's (personal digital assistants or organisers), computers, including also smart devices, smart systems, systems that will sense human beings in the environment whether this is from the perspective of architecture

or from the perspective of performance. I will also say that there is a political need to take more seriously human bodies, and physical communication on a variety of levels as our society becomes increasingly technologised; particularly if we're aware of the changes that we want to enact on a global level.

Philosophy too. We're dealing with the question of what constitutes an emancipatory discourse. How do we change our way of thinking to really have an impact on the world? So in the light of this I look back about ten years and say that the theorising of the body that occurred in the 90's was extremely important and absolutely essential, and now I think we need to take it deeper. This is where, for me, the real work begins, and the real work is about conceptual depth but it is also about practice, it is about doing, about making, about spending time in the studio, and understanding what it is that we're doing and why we're doing it. So many of us just do that. We actually work in our own little space. It feels like it's a very micro-level endeavour, but when we actually do create something and then reflect upon it, somehow it radiates outwards and it will actually touch people across seas, across continents. But it originates from that moment of actually doing, sitting there thinking about it, moving through it.

I am dealing with some of these questions in a book (forthcoming in 2007, published by The MIT Press) which is very deliberately called "Closer: Performance, Technologies, Phenomenology". It is written from the perspective of embracing our technologies, but not willy nilly. Not just that we have to because it's the latest fad, but because when we actually work with technologies we are able to understand more about ourselves, and to understand more about how we want our technologies to respond to us. The result may be new and different technologies, and social and artistic uses of them.

Some questions to be posed >>

What exactly is body knowledge? Now that philosophers, biologists and neuroscientists are acknowledging distributed intelligence, other areas are now realizing that the locus of our intelligence is not just in our head, in our brain, that we actually have brain cell matter throughout our bodies, in our joints for example. Our thinking, our moving through the world, occur on a full body level, not just as a mind.

Second question. What are the implications, socially, artistically and politically, of truly overcoming the mind-body split? (which I'm sure a lot of us have to deal with in our daily research and practice) What I'm really hoping is that at one point we will be not in the position of having to overcome, to integrate mind and body, but we actually originate from a position where that duality isn't even on the horizon. That we will be beyond it. We will no longer need to overcome it. We will actually be somewhere else where there is already integration.

Third question. What are embodied kinaesthetic first person methodologies, and how can they be transposed into other design, development and research processes, across arts, sciences and humanities? This is a huge area. There's a real resurgence of interest in phenomenology as a methodology. As someone working in this area, I am interested in not just blindly trying to follow Merleau-Ponty's, Sartre, Heidegger, but in asking what phenomenology can be for us now? What is a first person methodology that can be transposed into other disciplines, so that the relevance of the human being, of the embodied subject, is not lost. In art, in design, in other sciences.

Fourth question: What are the social and political implications of such a body centric approach? The body never exists in a void, just as computer technologies do not transcend cultures.

Fifth, what does a choreographic sensibility bring to the broader picture of human engagement. How many of you, when you see a video sequence of a person or footage of a crowd moving, whether it is just a city scene or whether it might be a more focused task with certain objectives, see it in terms of choreographic patterns? You see the flow. You read the gaps between bodies. You see a rhythm happen, whether it is people driving, or using bicycles or just walking. We have a refined sense of the choreography innate in all movement, organic or inorganic. I think that now, this is going to become more and more significant and across other areas. This ability to understand human flow and rhythm is going to become quite valuable; and when we view the wider social world in terms of choreographic patterns, what sort of poetics or aesthetics emerge from this?

