# THE KINESFIELD:

# A STUDY OF MOVEMENT-BASED INTERACTIVE

# AND CHOREOGRAPHIC ART

by

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# Abstract

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## The Kinesfield: a Study of Movement-based Interactive and Choreographic Art.

Through the exploration of practice and theory, this thesis aims to elucidate the characteristics of movement-based interactive art and the kinesfield, a term developed during the course of the research to describe the publics' body-medium. Movement-based interactive art is based on choreographed movements of the body, media and specialized technologies which facilitate new forms of participatory movement experience. This emergent art form has initiated new methods of experiencing and presenting dance in the public domain.

It is argued that this leads to new artistic developments which may constitute a paradigm shift of the concept of the body-medium in the field of dance. To understand whether the shift is indeed paradigmatic, and to contribute to the development of dance and technology, this study introduces and applies the concept of the kinesfield to extend the theory of the body-medium as kinesphere, first proposed by Laban, and to challenge its characteristics in the context of movement-based interactive art.

The concept of the kinesfield is employed to describe the relational dynamic of movement interactions which traverse the body and material forms in unbounded space. By this account, the body-medium is not defined geometrically, as in Laban's theory, but as a temporal and spatial field. The kinesfield accounts for a complexity of movement characteristics which pertain to the dynamic and relational experiences which occur between the biological body and its natural and atmospheric surroundings, natural forces, and its socio-cultural milieu.

The argument unfolds as a triangulation of three movement-based interactive artworks (*Shifting Ground, trajets,* and *Raumspielpuzzle*) presented during the course of the thesis, my physical and experiential knowledge in the field of dance and an interdisciplinary literature investigation in the fields of dance, physiology/psychology/cognitive science, philosophy and sociology, plastic arts and cinema. This written document is accompanied by a CD-ROM which serves as an electronic appendix including images, videos and diagrams of the works referenced in the written thesis.

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## AUTHOR'S DECLARATION

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award.

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# INTRODUCTION

This thesis is a discussion of the experiential and conceptual characteristics which underpin

the choreographic research of three movement-based interactive artworks[1], *Shifting Ground*

*(1999), trajets (2000)* and *Raumspielpuzzle (2003)*.[2] In addition to elucidating an emergent

mode of choreographic practice,[3] this thesis proposes a new term which offers a description of

the body-medium[4] materialised in choreographic movement-based interactive art, namely the

*kinesfield*.

This choreographic and theoretical research aims to expand the field of *dance and technology*

by highlighting a paradigmatic shift in the artistic and conceptual characteristics of the body-

medium. The choreographed movement-based interactive artworks with which this thesis is

concerned invite the general public to participate in multimodal, multisensual and responsive

environments with their whole body.[5] As director (choreography and video) of *Shifting*

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[1]This term describes the choreographic practice and technologically-mediated environments presented in this thesis. This mode of practice has also been described as variously "immersive interactive or performative environments" (Rubidge 2000), "spatial interactivity" (Penny 1996), "intelligent stages electronically sensitized spaces" (Lovell and Mitchell 1995) and as "responsive environments" (Paradiso 2003).

[2]This title has been adopted from a term Rudolph Von Laban (1920s) coined to describe his space-game-puzzle concept (Maletic 1987: 35).

[3]Choreographers Susan Kozel, Thecla Schiphorst, Sarah Rubidge, composer Todd Winkler, visual artist Aline Veillat and video artist Piero Gilardi investigate similar kinaesthetic-based and technologically-mediated questions.

[4]The term body-medium is extrapolated from Rudolph Von Laban's (1879-1958) notion of the kinesphere medium. Laban suggests that: "This inhabited space or spatial crystal is the *medium* in which the structural tension of man is built" (Laban quoted in Maletic 1987: 67).

[5] Char Davies *Osmose* (1994) comes close to movement-based interactive art as it focuses on qualitative breath, (expansion and relaxation of breathing measured by sensors on a vest) to navigate

*Ground (1999) Raumspielpuzzle (2003)* and co-director of *trajets (2000)*, my intent was to create technologically-networked spaces which afford choreographed movement interactions between people and media in both local and distributed spaces. The interactions are grounded in participatory embodiment, that is, the media (video, sound, objects and light) are created to specifically elicit kinaesthetic responses in the bodies of the public. It is my contention that such technologically-mediated and multimodal bodily participation challenges existing theoretical and practice-based definitions of the publics' body-medium as in these artworks, *who* dances includes the animate and inanimate moving in the same participatory "movement space" or "field."

My role was to direct (*Shifting Ground, (1999) Raumspielpuzzle (2003)*) and co-direct (*trajets* (2000) with Susan Kozel) these installations. However, in common with standard practice in technologically-based installations of this kind, it was necessary to seek expertise in the specialised fields of engineering, computer science, physics, architecture, and sound to build these installations.[6] My artistic contribution was to choreograph, film and edit the video material and direct *(*co-direct with *trajets)* the artwork as a whole. Within the context of this thesis, these experts, the choreographic research, and the presentational spaces of these artistic installations are collectively described as the Choreomedia Laboratory (CML). The Choreomedia Laboratory's creative research took place primarily at the Banff Centre for the

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within a virtual reality environment. The head-mounted device which facilitates the visual reception of the images is based on the traditions of Virtual Reality. Other artists outside of the dance community working in body and media interfaces include Gary Hill's *Tall Ships* (1992), Ulrike Gabriel's *Terrain* (1992) and *Breath* (1993), Aline Veillat's *Latence* (1998) and Edmond Couchot / Michel Bret's *Je sème à tout vent* (2001).
[6] The names of each expert who collaborated in each installation are indicated under the category "team members" in the Choreomedia Laboratory section of the CD-ROM.

Arts, Canada; Stanford University, the United States; University of Montpellier, France and

via the Internet.

## A) Artistic Context of the Research

### 1) Author's Artistic Background

An upbringing in several different geographic and linguistic environments has generated my

longstanding interest in socio-cultural[7] and ecological embodiment. The term "ecological"

draws upon psychologist/physiologist James J. Gibson's (1979) "ecological model" which

couples and describes action and perception (Rodaway 1994: 12). Gibson claims that the

body's perceptual systems and understanding of the world are in reciprocal and relational

processes of movement feedback[8] (Gibson, 1979). These processes are central to my artistic

research in movement-based interactive art and are similar to dance anthropologist Cynthia

Novack's (1990) definition of dance. For Novack,

> ... the body and movement, the mediums of dance, are not purely natural
> phenomena but are constructed, in concept and practice ... dance is a part of
> culture, both contributing and responding to larger patterns of thought and
> organization ... (Novack 1990: 13).

Novack's description reinforces the notion that social and environmental relationships

cultivate and inscribe our bodies. This attitude towards embodiment has permeated my dance

background, which consists of dance performance, choreography, and videodance for stage,

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[7] Phenomenologist Don Idhe (2000) critically analyzes technological embodiment as composed of
"Body 1" - the phenomenological body and "Body 2" - the social-cultural body (Ihde 2000: xi).
[8] Within the context of this thesis the term of "feedback" is used in Gibson's physiological and
ecological model meaning multimodal psychophysical from external and internal sources. This is not
to be confused with the technical term feedback in electronics to define a return link from input and
output.

single-screen, multi-screen projection and movement-based interactive art *(1- EEM-Author's dance background)*.

2) Mediadance

Because movement-based interactive art is multifaceted, it could be seen as belonging to the field of dance and technology, interactive arts or cinedance. In this thesis these are collectively termed "mediadance." Mediadance is one of many art forms that integrates computer-based technologies. As such, it is part of a general development in technologically-mediated systems, which include interactive-art, CD-ROM based interactive art, virtual reality, netart, telematics, and technologically-mediated performance and video gaming.

*Dance and Technology,* as a field of artistic and theoretical dance research, evolved with the expansion and development of digital technologies. This field has a precedent in the seminal work of Michael Noll, although his innovative and creative work at Bell Labs (1960s) is not well known. Noll created screen-based tools which elaborated a system of movement symbols.[9] He was interested in the choreographic potential of movement mediated with digital tools. While Noll can be credited for his seminal work with digital technologies, other artists have been exploring the innovative uses of technologies (not necessarily digital) to create movement-based art forms, such as performer Loïe Fuller's (1862–1928) creation of wooden arm extensions and mirrored stages, and Anton Bragaglia (1890-1960) and Arturo Bragaglia's (1893-1962) photographs of bodily movement trajectories *(chapter six)*.

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[9] Noll designed the first movement software in 1966. One could use an electronically sensitive plate to inscribe numerals that would then be translated into stick figures which immediately appeared on a screen in real-time. Instead of movement being translated into data, like most motion capture technologies, the numerical data created figures. Noll contacted the Laban Centre to better understand how notation could be dynamically linked to computer systems. See: (Noll 1967 and 1994).

As a field, however, *Dance and Technology* only gained momentum in the 1980s with the

ever-growing presence of affordable computers, MIDI (Musical Instrument Data Interface

1982), desktop video, and multimedia and animation software. These technological tools

became integrated into a variety of presentational (intelligent stage[10]), interactive (Internet,

CD-ROM) forms and research laboratories. Independent and university-based research in this

field began to take place in a variety of countries. Evidence of this momentum include: The

Kineto-Audiotory Communication Research Group in Sweden (1980s-1990s); conferences

and organised workshops such as "Dance and Technology" 1 (1990), II (1992), III (1995), IV

(1997) and V (IDAT 1999) in North America; the Dance and Technology Zone;[11] and "Digital

Dancing" in England, (1995-1998). These performances, workshops, laboratories and

conferences were initiated by groups of people[12] who were beginning to integrate digital and

electronic media into choreographic works. Collectively, along with cinedance and

videodance, I will term these modes of practice "mediadance."

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[10] The "Intelligent stage" is a term commonly used to describe technologically-mediated stage art
performance at the Institute for Studies in the Arts, Arizona State University.
[11] This website organized and united an international group of people sharing interests in the emergent
art forms, ideas and meetings taking place in the "dance and technology" community. This site was
created by Scott de la Hunta, Troika Ranch and Ric Allsopp. http://www.art.net/~dtz/. It is now
maintained by Scott Sutherland (20-09-01).
[12] Amongst others, choreographers Andrea Davidson, Troika Ranch (http://www.troikaranch.org)
Kozel (25-01-03), (http://www.meshperformance.org) (12-02-02) and Rubidge
(http://www.sensedata.co.uk.) (12-08-03).

## 3) The Practice of Interactive Art

The movement-based interactive art installations[13] illustrated in this thesis share certain characteristics with interactive art.[14] In interactive art, dialogical relationships are built between people, objects and/or media. Roy Ascott and Stephen Wilson each identify the characteristics of interactive art in a similar fashion. For Ascott these include "connectivity, immersion, interaction, transformation, and emergence"[15] (Ascott, 2002). For Wilson, "Interactive means that the user/browser/audience has the ability to act to influence the flow of events or to modify their form." This includes the characteristics of "presence, simple choice, the search for interaction possibilities, contributory, and authoring" (Wilson 1993: 1).

Dance practices such as Improvisation, Contact Improvisation, happenings, social dances, movement games (e.g. Twister) or martial art forms such as Capoeira Angola have characteristics that intersect with Ascott's and Wilson's definitions. Like interactive art, these dance forms are participatory. They *connect* bodies through movement in *immersive* and interactive environments where the dancers feel internally *transformed* within improvisatory contexts. These contexts in turn generate *emergent* choreographies and performances.