Finally, and this is something I've been thinking about a lot as of late, how can a transformative model of philosophical practice, based on critique, praxis and emancipation, be drawn out of our physical art? I'm very interested now that there are people who are not afraid to say that what they want to do is enact some form of change, based on a very aware critical practice.

transposing kinaesthetic awareness

My two main marginal approaches to the dance world are actually the media and technology approach and the philosophical approach. I use the word marginal loosely. These two approaches allow me to see more clearly a certain fundamental lack of confidence or lack of awareness, on the part of dancers: there's nothing like stepping slightly outside of the dance world to see what we don't realise we have going for us. What I call a lack of confidence, or perhaps an over-modesty, translates, sometimes, for a large number of us, into a tendency to do what we do for little money, in front of tiny audiences, with the presumption of limited social scope, and relevance. It is like we're happy to do what we do, we've got our small audiences, and that's fine. It is meaningful for the people who receive it. Historically we were really liberated by the postmodern 'dance for dance's sake' premise, the self-sufficiency of the body, the idea of movement in itself being enough, so we see a beautiful line up on stage, and do not need to go much further: we derived a lot of satisfaction out of that, and that was the end of it. I think that was extremely liberating, but I also think now, that was limiting. Now, our body practices and our tremendous understanding of bodies have greater significance than simply appreciating a line in space, or a dance for dance sake, or a movement for movement's sake. My suggestion is that we can think through the kinaesthetic sense of movement and derive social, philosophical, political and even economic impact. A very, small example: think about bodies sitting on a plane and realize the incredible sense of well being you can get by windmilling your arms back, opening your chest and extending your body after 10 hours of flying. How can that simple awareness be translated into a new sort of chair on a plane? Or consider the benefit of social spaces, built into our world, where it would be acceptable to invert your body, to actually lie horizontally for a while. These might seem like banal examples, but they come from a sense of knowing what is good for our bodies, knowing what produces a

sense of well being, or a sense of ease, and then seeing how this can be extended further into the wider world, into design processes.

Designing for kinaesthetic impact is what is needed, I suggest, on a widespread social level. It is evident when we design a relation between performers and audiences that breaks the conventional mould. A lot of designers are designing for kinaesthetic impact across performers and audiences. When we say, no, we don't want to use the proscenium stage, we want to embrace the installation format, we want to do something in the round, we don't yet realise that what we are doing is a kind of kinaesthetic design with the potential to be transposed to other practices. We might simply think "this piece needs to be constructed this way," but in fact, what we're doing is creating a whole new social dynamic, which has significance beyond the black box of the theatre.

This approach recognises the profound physical and energetic mapping that occurs across people. It acknowledges the electromagnetic resonance of human bodies, and the shifts that can occur when subtle levels of physicality are consciously accessed and transformed. And it occurs all the time, this electromagnetic repatterning. When a dance teacher or a choreographer (this is an example) conveys a movement or a movement quality by demonstrating with various degrees of proximity, or by actually laying hands on, she is patterning your physical and electromagnetic flow. When a yoga or Pilates teacher achieves a shift in your movement, simply by standing near to you and focussing on breathing -- sometimes they don't even have to touch you, they'll just stand and breath in a concentrated way next to you -- you can feel your whole body realign, you can feel the texture of your muscles and your movement quality shift, that's a repatterning. When somatic techniques involving visualization and shifts in channels of awareness are effective, a similar repatterning happens.

I mentioned a moment ago how performers use alternate theatrical conventions to achieve a different connection across performers and audience – a connection that has formal structures, obviously, regarding sight lines and where people sit or stand, and how far or near they are, but in addition to the formal structures, more importantly, emotional, kinaesthetic, and more subtle layers of physical engagement are implied. This accounts for the lure of the installation for so many choreographers. The idea

that you might want to keep your audience members shifting, moving, is appealing. They might start off in one location, and move to another. This is like the old form of the promenade theatre. It also accounts for the lure of interactivity. Some choreographers, particularly when they use computer systems, or visual projection, are interested in achieving a certain level of responsivity or interactivity across performers and audience. Part of the motivation for this is the recognition that there is a different emotional and kinaesthetic engagement when there is a level of interactivity happening. And as a community, we're still working on what interactivity means in live performance. I know Sarah Rubidge and a few other speakers at this conference will be able to contribute to this too. It is definitely an open question. So I'm calling for us to take a step back, to take a broad perspective on what we do, on what we know, and on what we have to offer. And it is hard to know what it is that we know. We often need a disruption in order to realise what it is that we do, what it is that we know. It is easy for what we know to become effaced in the whiteout of being simply what we do, or the mundane fog of daily practice. This in no way means that we abandon our art, or the glorious mundanity of what we do. Martin Heidegger was remarkable for being philosophically very complex but at the same time elevating the notion of the mundane, of the daily, of this notion of dwelling within a practice. By saying something is mundane, I'm not trivializing it. I'm actually saying instead that by being so proximate to us, it is one of the most important things we do, and one of the most important bases of our knowledge.