Ascott, however, goes further in defining interactivity by stating that interactive art "involves the creation of new worlds, in whose construction the viewer can become actively involved" (Ascott, 2002). These artistic worlds include "cyberspace, telematic networks, of

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[13] Video installations were part of an artistic movement in the 1960s, along with happenings and conceptual art. See Morse, Margaret (1990) "Video Installation Art: The Body, the Image and the Space-in-Between" in *Illuminating Video*, pp. 153-167.

[14] For an overview of the interactive art genres and artists, see Wilson (2002).

[15] See Ascott. R. (1993) Telenoia. In: R.Adrian (editor), Kunst im Netz. Graz: Steirischen Kulturiniative.

telepresence, mixed reality and the technology of artificial life" (Ascott, 2002[16]). Here, interactive art[17] includes digital and telecommunication technologies. As such, it could be argued that movement-based interactive art is a form of interactive arts. The difference between movement-based interactive art and interactive art per se is subtle. Movement-based interactive art differentiates itself from interactive art by intersecting physical movement practices, media dance and choreographic attention to participatory-based dynamic movement interactions.


## B) Theoretical Context of the Research

Theories concerning bodily movement and movement perception are implicated in the artistic research underpinning this thesis. "Movement" itself as a subject of research has evolved primarily in the areas of *Dance, Physical Education, Anthropology, Human Motion Studies* (Physiology, Biomechanics, and Sports Medicine), *Physics, Gaming, Cinema, the Military, Performance, Robotics, Computer Vision*, and *Kinetic Arts* (Plastic and Media Arts). The thesis draws upon relevant aspects of these disciplines to highlight the choreographic implications of movement-based interactive art and to illuminate the practice. Each area of study offers distinct notions of "movement experiences" or "kinecepts" and "movement ideas" or "kinestructs" which contribute to our perceptions of bodily movement characteristics (Metheny 1964: 58-60).


Historically, from the mid-1800s the dynamic nature of "movement" of animate and inanimate objects became a rigorous subject of scientific and artistic study. In 1878 Friedrich Engels, in

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[16] Email exchange with Roy Ascott 27-11-02.

a letter to Karl Marx, stated that, "The study of the different forms of movement is therefore the essential object of the science of nature" (Popper 1968: 226). During the same period, researchers such as physiologist Etienne-Jules Marey (1830-1904) focused on "movement as a characteristic state of the body," (Cartwright 1994: 24) while at the beginning of the twentieth century Rudolf Von Laban (1879-1958) began creating symbolic and language-based tools that translated the expressive and communicative nature of bodily movements.

These artists and researchers whose passions have been stirred by the complexities of bodily movement have developed practices, artefacts and definitions which contribute to our human movement repertoires. In this thesis, these practices, artefacts and definitions are considered perceptual and kinaesthetic tools, assistants or stimulators which enable us to grasp and differentiate idiosyncratic qualities of movement. They influence and contribute to the ways in which we describe and perceive our body-medium. While their motivations may cross-disciplinary objectives, within the context of this thesis, they all share a role in cultivating our body-medium perceptions.

## C) Contribution to New Knowledge

This research triangulates artistic, technological, and theoretical artefacts and strategies along with physical practices to elucidate the concept of a *kinesfield*. The concept of the *kinesfield* emerged from reflections on the nature of the artwork presented in this thesis in parallel with historical and theoretical research of bodily movement. The term, *kinesfield*, here describes the body-medium as a temporal-spatial dynamic based on interactive processes of feedback

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[17] Interactive art can also be historically contextualized in the 1920s with Dadaism (Wilson 1993).

which take place between the body and its environment. The *kinesfield* is inspired by four

disciplinary traditions. The concept both builds upon and challenges Laban's space-

movement theories and the notion of the body and space as a medium or "kinesphere" (1926);

and adopts the linguistic/anthropological *Kinesics* distinction of the *kine*[18] as a subunit of

bodily movement. The term *field* inherits its meaning from physics and phenomenology. This

includes phenomenologist Merleau-Ponty's (1962) description of our environment as a

perceptive milieu or medium. "The world is not an object such that I have in my possession

the law of its making; it is the natural setting of, a field for, all my thoughts and all my explicit

perceptions" (Merleau-Ponty 1962: xi). It also has resonance with the definition of "field"

used in field theory (1948) in physics where "field" is a "change of energy states or a force

based interactive dynamic.[19]" In physics, field theory is described through a potential (i.e.

energy state) representing a dynamical system with arbitrary degrees of freedom. As such, the

concept of the kinesfield highlights one's embodied state as relational to its environment

through temporal and spatial phenomenological (subjectively felt) dynamic transactions.

The environment or ecological system of the field consists of biological (other people),

atmospheric (wind, rain), natural forces (gravity and electromagnetism) and cultural (human

artefacts, traditions, history) phenomena (Figure Intro 1).

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[18] According to Birdwhistell, a "kine is an abstraction of that range of (bodily movement) behaviour
produced by a member of a given social group which, for another member of that same group, stands
in perceptual contrast to a different range of such behaviour" (Birdwhistell 1970:193).
[19] Discussion with physicist Dr. Olivier Klein 04-03-03.
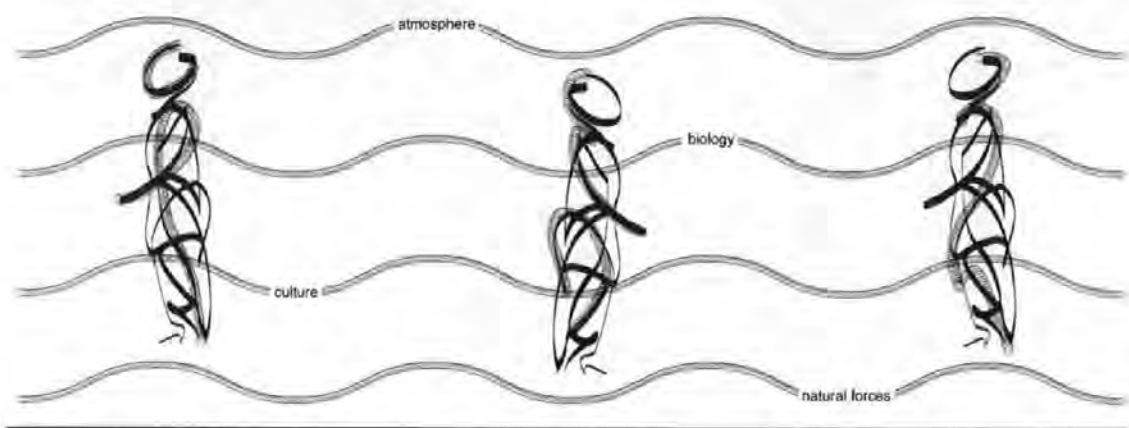
Figure Intro-1: The Kinesfield

The concept of the *kinesfield* shifts the locus of attention away from *dance* and *technology* as separate subjects of discourse and focuses instead on the relational and differential movement dynamics which take place between them. Through highlighting these "dynamic" transactions, the locus of discussion is re-directed away from the dichotomous "body" as tool-user[20]/subject on one hand, and "technology" as interface/object on the other (nature/culture, human/machine). It therefore links relational processes of embodiment and culture/environment. This focus on the dynamic relational movement actions is similar to the ways in which Russian psychologists Alexei Leont'ev and Lev Vygotsky (1924-30s) defined Activity Theory (Nardi: 1997 7-11). Activity theory describes the actions or "activity" within a given social context as relevant to human development in play and pedagogic applications. This thesis's focus on reciprocity amongst bodily movements and social contexts also brings to light sociologist Henri Lefebvre's (1991) description of bodily experience as linked to movement through space-time and objects.

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[20]Hayles distinguishes cultural embodiment as the posthuman condition or flickering signification. See *"Virtual Bodies and Flickering Signifiers"* (Hayles 1993).

For the body indeed unites cyclical and linear, combining the cycles of time, need and desire with the linearities of gesture, perambulation, prehension and the manipulation of things – the handling of both material and abstract tools. The body subsists precisely at the level of the reciprocal movement between these two realms … their difference – which is lived, not thought – is its habitat (Lefebvre 1991: 203).

The subject of reciprocal movement and kinaesthetic transactions across material forms is relatively new to dance, (Desmond, 1996), interactive art (Massumi, 2002) and sociology (Lefebvre, 1991). Like Lefebvre, Desmond and Massumi, the concept of the kinesfield centres the discussion on the kinaesthetic movement qualities and transformations which occur among people and material forms. The kinesfield arises both from the experiential and conceptual analyses of the body-medium in movement-based interactive art installations.

## D) Research Methodology

The concept of the *kinesfield* as argued in this thesis emerged from artistic and physical practice and theoretical analysis. This analysis compares the characteristics of the *kinesfield* with existing movement-based traditions and theories. The thesis draws upon and integrates physical research, the research process for creating movement-based interactive art, and a selected study of theories relating to body movement perception, communication and perceptual systems. As such, the practice-based and theoretical methods undertaken during this research are dialogical in that they inform each other. These methods include,

### 1) Artistic and Physical Research:

a) Artistic research within the Choreomedia Laboratory of three movement-based installations: *Shifting Ground, trajets and Raumspielpuzzle.*

b) Experiential Embodied Methodologies: that is of reflecting and commenting upon subjective and embodied physical and choreographic research; experience of movement awareness methods,[21] dance training and performance. These include first hand verbal, written and audio-visual data which are of an introspective, retrospective or direct experiential methods (participants describing an experience as they are embodying it).

2) Theoretical Research:

a) A theoretical investigation of selected bodily movement terms, concepts, perceptions and communication.

b) An analysis of technologically-mediated kinaesthesia.

c) A thematic investigation and taxonomy of technologically-mediated movement-based artworks from historical and cross-disciplinary traditions.

1) Artistic and Physical Research

a) Choreomedia Laboratory

The description of the Choreomedia Laboratory presents the choreographic movement-based interactive works which were developed during the course of this thesis (1999-2003). These interactive installations are choreographed movement environments or ecosystems which allow the public to physically contribute and to experience movement between themselves and an environment through technologically-mediated processes of stimulus-sensation and feedback. A movement ecosystem is being used here to define a multimodal movement-environment; this embraces Gibson's ideas of perception as situated within an ecological system. In these movement ecosystems inanimate objects become animated and generate choreographic and participatory movement rapports between the visiting public and a mediated environment. The artistic intent of these installations is to accentuate kinaesthetic-

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[21] "Movement awareness methods" are physical practices that train the individuals to become aware of their kinaesthetic condition (Myers 1980: 1-6).

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based movement interactions between the visitor's internally felt movement experience and a given choreomediated space. On one level, they are intended to "entertrain"[22] (entertain and train) the public's perception of their kinaesthetic movement-embodiment in the context of artistic public presentations.

These movement-based interactive installations differ from proscenium presentational dance contexts. They were choreographed, created and produced in a variety of working environments and geographically separate locations. The presentational spaces (galleries, theatres, shopping malls, churches[23]) are considered a part of the laboratory because the public's interactions contribute to the evolution of the works. These production and presentational conditions challenge the established conventions of contemporary dance in which the studio is identified with the creative production process and the stage with the public presentational space. The term *choreomedia*[24], is introduced in this thesis to describe the artistic act of organising the temporal, spatial and qualitative rapport of people, objects, media and physical spaces. The organisation of these elements is based on establishing movement qualities, given moods or state spaces.

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[22] Professor Allegra Fuller Snyder used this term during a mediadance class in 1991 at University California, Los Angeles, USA.

[23] For a list of presentation locations see http://www.trajets.net (13-02-2001) and http://schiller.banff.org (12-08-99).

[24] The term *Choreomedia* emerges from my media and dance based background *choreographing* with dancers and video for the stage, (i.e. *Enguelionne: the body of the possible* (1995), *Face à Face* (1994) and for the single screen videodance works *Camarà* (1996) *Suspended Ties* (1997).

## b) Experiential Embodied Methodologies

Within the context of this thesis, the term Experiential Embodied Methodologies is introduced as a conceptual framework for first person introspective descriptions of my own choreographic practice and physical research (dance and movement awareness methods) along with retrospective interviews of professional dancers and experts in the field of dance and technology and direct experiential recorded responses from participants in the installations. First person methodologies described by Francisco Varela and Jonathan Shear have set a precedent for subjective-based studies.

> By first-person events we mean the lived *experience* associated with cognitive and mental events. Sometimes terms such as 'phenomenal consciousness' and even "qualia" are also used, but it is natural to speak of "conscious experience" or simply "experience." These terms imply here that the process being studied (vision, pain, memory, imagination, etc.) appears as relevant and manifest *for* a "self" or "subject" that can provide an account; they have a "subjective" side (Varela and Shear 1999: 1).

First person methodologies as a framework have been adopted from Varela and Shear to articulate the dancer's and choreographer's embodied, mental and cognitive inner felt experience which, this thesis argues, constitutes the dancer's knowledge base. The terms "Embodied" and "Experiential" expand Varela and Shear's term "First Person" to emphasise the bodily (embodiment) and subject-felt knowledge (experiential). These Experiential Embodied Methodologies are used to build the concept of the kinesfield. Lived experiences by both dance experts and participants in the installations provide insight into the ways that the body-medium is perceived in choreographic, performance and movement-based interactive art contexts presented in this thesis. Experiential Embodied methodologies are necessary as they serve to describe and highlight the experiential nature of movement based artistic work in the field of dance and technology. These embodied resources collectively contribute to a

reservoir of movement knowledge and as such, are integrated in the creation of the installations and the arguments brought forth in this thesis.

## 2) Theoretical Research

### *a)* A Theoretical Investigation of Selected Bodily Movement Concepts

The artistic practice explored in the Choreomedia Laboratory and the concept of the kinesfield which emerged from it, are analysed and contextualized through an examination of selected terms from the theoreticians within the fields of physiology (Gibson, 1966), neurophysiology (Berthoz, 2002), anthropology (Birdwhistell, 1952), sociology (Lefebvre, 1991), phenomenology (Hans Jonas, 1966) and (Merleau-Ponty, 1962) and dance (Laban, 1920s-50s), (Preston-Dunlop, 1978) and (Novack, 1990). These theories illuminate how humans identify, express, communicate and describe movement transactions and as such, assist in understanding the characteristics of the kinesfield and movement-based interactive art. The *kinesfield* builds upon Rudolph Von Laban's analytic methods of describing movement efforts and spaces, namely choreutics and effort-shape. Laban's historical definitions of movement spaces when used in the context of movement-based interactive art, however, are found to be insufficient and consequently, are problematised in this thesis.

### *b)* An Analysis of Technological-Kinaesthetic Inscription and Transcription

This thesis investigates the notion of dynamic action-response, feedback and kinaesthetic inscription facilitated through the use of various technologies (i.e. digital, optical and mechanical). In the context of the thesis, technology is considered as a systematic channelling which influences movement perception and inscribes kinaesthetic sensations into the body. The assumption being made is that technologies affect perceptions of our moving and living world, and thus one's kinaesthetic condition. A discussion of this technological-kinaesthetic

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condition is framed and analysed with the assistance of theoretical arguments of 19th century

physiologist Etienne-Jules Marey (1880s), sociologist Gilbert Simondon (1958), cultural critic

Lisa Cartwright (1980), cultural critic Katherine Hayles (1993-2000) and phenomenologist

Don Ihde (2002).


c) Historical Selection of Technologically-Mediated Movement-Based Artworks

A selection of cross-disciplinary and historical movement-based artworks is used to illustrate

how bodily movement is altered and produced across material forms and events. These

include the photographs of Arturo Bragaglia (1893-1962) and Anton Bragaglia (1890-1960);

scenic design by Adolphe Appia (1862-1928), performances by Loïe Fuller (1862–1928);

kinetic art by Moholy-Nagy (1895-1946) and experimental film by Len Lye (1901-1980).

This chapter also highlights a selection of films selected from film and video makers in

experimental film, mainstream cinema, cinedance and videodance which alter the way in

which the body-medium is perceived (*chapter six*). In the context of the thesis, these artistic

artefacts are thematically associated with movement-based interactive arts, as they are

evidence of the ways in which artists have historically used technologies to alter, create and

introduce forms and events of embodiment. As such these artistic artefacts contribute to a

cross-disciplinary movement repertoire.

## E) Thesis Organisation

This written thesis is accompanied by a CD-ROM which contextualizes the installations as well as artistic and conceptual examples presented in the thesis with videos, images and text. The CD-ROM therefore needs to be viewed prior to and during the reading of this thesis. The videos on the CD-ROM will play with more fluidity if the whole folder is transferred to the reader's computer hardrive. The organisation and navigation of the CD-ROM is described in the (*appendix 1, pg. 143*).

The written thesis is divided into four sections. *The first section* illustrates the characteristics of the kinesfield as articulated in the artistic movement-based installations. *The second section* examines how specialised languages referentially frame bodily movement. *The third section* examines how bodily movement practices, technologies and art forms activate and facilitate kinaesthetic awareness. The *fourth section* summarises the characteristics of the kinesfield, and the conclusion outlines the research to be considered in the future.

## 1) Section One:  The Artistic Research

This section *(chapter one)* highlights and extracts the characteristics of the kinesfield as materialised in the movement-based artworks created during the research period in the Choreomedia Laboratory. The kinesfield emerged and developed across the three works as an articulation of the relation between theory and practice. *Shifting Ground* (1999) sets the tone of this practice with a one-to-one mediated environment of participatory weight shift and videodance. *trajets* (2000) extends the mediated interaction of *Shifting Ground* from a frontally-privileged point of view to a three dimensional space of people's movements that influence and affect the movements of screens and videos. *Raumspielpuzzle* (2003) links

perceptible feedback with a playful, puzzle-like or moving sculpture using hand gesture, sound and image feedback.
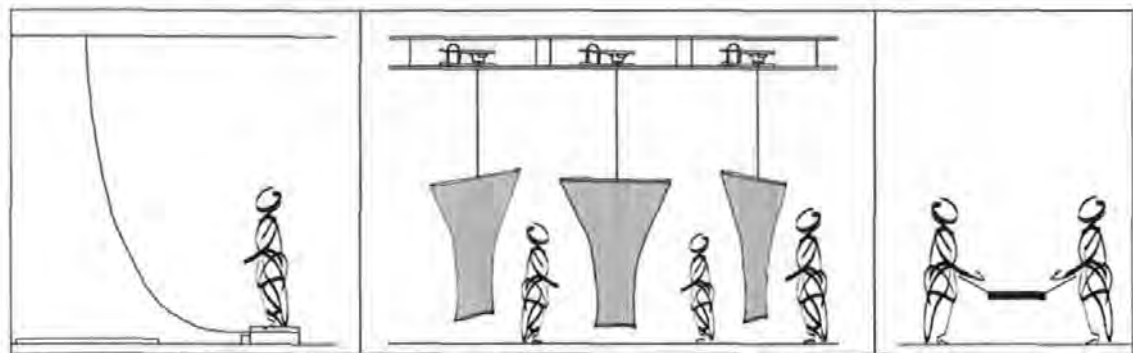


Figure Intro-2: *Shifting Ground* (1999), *trajets* (2002) and *Raumspielpuzzle* (2003)[25]

The objective of these three artworks was to explore the ways in which the publics' experiential body could be coupled, partnered and mapped with its environment through video, sound, a kinetic immersive space and real-time feedback. The concept of the kinesfield emerges directly from artistically exploring this coupling and questions its theoretical implications. The artistic exploration of this coupling, namely the kinesfield, is at the basis of this thesis. The kinesfield is a conceptual term which underpins the experiential (movement-based interactive artworks) and the theoretical (historical traditions of the body-medium) in my artistic practice.

## 2) Section Two: Modalities of Bodily Movement Analysis and Awareness

This section describes how bodily movement is translated into specialised languages, analysis and strategies. It begins by describing: *Choreutics, Effort-Shape* or *Laban Movement*

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[25] *Shifting Ground* was presented at the International Dance and Technology conference (IDAT 1999), *trajets (2000-2004)* has been presented in nine public venues, and *Raumspeilpuzzle* is presented as a prototype.

*Analysis* (Rudolph Von Laban, 1920-1950s) and *Kinesics* (Ray Birdwhistell, 1950-1970s) which translate the expressive and communicative nature of bodily movement into specialised terms and descriptive methods *(chapter two)*. This is followed by a discussion of psychophysical terms such as mimesis, empathy, kinaesthesis, proprioception and perceptive systems which articulate subjective and social embodiment and transactions with the environment *(chapter three)*.

## 3) Section Three: Modalities of Inscribing Bodily Movement

This section looks at experiential, artistic and technological artefacts and processes which activate and enable body and culture movement transactions. This section begins by examining how physical dance practices (movement awareness methods) integrate stimulus-sensation psychophysical feedback to materialise movement awareness with similar methods used in the movement-based interactive installations. Like the installations presented in this thesis, movement awareness methods seek to bring attention to one's kinaesthetic state through multimodal mapping, action-response and psychophysical feedback interactions *(chapter four)*. *Chapter five* examines action-perception mapping within the context of technologically-based movement interactions. This includes an analytical discussion regarding the ways in which technologies inscribe the body and cultivate one's kinaesthetic perception *(chapter five)*. This is followed by identifying historical art forms which use technologies to create and introduce alternative forms of embodiment. This thesis argues that these artistic artefacts contribute to our general movement repertoire and are evidence of artistic investigations of "bodily movement" produced and distributed through material forms and technologically-mediated processes *(chapter six)*.

## 4) Section Four: The Characteristics of the Kinesfield

*Chapter seven* summarises the characteristics of the kinesfield, which are materialised in the movement-based installations. The kinesfield as a body-medium is contextualized with and through existing models and frames of reference in dance, social science and phenomenology. Here the kinesfield is associated theoretically to Henri Lefebvre's practico-sensory body (1991), phenomenological traditions of Merleau-Ponty's fleshspace (1964) and Hans Jonas's phenomenological biology (1966). As such, the kinesfield is theoretically described as a condition of human perception which is defined in phenomenological and sociological frameworks. This section highlights conceptual frames of bodily-movement relevant to the movement-based interactive works presented in the thesis.