To conclude the first part of this presentation, I suggest that is it is desirable for us to see the richness and the transferability of our mundane and daily activities. Effectively, I'm adding this idea of the transferability of kinaesthetic awareness of performance design to the debate around the sustainability of dance that occurs at this conference. It is not just about sustaining dance, it is about seeing what we actually do, how this can be transferred outwards and reaffirmed within our community.

What follows are small and idiosyncratic examples of this transferability. I'll discuss a few projects, emphasising a particular conceptual and philosophical way of working with computer technologies, plus physical, social and choreographic implications. My methodology is an intuitive phenomenology. There is no strict formula, but there

are guiding principles, and these principles are conceptual, ethical and academic. There are trajectories and above all there are impulses.

connective tissue as the flesh of the network

I ask everyone now to just take a breath, and close your eyes. And what I'd like you to do is take a couple of seconds to centre into your bodies, feel your feet and shoulders relaxed, and visualize a network: the first thing that comes to your mind when you think of a network. Let a geometric or kinetic pattern arise in your mind. And don't change it. Just let the first one that arises, stay with you. And then I'd like you to open your eyes, and ask yourself which of these terms, perhaps none of these terms will be relevant, but which of these terms best describe what you just had in your mind. Is your network a grid? Or is it more of a web, a lattice, a weave, or a mesh? Thinking about your network, consider its complexity. Was it very dense? Was it clear, with a lot of open space? What was its size? Did it feel like it was microscopic? Did it feel like it extended way beyond you, containing others? Was it 2D? 3D? Or maybe 4 or more dimensions? Did it have warps or twists to it? Was it linear or curved? But above all, do you have a sense that what you thought of when you thought of network was dynamic or static? I suggest that the flesh of the network refers to dynamic, emerging, embodied networks.

A lot of the notions of network that dominate computer or media culture, and the internet and telecommunications worlds, are aware that a network changes over time but the modelling tends to feel quite static. When I talk about the flesh of a network, I'm referring to an idea of dynamic, emerging and embodied networks. Obviously, the human body and movement can challenge conventional notions of networks, but other practices can do the same. I'm thinking of knitting – I absolutely love the sensuality and complexity of textiles and find them able to illuminate corporeality alongside physical practices – if I could go back and study a whole lot more, I'd work with textiles. I love the hybrid, irregular and continuous flow of a piece of knitted … anything, whether it is rope, wire or wool.

networks of the body: connective tissue / fascia

The image with the slightly dotted pattern at the bottom corner of the screen is a close up of human connective tissue. Looking to connective tissue as a human grid is a fantastic way to reinitialise, or reboot, our ideas around networks.

Some of you are, I'm sure, massage therapists or somatic practitioners and will know far more about this than I, so I look forward to talking to you afterwards. What I now will do is sketch some ideas I discovered from a fascinating few pages taken from a manual that my massage therapist generously shared with me. I'll talk about connective tissue in the context of networks, and I'll also introduce, when I get onto discussing the projects, a couple of notions from Merleau-Ponty, which I find really useful for considering interactive work, work with technologies. These are *reversibility* and the *flesh*, and then maybe a little bit on alterity if we have time, alterity being an idea about otherness.

Hubert Goddard is a researcher and former head of the Department of Dance at the Université de Paris VIII; he also works in an occupational therapy clinic in northern Italy, dealing with patients who are preparing for major surgery. He is concerned with understanding how the brain and the body connect when it comes to dealing with the trauma of surgery and healing afterwards. And he's also a Merleau-Ponty scholar. I remember meeting him a few years ago when he emphatically said ' the body does not exist; we are nothing but connective tissue.' ('Le corps n'existe pas, nous ne sommes rien que le tissue connectif'). At that time I was a bit taken aback because I wasn't prepared to accept the disappearance of the body – I had a very particular relationship to materiality. When I started working with computers I didn't want to give up the sense that I was material. I wasn't ready to make that leap into cyberspace, into the dissolution of my body. When Hubert Goddard said 'we are nothing but connective tissue', I wondered if this was another dematerialization. I realize now that he was entirely right, I just didn't understand things well enough, and that's why I was wary. Now that I understand more about connective tissue, I see that it is not about dissolving our materiality. It is about understanding better what our materiality is. About understanding more the composition of matter.