Table Intro: 1: Body-Medium Frames of Reference and Definitions

| Date | Name | Discipline | Referent | Space |
|------|------|------------|----------|-------|
| 1920s | Laban's Kinesphere- Infinite Space | Dance | Expressive balletic body | Geometric and based on physical body reach of limbs in space. |
| 1920s | Laban's Dynamosphere | Dance | Effortful expressive balletic body | Effort impulse towards reach space. |
| 1964 | Merleau-Ponty's "fleshspace" | Philosophy | Philosophy Art | Space as an extension of flesh, fleshspace. |
| 1965 | Simondon's "transindividual" | Philosophy and Sociology | Technological invention | Objects embody bodily efforts. |
| 1966 | Jonas's biological phenomenology | Philosophy | Biology Philosophy | Organism-lifeworld. |
| 1968 | Birdwhistell's Kinesics | Anthropology Sociology Linguistics | Biological and Social condition | Social and contextual. |
| 1978 | Preston Dunlop's Shared Space | Dance | Stage dance performer and audience | Intersecting spaces between the public, theatre and performer. |
| 1978 | Preston Dunlop's Extended kinesphere | Dance | Stage dance performer and audience | Zones: Proximal Axial Imaginary |
| 1979 | Gibson's ecological model | Physiology | Biology and ecology | Biological – organism interrelated in ecology. |
| 1991 | Lefebvre's practico-sensory | Sociology | Rhythm | Body as producer and produced by space – rhythmic. |

The conclusion (*chapter eight*) recapitulates the major issues addressed in this thesis and offers suggestions for future research in the field. This includes a critique of the limits of the research methods employed. The Appendices includes two components: text referenced within the context of the thesis and the CD-ROM. The CD-ROM serves as an electronic

appendix with diagrams, interviews, images and videos of the referenced work presented in

the thesis. Due to the practice-led nature of this thesis, and its movement-based subject matter

work, it is necessary to accompany the thesis with a CD-ROM "digital record book" — which

includes video and image-based documentation — to support the artistic investigations

developed during this practice-led research. This CD-ROM should be viewed both prior and

during the reading of the thesis[26].

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[26] Go to http://www.apple.com/fr/quicktime/download/standalone/ to download the appropriate
QuickTime player.

# SECTION ONE: ARTISTIC RESEARCH

The concept of the *kinesfield*, results from the choreographic experimentation and reflection which took place throughout the creative evolution of the practice-based research in the Choreomedia Laboratory. Documentation of these installations (i.e. installation descriptions, technical diagrams, videos and team members) are included in the Choreomedia Laboratory section of the CD-ROM and must be viewed prior to reading the following chapters (*appendix 1, pg. 143*).

The Choreomedia Laboratory is constituted by three movement-based interactive art installations *Shifting Ground, trajets* and *Raumspielpuzzle* which were developed during the course of this research. These works are specifically installations for the general public and not staged performance spaces in traditional theatrical venues for dance specialists. In this they are relatively rare in the dance and technology community. Choreographers Sarah Rubidge, Susan Kozel, and Thecla Schiphorst share a similar interest in externalizing and materialising kinaesthetic sensibilities into interactive installations.[27] In some respects, these installations can be read as an "exteriorisation" of a kinaesthetic sensibility which is transposed into the qualities of materials and interactions used in the installations.

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[27] Rubidge: *Passing Phases* with Garry Hill (1996-1999); *Time & Tide* (2001); *Sensuous Geographies* with Alistair McDonald (2003); Kozel: *Contours* with Kirk Woolford (1999); *trajets* (2000); Schiphorst *Body Maps Artifacts of Touch* (1996); Kozel, Schiphorst, Lovell et al. *Whispers* (research currently in progress).

## 1.1) Overview of the Practical Research

The focus of this practical research was to explore artistically ways in which the general public physically experiences movement within kinaesthetic, sensuous, mediated and networked environments. These explorations led to the creation of three artworks *Shifting Ground, trajets* and *Raumspielpuzzle* which are partner-like dances between the environment and the visiting public. These artworks consist of poetic, social and playful movement interactions between the visiting public, responsive screens, videos, sound and light.

### 1.1.1) Synopsis of *Shifting Ground*



Figure 1.1: A 3d simulation of *Shifting Ground*

The first of the three installations, *Shifting Ground* jumpstarts the artistic journey taken during the research towards participatory-based technologically-mediated installation work. This installation establishes a dialogical relationship between the body and a mediated environment *(2* and *3-CML-SG-Video and Installation and Technical Layout)*.

The research for this piece extends an artistic interest in highlighting and materialising the "social-ecological–dialogical-body." The installation's ambience is comprised of a minimalist

sound score, projection, air currents, and texture to encourage the visitor to feel embedded within a moving landscape or ecosystem. Here the intent was to make the participant's body feel kinaesthetically mapped with the environment created in the installation.

The primary interface which connects the participant's body to the undulating screen and video images was developed after reflecting upon a movement experience which is common to all, but often neglected, namely weight shift. The result of this choice led to the creation of an optical and mechanical springboard[28] (Figure 1.4), which when it was stood upon, detects the weight shift of the participant's body and the development of a sensuous *mise en scène* of a moving environment (*4 CML-SG-Videos-SG-1 & SG-2*).
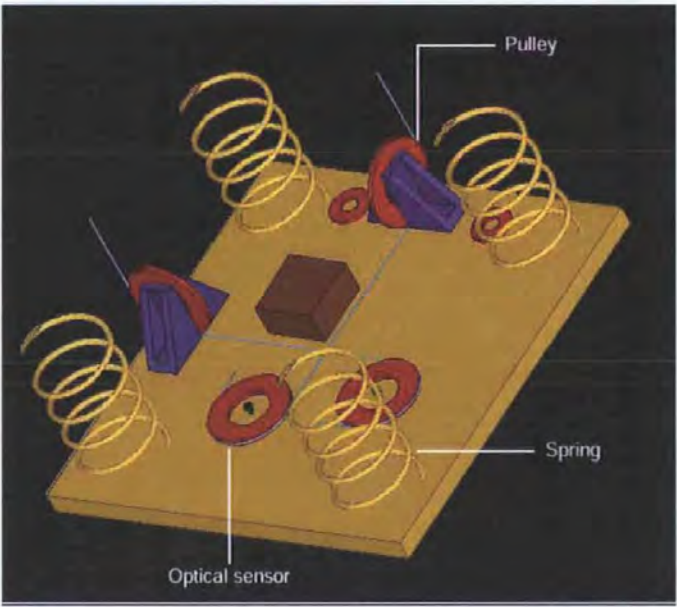


Figure 1-2: Inside of the Springboard

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[28] German Media Artists Monika Fleischman and Wolfgang Strauss also created a board to navigate through space with the participants weight in a virtual space, see *Balance System SkyWriter* (1992-1997) (http://imk.gmd.de/mars).

The installation invites the visitor to use their weight to activate, select and alter pre-recorded video dance sequences projected on a fan-activated undulating screen. The interface is constructed to accommodate one body at a time. The videos projected on the screen are compositions of three dancers' visual interpretations of movement as represented through images of their homelands, Ivory Coast (Kossua Ghiamphy), China (Qing Fang) and Finland (Mia Keinänen). Each participant uses their own physical weight to activate, and "travel" through a kinaesthetic and visual journey of these dancers pre-recorded videos *(5- CML-SG-SG-3 & SG-4)*.

1.1.2) Synopsis of *trajets*



Figure 1-3: *trajets*

The second installation, *trajets* extends the mediated environment exhibited in *Shifting Ground* from a frontal based experience to a three dimensional moving environment and is, with respect to technology, optimised for one to three participants. (*6- CML-T-Installation-T-6, T-9, T-10*) *trajets* emanated from two artistic experiences, the first – *Shifting Ground*, and the second a telematic artwork linking dancers with video transmitted on the internet between two theatres *Ghosts and Astronauts* (Kozel 1997)[29]. The spiralling and swerving video material I filmed of Kozel, but did not use in *Ghosts and Astronauts*, prompted a mutual artistic interest between Kozel and myself in arousing the public's sensibility to spiralling and circular spaces creating movement trajectories[30].

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[29] *Ghosts and Astronauts* (Kozel 1997) was a telematic work within which I created videos that would be projected between two performance venues in London: The Place and Riverside Theatre.
[30] The concept of "trajectories" or "trajets" was also influenced by Paul Virilio's philosophical text describing the movement between the subject and the object as a trajectory (Virilio, 1996: 40).

*trajets* elicits the publics' kinaesthetic responses within a moving architecture made of projected images and swirling, interactive screens. In *trajets* the "choreomediography" is articulated through twelve, motorised suspended screens moving in response to the visitor's paths. This environment is fluid as the screens spin and twitch in response to the visitor's body. This creates a dynamic movement interplay between the visitor, the screens and the images projected onto the screens. As the visitor moves, a screen moves and images change. The projected images include bodies filmed in various textured environments. The images are at times figurative (one recognises the body) and at other times more abstract showing traces of bodily movement.

1.1.3) Synopsis of *Raumspielpuzzle*
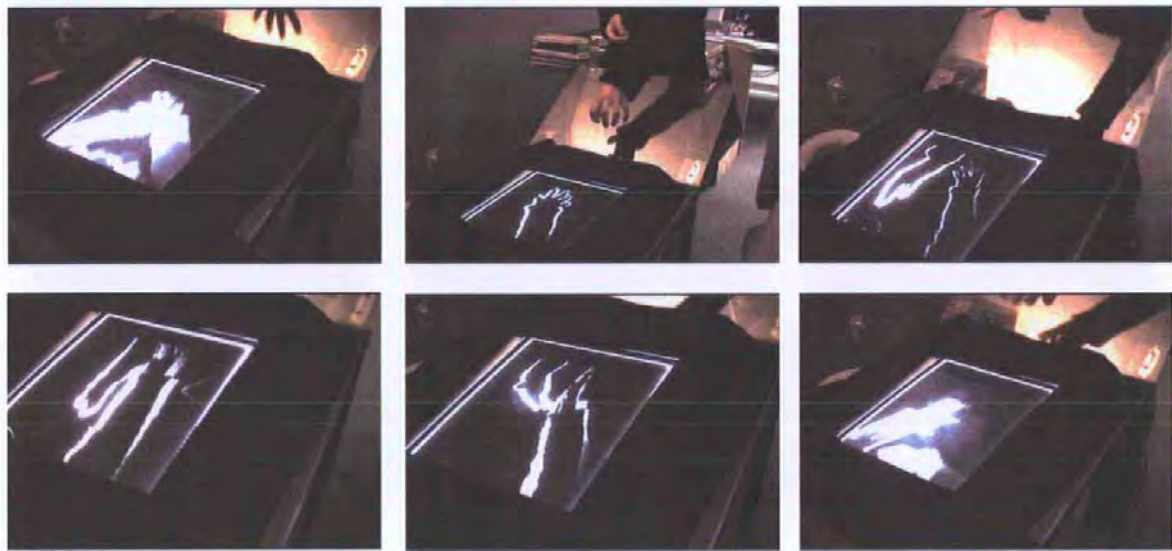


Figure 1-4: *Raumspielpuzzle*

The third installation, *Raumspielpuzzle* presented as a prototype in this thesis, is an interactive sound-movement-image puzzle. *Raumspielpuzzle* takes the notion of movement-visual-sonic feedback a step further by introducing sound–movement-image relationships with the public's hand movements to encourage the visitors to feel space as having textural and dimensional

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variation. The participant's hand movements are captured by a video camera and translated into various modalities of image processing and sound spectral manipulations in real time (*7-CML-R-Videos-R-1*).