Connective tissue is a living metaphor with physical, social and philosophical relevance to the consideration of networks. The connective tissue or fascia, which I'll refer to as a subset of connective tissue, it spreads throughout the body in a three dimensional way, without interruption, from head to toe. Fascia surrounds, but also infuses, all our organs, and our bones, down to a cellular level. There are three levels of fascia in the body. There's the superficial, which is just below the dermis. There's the deep, which surrounds and infuses muscles, bones, nerves, blood vessels, organs and cells, and there's the deepest level of fascia, which is the cranial-sacral, or dural system, encasing the central nervous system, the spine and the brain. It has been estimated that if we removed every bone and every organ in our body, except the fascia, that our body would maintain its volumetric shape. Think of that famous 18th C engraving, I think it was by Vesalius, where you have the empty envelope of human skin held out at arm's length and dangling like it were a piece of cloth; this was intended to be an example of what would happen if you removed the organs and bones from the body. It is not entirely accurate. If you were to leave the fascia behind you would not have an empty envelope of flapping skin, you would actually have the volume of the body, more or less as it is now. So in addition to keeping everything connected and in place, the fascia also creates separation within our bodies. It creates space for nerves, blood vessels, fluids, and the rest. This is important to bear in mind because we tend to think of networks mainly as ways to stay connected, but in fact networks preserve ways for us to stay separate. They actually enhance the gaps as well as the connections. We're not collapsed into somebody when we're connected by a network, just as our body or organs aren't folded into one another because the fascia holds them apart.

The other thing about fascia is that it is enduring but it is also adaptive. It has maintained its general structure and its purposes over the millennia. Its functions are evident in the earliest stages of multicelluar organisms, in which two or more cells are able to stay in contact, communicate and resist the forces of the environment. Yet despite its evolutionary pedigree, fascia is not an autonomous metastructure. This is a quote from the massage therapy textbook, "it will organize along lines of tension imposed upon it, and can produce bizarre and seemingly unrelated clinical results in adjacent areas of the body." Anyone who seen a massage therapist about a sore neck, and has noticed that work on the neck can cause pain on the opposite side of the body

down by the hip or elsewhere, will attest to the peculiar lines of tension that can be created across the body. It seems to be illogical, but fascia has its own logic. The reason for this is that fibres run in various directions, so that they appear interwoven, without one direction dominating. Fascia is not linear. It has been called, in therapeutic journals, a potential space and an interstitial space. I got very excited when I discovered in this anatomical journal highly poetic, highly metaphoric terms. Calling something in our body, a piece of our anatomy, an interstitial space, or a space of potential, seems to be a highly poetic way of describing it. And as a space of potential, an interstitial space, this network is quasi invisible. Merleau- Ponty has discussed the visible and the invisible, celebrating the function of the invisible. We exist through so much that is invisible, whether it is somatic layers of knowledge or the fact that fascia is not actually seen or visually captured by medical devices. It does not show up on X-Rays, it does not show up on electromyograms or computerised tomographic scans. The way we encounter fascia is by touch. That which is invisible can be tangible.

Immediately we have a transposition across senses. We are no longer relying on vision to get at an integral part of our body's network, we have to rely on the other senses. We rely on touch, either the touch of another, or the touch of ourselves. We also sense fascia through movement. We know when there's a constriction. We know when we can only move to this position when we used to be able to reach this position. We have a kinetic engagement with this network within our body. It is kinetic, kinaesthetic and tactile.

Connective tissue becomes a living metaphor for networks. As we understand networks better, we grasp their potential and the complexity of new networks. By considering connective tissue, we get an inkling that the wider world, the worlds of media and computers, have notions of networks that are no longer accurate to describe the way networks are functioning. An examination of the body's networks may actually help the computer scientists and the engineers understand better what's going on with their networks that they create by problematising some of the assumptions. Because networks aren't linear, they aren't predictable. There is a lot of irregularity to them. We know this. We understand this. Connective tissue becomes a living metaphor for networks that we can actually share with the wider

world. This notion of surrounding and permeating, connecting and separating, adaptive, which means it transforms, possessing its own logic, which may seem alogical, but is in fact a different logical structure, and it can be accessed and understood physically.

media performance and installation

Expanding this notion of interstitial spaces, I suggest that any time we create a piece, a dance performance, an installation, a theatre performance, we're actually creating a space of potential. We're creating an interstitial space, where the audience and the performers are connected but also separated, where there's a logic and a relation between them. I will present an overview of various formal structures of interstitial spaces linking audience and performers, then I will describe a couple of projects in greater depth.

between performer & audience >>

This is an image from a piece called *contours*, which some of you here will know and will have seen (1999, by Mesh Performance Partnerships, software and visuals by Kirk Woolford, architecture by Horatio Monteverde). What we created for *contours* was a huge wooden structure for the audience to stand on. It was 8 metres in diameter, 6 metres high. We were aware that we wanted to create a different sort of relationship between the performers, the kinaesthetic activity, and the audience, so we created an entirely different interstitial space. When you work with technologies, you're also able to create a different relationship across performers. Here's a very hazy still from the *contours* performance, the first piece of software. What you can see is an outline of two bodies, abstracted and projected onto the floor. The cameras captured the performers' movement and a piece of software processed the movement by registering what changed frame by frame; so if we were totally still nothing showed up, if we just moved an arm, only the arm was visualised and projected into the space. What the performers did, in the end, was that they crafted their relationship with each other – with each other in physical space, but also in digital space, in camera space.

between performers & their own bodies >>

It is possible to interpret technological mediation as a way for performers to engage with their own bodies and their own narratives differently. This is an image of was a different piece of software from *contours* which tracked with a grid the body was moving most quickly. So as we were moving and improvising we were aware that we were able to pull the grid to different parts of our bodies, and we understood our own body's movement through the technology. It gave us a different space and understanding of our own narratives. (Note: the second dancer in contours was Ruth Gibson)

between audience & their bodies >>

Here is an image from another piece called *whisper[s],* which I will describe at greater length in a few minutes. This is an example of audiences engaging with their own bodies through technologies. And this is a departure for a lot of dance – not totally, but a lot of professional dance does not allow for the audience to engage with their own bodies in such a specific way. Here you see a little girl wearing a wearable garment, she uses her fingers to connect with an electronic patch on her garment which will help her access her own respiration data or her own pulse data, so it can be externalised and projected onto the floor.

between audience & their bodies through performers' bodies >>

It is worth remembering that audience members can connect with their own bodies, not only by wearing garments containing wearable computers, but more conventionally by responding kinaesthetically to the performers' bodies. Dancers make great audience members because we're always reading the movement on stage through our bodies, and if we're really into it, we will twitch and squirm in on our chairs, annoying the people around us. This happens in any good dance and good theatre. We are actually able to gain knowledge of ourselves through extreme empathy, kinaesthetic empathy, with what happens on stage, and when you're working technologically you have the ability to actually increase this.

between audience & mediated performers or objects >>

When we work with technologies it is possible for us to create a space of relationship between audience and mediated performers or objects. This is an image from *trajets*,

the piece I'm going to talk about immediately after this. This piece did not have live performers, it involved visual imagery of movement projected across motorised screens. The audience walked through the screens. The screens and imagery responded to the audience. This way, the element of the performer, the performing subject, was shared by the inanimate screens and by the visual imagery.

between audience & audience >>

And the final examples of connections through interstitial space are those between audience and audience. This image is from the wearables piece again. Audience members were able to connect literally and metaphorically by giving their body data (respiration, pulse) to other audience members by means of a shared gestural dialogue.

trajets

That was the overview. Now I'll talk a little bit about *trajets*. *trajets* is an installation that has twenty-one screens suspended from a large aluminium structure, and a sensing floor that tracks the visitors as they walk through the screens, identifying where they are on an x-y plane. The information on positions of the visitors is processed by the computers, which in turn control screen movement. As you approach a screen, it will know you are coming near and it will gently spiral either away or towards you, your position indicates which video imagery is projected out across the screens. An ecosystem of relations between people, screens and images is created.