In *Raumspielpuzzle* the intent is to make the space active and reactive with sound feedback. The term and concept evolves from Laban's theoretical proposal of creating a scripting game which would generate choreographic possibilities with notated cards where, "Unexpected space-puzzle combinations can offer an insight into the manifold drives of the free power of movement" (Maletic 1987: 141-142). In regards to Laban's concept Laban dancer, Sophie Taeuber stated that the Raumspielpuzzle "unfolds in time and space as a unique, moving ephemeral sculpture" (Maletic 1987: 35). Laban's concept of the Raumspielpuzzle is described as a sculpture and game where,

> ... several people play or attempt to realize the puzzle simultaneously, one may be
> surprised to find both a multitude of individual characteristics and many common
> trends which are hidden in the game...the actual execution of the puzzle
> combination is left to the player's invention (Maletic 1987: 143).

Laban's interest in "creative" play and the"spacegamepuzzle" is taken on board and developed as a component in the design of the feedback of images, sound and the participants interactions. In this installation the participants 'play' by introducing their hands into a sensitive region *(8- CML-R-Videos-R-9)* which immediately feeds back black and white inverted differential visual images of the hand. The sensitive region is organised into zones which produce sounds in response to the quality and position of the participant's hands. The participants can "play" the "spacegamepuzzle" by themselves or with others (*9- CML-R-Video R-8*).

## 1.1.4) The Collaborative Process

In the Choreomedia Laboratory the field-specific knowledge and methods of the team of experts from architecture, engineering, computer science, dance, philosophy, video, music and lighting became integrated into the creative process of the installations. For example, during the production of *trajets* and *Shifting Ground*, the team engaged in a variety of physical practices and skills together such as yoga, (during periods of video shoots) and the physical building of the architectural, electronic and mechanical components of each installation (i.e. building a rock climbing wall in *trajets* and building a interactive platform in *Shifting Ground*). As a choreographer, this collaborative and interdisciplinary creative process enabled me to better understand the engineering, mechanical, and architectural conditions which would enable and or limit the ways in which kinaesthetic and choreographic-based choices could be transposed into the materials used in the installations. For instance, while developing the prototype for the screens of the motors in *trajets*, five motors were tested to accommodate the choreographic potential of the motor's acceleration and speed capabilities within a given duration. In all, the notion of movement technique took on a new direction for me whereby movement techniques ranged from micro movements involving delicate engineering tasks (threading the wires for the pulleys in *Shifting Ground*) to filming bodies from an upside down and suspended position on a rock climbing wall during a video shoot (*trajets*).

## 1-2) Characteristics of the Experiential Nature of the Kinesfield

The concept of the kinesfield which emerged from this practice-informed thesis brings to light the temporal and spatial dynamic relationships between the body and the environment. This term evolved from reflecting upon the ways in which the body and its environment were being mapped together in the installations. During the first research project, *Shifting Ground*, the screen was designed as an extension of the participant's skin undulating close to their feet. As

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such the screen was an extension of the participant's kinesphere and extended to Laban's

notion of infinite space. After the presentation of *Shifting Ground*, however, and during the

production of *trajets*, it become apparent that the body-medium of the participant was not only

continuous through space, but through space and time. Effectively, in *trajets*, a continuous

skin (screens moving with the participants' bodies) coupled the participant's body with the

environment. As a result of working on various presentations of *trajets*, the body-medium

took on a new direction and from then on in was defined as a relational dynamic.

This relational dynamic is like movement, in flux and defined in the context of this thesis as a

kinesfield. Three key characteristics constitute the experiential and conceptual participatory

body-medium of the kinesfield which emerged from the artistic research presented in this

thesis. These include multimodal kinaesthetic conditioning, destabilisation or estrangement,

and triphasic participatory embodiment (public as dancer-audience-choreographer).

1.2.1) Multimodal Kinaesthetic Conditioning

In the installations presented in this thesis a variety of feedback interactions are

choreomediated to stimulate the participant's kinaesthetic experience. The term feedback as

stated in the introduction, refers to the psychophysical dialogical relationships with others,

inside oneself (memory, mental thoughts or imagination) or with elements of one's

surroundings. Psychophysical feedback is choreomediated technologically with electronic,

mechanical, optical and sonar-based technologies used to generate relationships between

various material forms, movements and mood states.

The notion of psychophysical feedback, or the feedback loop in dance is intrinsic to its

practice, yet dance literature rarely defines the back and forth movement interplay between

two dancers as feedback. A rare example of reference to this in the dance context can be seen

in Freedom Baird's (1998) artistic work. Dancer/media artist Freedom Baird integrated the

idea of movement feedback into her interactive installation research at the Media Lab

(Massachusetts Institute of Technology) after experiencing the continuous action-reaction

nature of creating a duet in a dance studio while building an interactive installation (Baird

1998: 33).


In *Shifting Ground* the action-reaction psychophysical feedback corresponds visually and

instantaneously to the participant's weight shift. Here an optical sensor attached to pulleys

and springs constitute the springboard where the participant shifts weight.[31] A visual moving

icon projected on the screen represents the weight shift creating a real time notation of the

participant's weight shift *(10-CML-SG-Videos-SG -4 & SG-5)*. The scaling of the videos

corresponds instantaneously to the size and shape of the videos with left to right movements.

The sonar-activated fan causes the screen to undulate and ripple underneath the participant's

feet as if the screen was an extension of the participant's skin. The stones under the feet on

the springboard create a sound score and a textural contact for the participant's feet. At the

same time, the shadow of the feet on the screen provide a visual image of the participants legs

as integrated with the projected videos. These multimodal feedback systems generate a

continual relationship or "dance" between the participant and the environment.


This installation was presented in the context of the International Dance and Technology

Conference, (IDAT 1999). After the conference, three dance and technology specialists who

attended the conference and the experienced the installation were asked to critique their embodied experience of *Shifting Ground*. They were asked six questions (EEM-Shifting Ground Expert's Table) regarding their experience in *Shifting Ground*. When asked: *What were the weak and strong points of your movement experience?* Mia Keinänen who was a dancer filmed in the project answered " (sic) Strong point was the exploration, feeling of being 'one' with the installation...*(but)* I really had to be close to the screen in order to see the rich details of each video sequence. I think that larger images would have amplified my movement/bodily experience as well" for Susan Kozel who is a dancer researching the choreographic and performance relationships of digital technologies, "The wind, the skating (for some reason the gliding really resonated-perhaps this is autobiographical, but even so it indicated that you created something which had the scope for triggering the autobiographical phenomenological in the participants)..." for Robb Lovell, a computer scientist and dancer the nature of the interface was cumbersome and demanded too much attention, "I didn't feel the moving elements of the installation in the sense of it inducing something in my body. I was aware of the muscular actions required in order to manipulate the interface."

It became apparent that these specialists' retrospective written critiques and translations of their given embodied experiences added a critical dimension to my research. At the same time, however, as I was creating installations for the 'general public' it was necessary to consider other methodologies of observation and embodied descriptive methods for *trajets* and *Raumspielpuzzle*. In *trajets* this included "anthropological-like" observations and videotaped footage of the participants. Whereas in *Raumspielpuzzle* the general public (cross section of participants) were asked to describe their experiences while "playing" with the interface. This

latter method proved to be informative in developing the installation's image and sound feedback characteristics. Video documentation of their movements, interactions and perceptions are included in QuickTime files on the CD-ROM (*11- CML-R-Videos-R-1 to R-12*).

Multimodal feedback in *trajets,* unlike the singular screen interaction in *Shifting Ground,* takes place with twelve moving screens, images and the mapping of the participants' pathways. The movement of the screens ripple around the bodies of the visitors like waves propagating around an object or body in water. The installation is technologically programmed to react to one body's relationship to a screen(s) or to a group's relationship to screen(s). As a visitor walks in a given path the screens in front, beside and around the body react *(12 CML-T-Videos-T-18).* In comparison to *Shifting Ground* the feedback in *trajets* is more subtle. Here the feedback links people's movements to the screen's movements, introducing the notion of felt forces or tensions between people, objects and the space. It is as if the "vacuum spaces" between the screens and people are palpable and magnetic, and thus dynamic.

The screens and visiting public together alter patterns in the installation space which affect the screens' direction, velocity and rotation and the publics' pathways or movement trajectories. During a presentation of *trajets* (The Works Festival 2002, Edmonton, Canada) a women pushing her child in a stroller said that the movements of the screen - herself and stroller were detected as one body. This type of feedback with the screen reminded her of her pregnancy, of feeling the child and her as one body. This is due to the fact that the computer vision motion detecting software was averaging her body and the stroller as one body.

This computer vision motion software (*Eyes* in Opcode's software MAX) used in *trajets* tracks the participants movements and records the people's pathways in real time *(13 CML-T-Installation-T-13)*. Each participant is represented by a different coloured dot. This dynamic visual representation of movement is projected outside of the installation and it serves as a referencing map both to recall (for those who have visited the installations) and create a prologue (for those still waiting to enter the installation) to the idea of movement trajectories. This mapping builds upon the idea of extending the participants movements to different locations as trajectories crossing various spaces. As such, each participant activates and leaves traces of movement in space. This mapping of their pathways is projected into different contexts such as outside the installation in the bar (ICA-London 2001) on the window facing the street, (Green Room Manchester 2002), on a floating map at the entrance of the installation (Walter Philipps Gallery Banff 2000).

With *Raumspielpuzzle* on the other hand, relationships take place between one participant and his/her own hands or two participants with each other's hand movements. A series of participants were videotaped while experimenting and beta-testing the installation. They are strategically not dance and technology experts per se, but a group of people who have diverse backgrounds and are meant to represent the general public. Their answers are videotaped, which offer an audio-visual support for the experiential embodied research methodologies. These QuickTime movies on the CD-ROM record participant's experience and their perceptions of their actions *(14-CLM-R-Videos R-1 to R-12)*.

In *Raumspielpuzzle,* the movements of the participant's hands are translated into sound and image feedback in real time. Both the images and the sound have varying degrees of projected opacity and intensity. For instance, at times the "real" participant's hand imprint visual

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"echoes" of the hand movements on the screen, while at other times, the visual images of the

hand movements disappears with a delay. At the same time, the sound is fed back in such a

way to offer resistance to the space – so as to encourage the participant to sculpt space and

feel the space as tensile and material.


1.2.2) Destabilisation-Estrangement

The choreomediated movement-based interactive installations strategically alter the

participant's habitual experience of weight, force, time and/or space between their bodies and

the environment. Technological feedback is choreomediated to introduce movement

experiences which oscillate between "familiar" movements or (what one anticipates) and

"foreign" or destabilising movements. The tension between familiarity and foreign is

considered a technique in destabilising the public's sensibility to help them sense their

embodied state.