Most of these technologically complex pieces are massive collaborations with an incredible team of highly skilled artists, composers, engineers – we try not to use the word 'technologists' because it implies something of a hierarchy. I have been really fortunate to work with an amazing team on this piece. (I co-directed with Gretchen Schiller, software by Robb Lovell and Scott Wilson, hardware by Pablo Mochcovsky, architecture by Shaun Roth & sound by Jonny Clark).

The inspiration for the title *trajets*, which is the French word for trajectories, comes from Paul Virilio who indicated that between the object and the subject there was the trajectory. We are not interested in the static endpoints of subject and object, but in that flow between them.

Now, I'll just show you some of the imagery. Gretchen Schiller and I came up with the concept and a strategy for capturing movement through video. Gretchen is a dancer/choreographer trained at UCLA and an excellent dance videographer. We wondered whether we could get the sense, the kinaesthetic sense, of bodies, without actually having a live performer in the space. We wondered whether, if we created an installation, people would feel in their guts the different quality of movement – a drop or a whoosh or a slide. We did a lot of camera experiments that involved rolling, falling, working at the border between controlling movement and loss of control. We filmed on a climbing wall, we filmed in mud, we filmed in water, we filmed in harnesses, and most of the kinaesthetic quality in these images is actually gained in the moment of video capture, not provided by post production. This image sequence was captured on a climbing wall. This was a particularly elaborate shoot at the Banff centre where we had dry ice, lots of dry ice, and different people working on the climbing wall, and we were playing with different senses of dissolving and reforming the body. So it's a really liminal physicality: on the border of being there and not being there, is movement transformed into something else?

The idea of reversibility is one of the main concepts to come from Maurice Merleau-Ponty. I've suggested in previous writing that the dynamic of crossing and interlacing implied by reversibility is fundamental to dance. The simplest way to understand reversibility as a chiasm is to draw a figure of eight. It is this idea that one thing bends across to another, bends across to another, so that we're always creating an impact and responding to something. According to this dynamic, we never just singularly impose something on someone. We're always receiving at the same time as we give. So it is about human dialogue, it is about movement quality too, there's an initiation and there's a response, always happening. It is hard to separate out endpoints because they're so delicately entwined. Merleau-Ponty would say that not only do we see, but we are seen. Not only do we touch something, but we are touched back by that. When I wrote my PhD, ten or so years ago, the main suggestion was that not only do we dance, but we are danced. It's the impulse that dances through us.

So reversibility is at once a relation, it's a dynamic, and it's a poetic image. It is relevant to a lot of work with responsive or interactive systems because what ends up

coming to be at stake in these systems is this idea of control. If I do this, will it do that? What makes the screen move as I walk up to it. Is the relationship like my CD Rom, where I click on this button and something immediately happens? What sort of relationship of control are we actually creating when we use interactive technologies? Do we want it to just be push-button, press-here, one-directional control, or do we want a bit of irregularity in the system? Do we have a bit of a lag, do we have a bit of softness in the responsivity. I love working with glitchy systems because there is a bit of a lag, a bit of a delay, you're not sure whether it is going to respond to you. Of course, people who like perfectly running systems think it's a bit of a disaster if you're working with a glitchy system, but I actually think it gives a system a bit of irascibility, it gives it a bit of idiosyncrasy, and in some ways it makes it more human.