For instance, in *Shifting Ground* the visual icon on the screen moves to the left of the screen

while the participant's body moves right. This technique of opposition inverses one's sense of

symmetry that the participants must learn to navigate with their weight. In *trajets*, the public

engages with screens which either mirror or repel their movements. This difference depends

on the technologically programmed thresholds of the screens, simulated magnetic range and

the movements of the participants (*15 CML-T-Installation-T-14 & T-15*). The magnetic

quality of "pull and repel" of the screens introduces a physically felt force field around the

public's bodies. This challenges the publics' habitual relationship with gravity and force as

habitually felt as downward. Instead here the force is felt radially as in the horizontal plane.
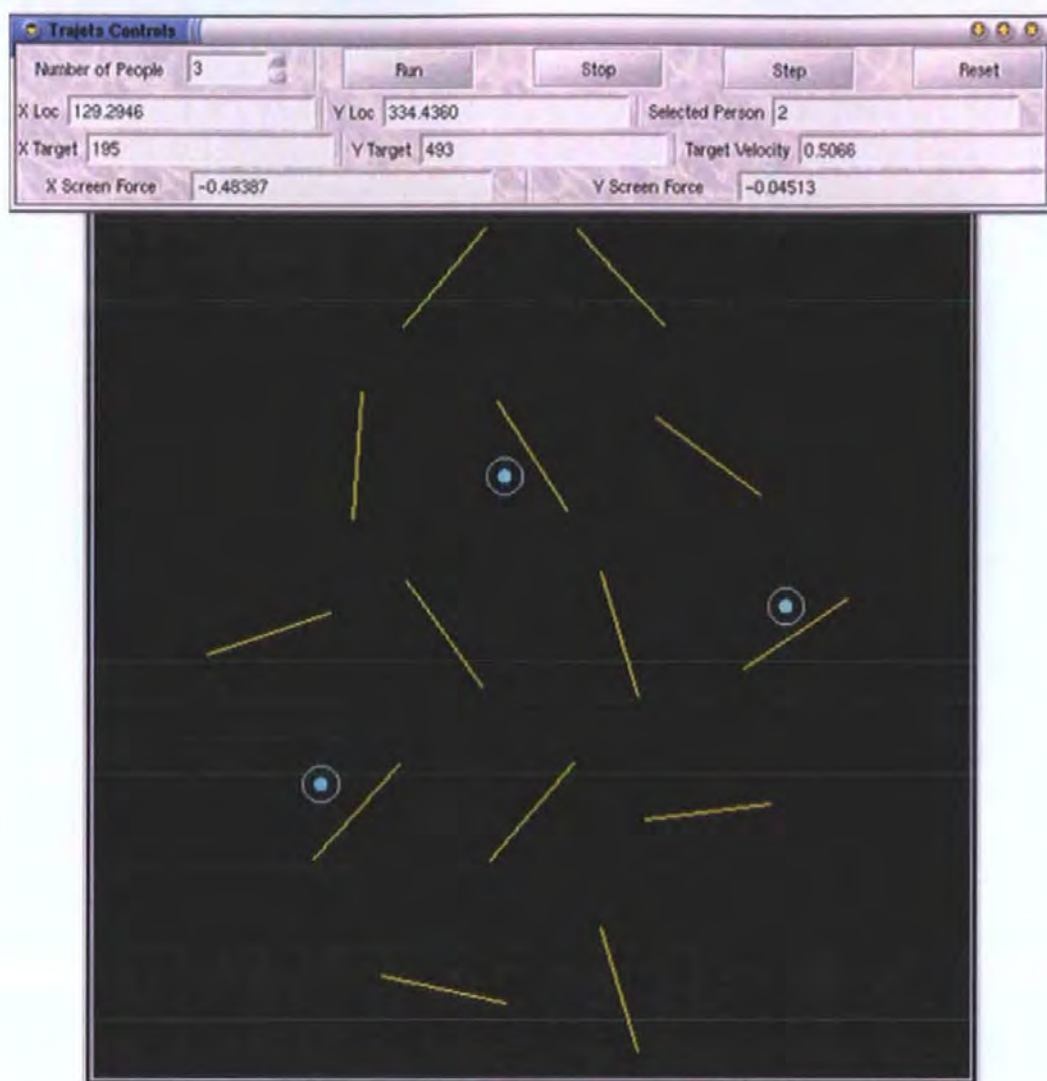
**Force field simulation software**
**written by Scott Wilson**

Figure 1-5: *trajets*:

*(the dots represent the participants and the lines the screens)*

In *Raumspielpuzzle* the participant's hands are visually inverted in the projected image which lay between the two participants. When participants move their hands they see their hands projected as if emanating from the other participant's body.
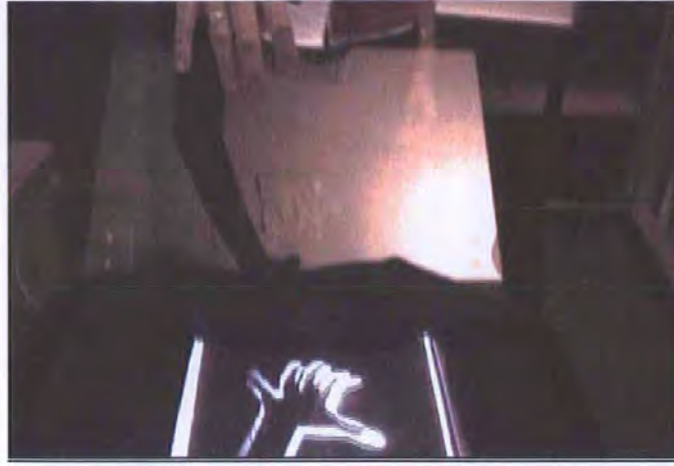
Figure 1-6: Hands Inverted Raumspielpuzzle

Here the participants can feel as if they are empathising and embodying the other (person, object, and media) as self. As one of the beta-testing participants noted, "her hand seems more like me, even though I know it is not...and now I want to be doing what her hand is doing" *(16-CML-R-Videos-R-7)*.

These movement examples of feedback destabilise the public's habitual movement expectations. This destabilisation or estrangement invites the participants to experience physically alternative movements and configurations of their body. In this installation, estrangement is a process of enhancing one's awareness of self or as phenomenologist Hans Jonas notes,

> ...In affection by a foreign agent, the affected feels itself, its selfhood excited, or
> illuminated as it were, against the otherness without and thus set off in its isolation.
> At the same time, beyond and "through" this state of excitation, the affecting
> presence is felt, its message of otherness, however obscurely, incorporated within
> (Jonas 1966: 85).

The alteration, estrangement, or destabilisation in the choreomediated environment serves as a mechanism to encourage the public to become aware of their own bodily movements by

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comparing the new bodily feedback to their customary habits. Its use in these installations derives from a technique used in movement awareness methods which is part of my physical movement training (*chapter four*).


## 1.2.3) Triphasic Participatory Embodiment (as dancer-audience-choreographer)

Dancers are often defined by their native culture, or within a given dance context - be it folk, contemporary, modern, ballet, ethnic, ritual, sacred or social dance. Through their contextual and professional traditions dancers train their bodies to embody, reinforce, challenge and produce a kinaesthetic culture. In movement-based installations the visiting public are not necessarily trained "dancers."


Who then dances in movement-based interactive art? This thesis argues that within the context of these installations, both the participants and objects[32] become in a sense, "dancers" or players. Together they "dance" and occupy the same artistic moving space. Not only do objects and dancers share the same movement space, but the dancer, audience and choreographer also converge in movement-based interactive art. Consequently the triadic perspective of the "dancer-audience-choreographer[33]" (Preston-Dunlop & Sanchez-Colberg 2002: 12-14) merges and oscillates between these various roles. The participants move in the space, witness others behaviours, and engage in an informal yet structured choreographic event. Their role is triphasic, as they participate, *dance* watch others as *audience* members – and/or *choreograph* movement patterns.

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[32]For instance, the springboard interface and the undulating screen in *Shifting Ground*, the rotating screens in *trajets* and the sound and video feedback in *Raumspielpuzzle*.

[33] Preston-Dunlop and Sanchez-Colberg (2002) describe the triangulation between the choreographer, dancer and audience as a triadic relationship.

In the movement-based installations presented in this thesis, the participants must link the two-fold reality of bodily movement performance and reception, that is, the reality of having a material physical body (körper) and identifying their own subjective state or feeling of one's living body (leib) [34] in the artistic work. The participants enter these spaces with their körper and leib but are not prepared with physical technical expertise prior to entering the installation. Nevertheless they are expected to engage their bodily movements and participate within these installations. To accommodate this condition, the participant's required movements are reduced to simple gestures such as standing, shifting weight, walking and moving hands. Simple quotidian movements are chosen to accommodate the range of levels and the visitors' skills.

## 1.2.3-a) Contract of Fiction

Upon entering the installations, the participants are introduced to the "rules of the game" with simple introductory feedback. Danish Dramaturge Janek Szatkowski introduced me to the concept: "contract of fiction[35] during a presentation of *trajets* (February 2001). I have since integrated this concept into my practice in movement-based interactive art. This contract, like the prologue of the book, sets the tone of the artwork and invites the public to focus their attention on the movement rules, kinaesthetic logic and the technological interplay in each installation.

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[34] Social philosopher Helmuth Plessner (1892-1985) uses these terms to distinguish the material body (körper), from the feeling body (leib).

[35] The term "contract of fiction" was introduced to me by Danish Torunn Kjølner and Janek Szatkowski during a presentation of *trajets* at the Centre Advanced Visual Imaging, University of Arhus, Denmark February 2001. Dramaturge Janek Szatkowski introduced this term to theatre in the 1980s to describe the information, and tone which is established between the first few minutes of a given performance. This is meant to guide the audience into the dramaturgic intention of the artistic event.

In stage arts (cinema, dance or theatre) contracts of fiction take place with the conventions and the expectations of the theatre event: giving an attendant a ticket; sitting in the dark theatre; watching a performance from a seated fixed position, and with the first few minutes of the performance which sets the tone of the staged event. During the course of the research, it became apparent that the term "contract of fiction" could describe not only staged performances in a theatrical venue, but the participants first contact in these movement-based interactive art installations. In *Shifting Ground* a contract of fiction was not established at the entrance of the installation. After the first two presentations of *trajets*, the notion of the contract of fiction was taken on board to enable the participant's to habituate themselves to the technologically-mediated movements and the mood state of the installation. Choreographically, the first two screens were placed at the entrance of the installation as "welcoming doors." Both "welcoming doors" move in a similar fashion to automated doors in supermarkets. In *Raumspielpuzzle* the participants position their hands in the sensitive zone analogous to the manner in which one selects a clear frequency signal (or station) on the radio.

### 1.2.3-b) The Dancer's Fictive Body

After the participant accepts the "contract of fiction" within a given installation, they become in one sense, a "dancer." Based on my experience as a dancer (1982-2003) I understand "dancing" as a process of transforming one's quotidian bodily inner state, to what performance theoretician Eugenio Barba's coins the "*corps fictif*" or the "fictive body" (Barba 1995: 20). One of the characteristics of a performer (dancer or actor) is identified by theoretician Barba as the fictive body.

> Dans la tradition occidentale le travail de l'acteur a été orienté par un réseau de
> fictions, de "si" magiques qui touchent à la psychologie, au caractère, à l'histoire de
> sa personne et de son personnage. Les principes pré-expressifs de la vie de l'acteur
> ne sont pas non plus quelque chose de froid qui concerne la physiologie et la
> méchanique du corps. Ils se basent eux aussi sur un réseau de fictions de "si"

magiques qui concernent les forces physique qui meuvent le corps. Dans ce cas, ce que l'acteur cherche, c'est un corps fictive, non pas une personalité fictive (Barba 1995: 19-20).

Barba states that the stage dance audience reacts not just to the physical body (executing gestures through space), but to the *"corps-fictif"* which is generated by a psychophysical technique where by the performer creates a network of external sensations in reaction to physical gestures. As a dancer I generated this "fictive body," by drawing on lived experiences, memory and imagination to alter my mood state. This mood state creates the conditions of fictive embodiment and is the means of transforming oneself from being a "quotidian body" to being a "performing/dancing body." This mood state characteristic of the "dancing body" directly informs the ways in which "dance space" is for me kinaesthetically – felt and intentionally externalised and materialised in the installations presented in this thesis.

In order to gain a more expansive and diverse appreciation of this corps-fictif and inner-felt "dance-space" dancers from diverse professional contexts were asked to describe their body-space with a given performance and to describe their experiential embodied "dancing spaces." These informal interviews were recorded on tape, written in email exchanges and then translated and transcribed.[36] As Odissi dancer Yamuna Sangarasivam (1964[37]) from Sri Lanka states, performance "…is connecting with people in the room, it is connecting with the environment, and the play with myself the environment and the people in the room." (*17-EEM-Dancer's Interviews*) Japanese Butoh dancer Kim Itoh (1974) said that "Me my body,

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and the wall is creating the space ..." (*18-EEM-Dancer's Interviews*) Opera Ballet dancer

Nolwenn Daniel (1973) says "I need to fill the space with my body ... you have to work this

mental imagery very much in regard to the spirit of what you are trying to dance" (*19-EEM-*

*Dancer's Interviews*), Brazilian Capoeirista Mestre Joao Grande (1934) "I transform in an

animal, the movement of the snake, the crab, the monkey." (*20-EEM-Dancer's Interviews*)

English (social dancer in clubs or "clubber" Guy Hilton (1974) wrote that "Dancing is a route

to an oceanic state, a place of amniotic weightlessness...," (*21-EEM-Dancer's Interviews*)

whereas Australian telematic performer Hellen Sky (1954) wrote: "I am in a feedback loop

between seeing my body altered, dancing with the absent present virtual partner knowing that

I am here and there, and there and there, at the same time" (*22-EEM-Dancer's Interviews*).

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[37] The date of birth is added after each dancer's name. In theses interviews, dancers of different generations and cultural backgrounds were specifically chosen to gain a better appreciation of the similarities and differences in the experiential an embodied "performing dancing space."

"Clubber" Guy Hilton



Telematic dance performer Hellen Sky



Odissi dancer
Yamuna Sangarasivam



Capoeira Mestre Joao Grande



Butoh dancer Kim Itoh



Ballet dancer Nawenn Daniel

Figure 1-7: Dancer's interviewed

After comparing all of the interviews, it became apparent that the dancers interviewed did not discuss dance in performance as a purely physical gesture-based experience. They all described performance as a sort of resonating experience between the environment and one's embodied state. French philosopher, dramatist and poet Paul Valéry (1931) defined this experience as a resonating loop. "An inner life, indeed, but one consisting entirely in sensations of time and energy which respond to one another and form a kind of close circle of resonance ..."[38] Valéry extends this to the audience's participation. "This resonance, like any other, is communicated: a part of our pleasure as spectators consists in feeling ourselves possessed by the rhythms so that we ourselves are virtually dancing."[39]

The concept of the dancer's space, mood space, and the *"corps fictif"* is addressed from another perspective by choreologist Valerie Preston-Dunlop. In answering the question: "What is the dancer's space?" She states that there is a psychological negotiation in the triadic dancer/dance/audience. "It (the space) becomes a place of expectation that the negotiation will take place in..." which are "inhabited, temporarily, by humans in joint endeavour, at which illusory forces and relationships are manifest" (Preston-Dunlop 1978: 10).

This characteristic of dance performance, along with the notion of Barba's "corps fictif" is intrinsic to my performance and choreographic sensibility. It is one of my artistic intents to externalise the notion of fictive body states as mood states into the installation space in order to elicit the participant's kinaesthetic sensibility of the corps fictif. This resonating fictive

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[38] Valéry, Paul (1980) "Philosophy of Dance" by Paul Valéry (1871-1945) in The Dance Anthology. Cobbett Steinberg (ed.), pp.337 taken from Aesthetics, "The Conquest of Ubiquity," translated by Ralph Manheim, p.225. Pantheon Books, Bollingen Series, New York, 1964.

body, however is difficult to frame, as it is subjectively-felt and not measurable quantitatively. Dance ethnographer Sally Anne Ness argues that the body in dance,

> becomes the key to relating a tremendous imaginary reservoir of purposeful instances of self-conduct, in the most ideal terms conceivable. The imagined reservoir itself, which is exposed and generated by this activity, is both a cultural and a choreographic construct (Ness 1992: 10).

As the dancer's described in the interviews this imaginary reservoir is stimulated through the act of performing through processes of resonance and reciprocity between elements in the environment and the dancer's "leib." In *Shifting Ground, trajets* and *Raumspielpuzzle* the sensibility of the fictive body is transposed into the choreomediated objects, alternative movement interactions, mood and architectural nature of the installations so that "all the sensations of the body, which is both mover and moved, are connected in a certain order-that they call and respond to each other, as though rebounding or being reflected from the invisible wall of a sphere of energy within the living being." [40]

### 1.2.3-c) Participant as Choreographer/Multistable Possibilities

Despite the controlled and choreographed environment and fictive contract established in the installations, it became apparent during presentations that at times the visiting public invented their own behavioural and choreographic logic. As such, these choreomediated installations are in a sense multistable, awaiting the "wild card" public participant to choreograph and/or improvise. In the context of this thesis, this behaviour is interpreted as a choreographic act.

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[39] *Ibid.*
[40] *Ibid* p. 334.

This thesis adopts and extends philosopher Don Idhe's term "multistable possibilities" as it articulates this choreographic characteristic of technologically-mediated movement-based interactive artwork very clearly.[41] As elaborated in chapter five, technologies have multiple applications of experiential embodiment or "multistable possibilities" (Idhe 2002: 106) a term Idhe uses to describe multiple uses of a given technology. This is relative to the choreomediated possibilities which emerge for the participants when they enter the installations. In some respects, some public members take on a choreographic role in organising their body in relation to the screens and images in innovate creative ways. The public's behaviour in *Shifting Ground* and *trajets* surprised and surpassed the original choreomediated concepts and intentions. For instance, my expectation during the presentation of *Shifting Ground* was to have the public step onto the springboard. The visitors, however, introduced other approaches. These variations included putting only a toe on the board, sitting on the board and making drawings with visual feedback of their weight (like hoolahooping).

In *trajets* the expectation was that the public would walk in an "action-reaction" manner to the moving screens. Again, the public as choreographers introduced other approaches. Upon entering *trajets* (Main d'Oeuvre Paris 2002), two children created a movement game which adults could not play due to their size. They ran and lay down under a screen (navel under the plumb-line of the screen) and extended their legs up and then back down and moved as soon as the screen would get too close to them. The rule of their game was "do not let the screen touch your body."

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[41] It should be noted that different presenters of *trajets* used the installation space as a pedagogic and choreographic space for creating dances and projected videos.

Two other incidents are worth noting. A participant (Institute of Contemporary Art (ICA) London 2001) spent approximately one hour in the installation dancing and improvising with the screens. At times he moved forwards and at others backwards. He changed his body-shape in relationship to the screen's movements and played rhythmically with each screen's movement quality. Before he left I went up to him and complemented his movement improvisation. He told me that he was not a dancer (and here I paraphrase) and that the installation gave him the opportunity to explore spaces which opened, closed, pulled, caught, tricked and surprised him. He said he felt his body discover the multiplicity of spatial complexity. The second example was of an elderly man who sat on the attendant's chair and watched others in the installation for approximately 30 minutes (ICA London 2001). He then stood up and began walking in figure eights around the screens. Then he sat down to watch the repercussions of screen's echoes of his movements. His behaviour illustrated this triphasic participation clearly. He participated, and danced in the space, watched his movements as an audience member and choreographed movement patterns.

### 1.2.3-d) Turning the Audience Inside Out

The audience-performer division converges in movement-based interactive art, as the public participates in the fabric of the artwork. In stage dance, for the most part, the audience does not intervene or contribute to the fabric of the choreographed work. The spectator, for the most part, watches the dancer/s on stage perform. This audience-performer framework creates a separation not only between viewer and viewed but also between the expert and the non-expert.

Even in the stage dance paradigm performance, however, it is a mistake to describe the audience as completely passive, for they fill the theatre with an attentive gaze, energy and applause. Additionally, they interact and respond to the dancer's movement with internal felt sensations or their kinaesthetic sensibility. As Best notes,

> The dancer experiences certain kinaesthetic sensations as she moves, and these constitute the aesthetic meaning of the dance. Communication of this meaning is effected by a feeling of empathy in the spectators, caused by watching the performer's movements...Most people, even those with little experience, have some capacity for movement, hence when watching, they are aware to some extent of what the dancer is feeling[42] (Author unknown, cited in Best 1974: 144).

In 1960 John Martin (Martin 1933: 85) proposed the term "Metakinesis" to describe such a kinaesthetic identification and movement empathy which takes place in the audience's inner perception of a dance performance.[43]

In movement-based interactive art the participants at times watch others and seem to be anticipating what they are about to experience, or recalling their own lived experience. Even though these installations were created for public participation – the notion of the audience watching, or witnessing others is still quite present. In one venue the public literally sat on the floor to watch the others in the space, as if they were on a stage.

## 1.3) Summary

The artistic intent in these movement-based interactive installations discussed in this chapter lies in bringing the publics' attention to multimodal, playful and dynamic relationships between their kinaesthetic bodies and the environment. Kinaesthetic awareness is conditioned

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[42] This quotation is unattributed in Best's 1974 text.

with various systems of feedback with choreomediated objects, video and sound technologically networked together.

As illustrated, each of these installations invites the public to inhabit[44] their body-medium or kinesfield differently. In *Shifting Ground* the public participates with the use of weight transfer, in *trajets* they walk and stand within a forest-like space of moving images and screens, and in *Raumspielpuzzle* they move their hands to generate a sonic, visual and tensile space. The emergent characteristics of the body-medium in these movement-based interactive art installations are described as *triphasic participatory embodiment, multimodal kinaesthetic conditioning* and *destabilisation/estrangement.* These characteristics gave rise to the nascent concept of the kinesfield. The remaining part of the thesis will elucidate these concepts and illuminate the notion of the body-medium as kinesfield.

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[43] Laban compares this audience – performer contact to a bi-polar magnetic current. (Ullmann 1980: 6)
[44] The term "inhabit" is used in (Jonas 1966) as a biological and phenomenological description of active condition of living in the environment or as Jonas describes "life-world."

# SECTION TWO: MODALITIES OF BODILY MOVEMENT

# ANALYSIS

# CHAPTER TWO: DESCRIBING BODILY MOVEMENT

The concept of the kinesfield builds upon characteristics of bodily movement description developed by Rudolph Von Laban (1879-1958) and Ray Birdwhistell (1918-1994). These specialised modes of movement description, the first originating from dance, *Choreutics*[45] and *Effort-Shape,* and the latter from anthropology/linguistics, *Kinesics,* are of prime interest to this thesis as they translate bodily movement characteristics into descriptive, symbolic and conceptual analytic tools. In turn, these tools or specialised languages enable bodily movement experience to be communicated and translated across material forms, disciplinary traditions and history.

This chapter begins by illustrating how Laban's specialised term of space-movement: namely the "kinesphere" (1926) was seminal in conceptually coupling the body and space as a medium, yet argues that it ill suits the participant's body-medium in the movement-based interactive installations presented in this thesis. This is followed by a discussion of Laban's effort-shape "motion factors" and Birdwhistell's concept of bodily "transactions", both of which are practically and theoretically pertinent to movement-based interactive art and the concept of the kinesfield.