The other great thing about Merleau-Ponty's idea of reversibility is that it does not just have to apply only to human beings. It can apply across the organic and inorganic. Merleau-Ponty's engagement with reversibility integrated the visual and the tactile by reflecting closely on paintings by Cézanne. I apply it to screens, robotics, imagery and bodies. It is really the sense that when we create our environment, we really create ourselves. And that's the point of embodied vision. We actually are not separate from the world that we're in. And this relates strongly to an eco-philosophical approach from which certain concepts of sustainability are also emerging. It is this recognition that we'll be interrupting the world and the world will be interrupting us that is emphasized. This is how a creative dialogue or a creative relationship occurs.

whisper[s]

Now I'll talk about *whisper[s]* project. *whisper[s]* is an ambitious long term research project that has periodic artistic showings. It is one of the main reasons I moved to Canada to work with Thecla Schiphorst (director of the project), Sang Mah, Robb Lovell and other collaborators who work across bodies and computers. It is a project in wearable computing, which is focussed on the creation of garments that have small wireless computers embedded in them. Sensors attached to the computers read body data such as pulse, respiration or skin conductivity and transmit it to others. The garments also receive body data from others. *whisper[s]* is a grand and evolving acronym. It can stand for wearable, handheld, intimate, sensory, personal, expected

and responsive, or other words that you might add which resonate with the area of embodied, affective computing.

Affective computing is also called emotional computing, and is an area of computing that has become more and more important over the last four or five years. Computer scientists are realizing that it is important to try and emulate the emotional, less predictable sides of human responsivity in the creation of artificial intelligence systems, robots or smart objects. It is not just about creating rational thinking machines. What does it mean to create a feeling machine, a device, or a machine or a software program that might actually have an emotional content or openness?

The philosophical concept that I read through this project is Merleau-Ponty's idea of flesh. And the funny thing is that when I was working on Merleau-Ponty all those years ago, I had a sense that flesh had relevance beyond the context I was then studying. Now that I'm working on wearable technologies, I think that Merleau-Ponty provides a way to understand the close engagement between bodies and technologies. He speaks of objects of the world "encrusted" into our flesh.

Again, big team of artists is involved and quite a lot of support from local and international sources, including Canadian, Dutch, and English. When we opened at the Dutch Electronic Arts festival in February 2003, we had six bodies, six sound domes, seven layers of sound, six micro-controllers, (which are small computers in the garments). We had respiration sensors in each of the garments (breath bands around the rib cage), and a pulse sensor that attached to a finger, and we had visualisation pools containing mathematical symbols that responded to the body data (designed by Julie Tolmie and Robb Lovell). In this image you see a sound dome and a visualisation pool. We had a wireless networked system, hardware and software, but I also think the ingredients were attention, intention, breath, movement, listening. Part of what we're doing when we invite members of the public into our garments is introducing them to a listening and an attentiveness to their own bodies, which they wouldn't necessarily have in their daily practices. It's surprising how many people now practice yoga or martial arts or some form of meditation, and are very open to this movement approach, to this way of listening to their bodies. But still a lot of people wouldn't think of doing it in an art installation.

This image is a close up of our snap connectors, again, very low tech. Those are just sewing snaps soldered onto small circuit boards. We're interested in textures and textiles. We designed garments that have hand stitched LED arrays on their arms (designed by Kristina Andersen), a respiration sensor, and the computer lived in that little pocket in the back. For those of you who are interested in somatics and perhaps kinesiology, we adopted a bio-kinesiology approach to designing the functionality and placement of hardware in the garments, rather than a technology driven approach. We were very concerned about wearing computers on the body. We know that there's a lot of research into the potential dangers of the mobile phone, and of disturbing the human electromagnetic field by having computers too close on the body, so we used kinesiological practices to decide where to put the computer, where to run the cables, which involves a certain amount of muscle testing, which some of you may be familiar with through allergy testing or other practices. Basically, if your body's electromagnetic current stays strong, your extended arm will stay strong when the kinesiologist presses on it. If something short-circuits your body, like an allergy or a dangerous frequency from a device, your muscle will release and your are will drop even if you try to hold it up. Part of our design process involved me on a massage table, with my arm in the air, and Thecla working muscle testing, and saying, ok, do we want to put the computer here? No, that's too close to the heart. Here? No, that's too close to the kidney, no it has to be here, below the belt, above the belt, to the left, to the right, where do the cables go? It is a distinctive embodied design process that we're undertaking to create these garments.

We also asked what kind of fabric we needed to use for the garments. This time it was cotton. And again, we're interested in people in a space. Each person emanates their own physiological data, but is also part of a bigger, shared network of data transmission. We have different poetic categories for connections between people. Each of these has been the starting point of an improvisation as part of our workshop process.

Here are some images showing the garments. These are from Cambridge, UK, the Future Physical festival in April 2003. These are little girls. You can see the visualisation pools, certain amounts of physical gesture that comes out of this. What I

must say is that this is a prototype. My interest is in actually seeing whether performative and physical vocabularies can come out of using these devices. We haven't really got to that phase yet. Do you see these three figures? Each of these (the starfish, the swirl and the circle) is the symbol assigned to one person. Respiration will cause the symbol to leave a smear or a trace, heart beat will cause it to pulse from a smaller to a larger size.

Merleau-Ponty has this great sense that my body exists among things. My body is "caught in the fabric of the world and its cohesion is that of a thing." "Things are an annex of a prolongation of itself," and I particularly love that "things are encrusted into its flesh," which is particularly relevant to working with wearable technologies. "They are part of its full definition: the world is made of the same stuff as the body."

Now I will quickly run through the next iteration of this wearables project that is called *between bodies*. And this was just shown in Spain two months ago, at the Ciberarts Festival in Bilbao in May 2004. We're still prototyping, but we have changed the sensors, the computer system and the look of the garments. It is still a wireless system with computers built into garments, but this time they are skirts. We work with a talented Vancouver designer called Gretchen Elsener who makes our skirts. We also made neck pieces: that's a tiny fan, and on the left you'll see a feather attached to a vibrator. When activated, the feather tickles your neck and the fan blows air. I'm showing you these neck pieces in particular because we made them by crocheting with copper wire, painstaking and hard on the hands. But they were stolen the first night we got to Bilbao, so this now is the only documentation I have of them. Unfortunately that happens when you tour. The sensor input for these skirts was a muscle contraction sensor (EMG) sewn into a garter belt. We decided to go feminine with this construction, unapologetically. The muscle sensor in the garter belt read the contraction and relaxation of the muscles. Here is an image of the lining of the skirt. You can see it is very lush, very like the inside of the body, like organs and tissue. Those little pockets held the tiny fan or the tiny vibrator. So basically what happened was you put a skirt on, you had a garter band around your leg, and as you walked, your muscle signal was sent wirelessly to someone else's skirt, and the little fans and the little vibrators in their skirt moved as you moved. It was very playful. Here is an image of the skirts from the installation in Bilbao. This one in the front is made out of

wire, it is steel mesh. It was a really beautiful skirt – they all are. At the back you can see three light bars, vertical bands projected onto a screen. These were a visualisation of the muscle data, it looked like very fine hair. It would go very active and tangled when the muscles were active, and it would go quiet when the muscles were quiet, as if it was dancing in response to the activity in the skirts.

We had some people in the skirts, some people watching. Again this was more of an installation space than a performance space. This is an image of two boys in the skirts. As an example of an early phase of research into the next phase of the wearables project, a movement vocabulary is just starting to emerge. I'm interested in getting the system stable enough so that we can work with dancers in a theatre space and see whether there is choreographic potential coming out of these devices, or whether perhaps they are more effective when given to people to use in a free and improvisational way, as they go through the installation or through their daily lives. I am really open to the idea that this might not have a formal choreographic endpoint, but maybe it will have to reflect the performativity of everyday live, as a lot of the technology work does. The *whisper[s]* group would like to see our devices existing alongside PDAs and mobile phones in the market. They make people aware of how they can communicate across wireless networks with their senses, rather than having to communicate with words or with voice. We can communicate with other levels of the body. This is one of the main motivating factors for this project, this recognition that there is an incredible amount of activity going on beneath our words. Dancers know this. We know about the kinaesthetic response you get when you're improvising with somebody, even if you are completely still. How can we expand this awareness with the use of devices? Our phrase for the *whisper[s]* project, part tongue in cheek part serious, is that these are "wearables for the telepathically impaired." We will try to expand this awareness of how human beings connect, and then perhaps ultimately we won't need these devices anymore, we'll just be able to communicate kinaesthetically, corporeally over long distances without any technological assistance.