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[45] Choreutics describes the study of spatial forms for dancers and dance. See Chapter One in (Laban: 1966).

## 2.1) Historical Context of Laban's Work

At one level, the origins of Laban's Choreutics and Effort-Shape can be traced back to

historical graphic notations of court dances (1400-1700s) (Figure 2-1). These graphic

notations were in a sense spatial maps of court dances representing the arrangement of both

individual and group dance floor plans.[46] Choreographer Raoul Auger Feuillet advanced

dance notation with his (1699) <u>Chorégraphie ou l'art de décrire la danse par caractères, figures</u>

<u>et signes démonstratifs par soi-même</u> (*Choreography or the art of describing dance with*

*demonstrative characters figures, and signs on your own*) dance guide and provided the

source materials for Laban's movement notation.

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[46] See Thibeau Arbeau's Orchesographie (1588) for written descriptions and notations of court dances with floor plans and selected arm gestures.
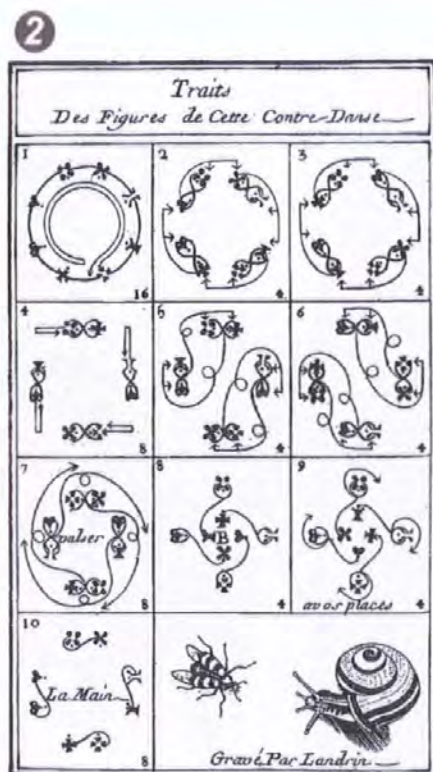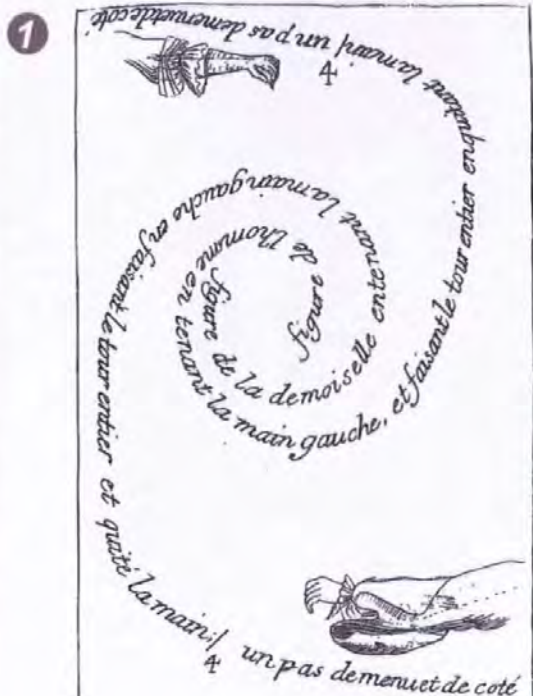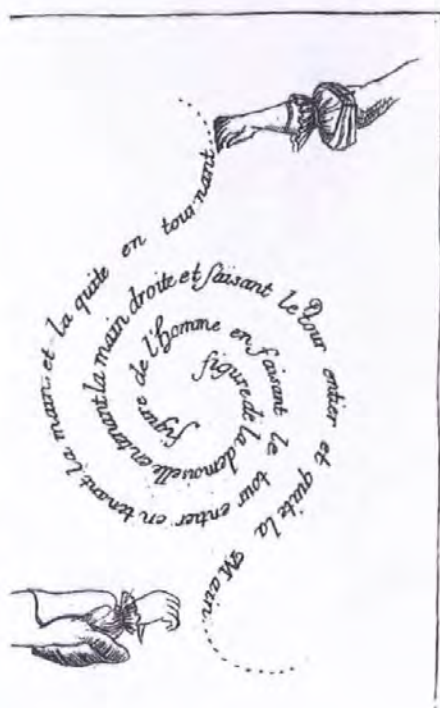
*From the top to the bottom:*
1-Feuillet (1700s)
2-Landrin (1700s)
3-Bartholomé Ferriol and Boxeraus
(1795)

Figure 2-1: Examples of dance notations (Vuitton 1993)

Laban who was a graphic artist, dancer and choreographer expanded upon the directional and

graphical translations of Feuillet's notational system into what became Kinetography[47] or

Labanotation. Laban's interest in movement, however, went beyond quantitative movement

notation. In <u>Die Welt des Tanzers</u> (The Dancer's World) the section entitled *The Science of*

*Dance* (1922) (*appendix 2, pg. 145*) Laban stated that the "newly emerging science of dance

will be to show that the whole of nature is ruled by the dynamic laws of harmony" (Maletic

1987: 156). Of the eight points outlined in this publication the first two are of direct interest to

this thesis. These include the geometric zones of space-movement and the four motion factors

in effort-shape analysis. The first establishes the idea of the body-medium coupled with its

surrounding space, and the second, provides analytic tools to translate bodily movement

qualities across material forms.


## 2.1.1) The Kinesphere

Despite his eclectic interest in movement, Laban's frame of reference in Choreutics was

initially Feuillet's balletic body "…as a first step towards the understanding of the new aspect

of movement we employ the terminology of the (classical ballet) dancer to describe relations

of positions in space." According to Laban, the "basic elements of orientation in space are the

three dimensions: length, breadth and depth …" (Laban 1966: 11). These geometric

attributes create the foundation of the kinesphere.

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[47] Albrecht Knust is often cited as being primarily responsible for completing Laban's kinetography.

Figure 2-3: Kinesphere

The kinesphere is the sphere around the body whose periphery can be reached by
easily extended limbs without stepping away from the place which is the point of
support when standing on one foot, which we shall call the "stance." ...We never,
of course, leave our movement sphere but carry it always with us, like an aura
(Laban 1966: 10).

This kinesphere symbolized by an icosohedron shape is composed of twenty six points or

directions (thus supplementing the basic dimensional cross with intermediate directions) with

the twenty seventh point originating at the centre of the body. The size of the kinesphere can

expand or shrink to represent the "infinite diagonal rays that radiate from the centre of our

body and its kinesphere into infinite space" (Laban 1966: 17). Infinite space is the zone which

propagates beyond the body's reach space.

2.1.2) The Limitations of the Kinesphere in Movement-based Interactive Art

The fact that Laban articulated space-movement as a medium is crucial to the concept of the

kinesfield as it acknowledges the entangled relationship of the body and space. In movement-

based interactive art, however, the characteristics of Laban's space-movement terms are

problematized.

Laban's definition of the kinesphere does not elaborate upon the spatio-temporal conditions of

the environment (i.e. socio-cultural events/objects, natural laws, and atmosphere) which

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influence the body-medium. In the movement-based interactive artworks presented here, the participant's body moves with moving objects that together create dynamic transactional relationships. In these relationships the choreomediated space is palpable and dynamic.

Whilst Laban notes[48] the relationships between body, space and locality;

> The conception of space as **locality** (my emphasis) in which changes take place can be helpful here. However, we must not look at the locality simply as an empty room, separated from movement, nor at movement as an occasional happening only, for movement is a continuous flux within the locality itself, this being the fundamental aspect of space. Space is a hidden feature of movement and movement is a visible aspect of space. (Laban 1966:4)

his definition of the kinesphere focuses primarily upon the individual's dynamic shaping of bodily movement and expression into space and less on the actual dynamic impact of space.

> the crystalline shapes (of the kinesphere) serve not only as visualizations or schematizations of the environmental space directions, but also as metaphors for the **dynamic shaping of expressive movements** (my emphasis), the edges and inclinations of an invisible spatial crystal. This spatial crystal is the medium in which the structural tension of man is built. The building power of space induces the drawing together of the skeletal parts to which muscles are attached, the swinging out and executing of the full range of movement for which there is potential (Laban 1966: 54).

Laban's interests were multiple yet due to his interest in the "expressive dancer" the locus of attention centres itself more on individual expressive movement impulse and effort and less on processes of movement communication between people and objects[49]. This thesis argues that the kines*field* fills this gap and highlights the dynamic transactions that take place between the

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[48] See Sánchez-Colberg's 1998 discussion of Laban's thinking of space as locality.

[49] Laban highlights the inanimate and bodily relationships by describing peoples' relationships to objects as being based on "preparation, actual contact, and release" (Laban 1980: 66).

body and the environment. This is a crucial element of the installations presented in this thesis – and even our everyday spatial behaviour.

In 1978, Valerie Preston-Dunlop, former student of Laban, extended the kinesphere to being not only a dancer's space, but common to all human beings and a psychophysical space or "personal space" (including one's mental and imaginary condition) (Preston-Dunlop 1978: 33-34). She also segmented the kinesphere into three zones: the "*internal,* (within the body); *proximal*[50]; (i.e. between one's skin and costume) and *axial*" (which relates to Laban's notion of reach space) (Preston-Dunlop 1978: 36). Preston-Dunlop also noted that dance presentational venues could be described as "shared space" (i.e. between the audience and performers or in martial arts), however performance dance space (like the kinesphere) is framed as having dimensions, peripheries and centres (Preston-Dunlop 1978:36). Preston-Dunlop's notion of kinesphere as not only personal but shared space is evidence of a necessity to expand Laban's theories (Preston-Dunlop 1978: 33-34).

Laban and Preston-Dunlop both, however, emphasize the locus of bodily movement as emanating from the centre of the body and extending to infinite space.[51] Laban's dynamosphere or the "connection between outer (executed) movement and the mover's inner attitude" is closer to the spirit of the kinesfield as it is based on the temporal, spatial, weight

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[50] Anthropologist Edward Hall (1966) also described proximal bodily spaces. Hall coined the word "*Proxemics*" for the "the interrelated observations and theories of man's use of space as a specialized elaboration of culture" to distinguish different scales and distances of movement interactions (Hall 1966: 1).
[51] Choreographer William Forsythe challenges Laban's 27th centre point in the kinesphere and instead says that each joint of the body could be a centre point for bodily movement initiation. See "Proliferation and Perfect Disorder: William Forsythe and the Architecture of Disappearance" Baudoin, Patricia and Gilpin, Heidi by http://www.frankfurt-ballett.de/artic1.html pg.3.

and flow of bodily movement, yet it is still based on "varying degrees of intensity emanating from the body" (Laban 1966: 27). Although this zone comes closer to the movement-based interactive art experiences brought forth in this thesis, it still does not accentuate the dynamic characteristics of incoming exterocentric (*chapter three*) phenomena. Rather it focuses on the inner impulse or effort of a given person's bodily movements that are executed expressively and outwardly coupled with space.

## 2.1.3) Effort-Shape: Motion Factors

Whereas Laban's Choreutic space-movement theories need expanding in movement-based interactive art, his Effort-Shape's 'motion factors' are practically and artistically speaking, of great interest. Effort-Shape develops and schematizes descriptive terms of bodily movement qualities. Even though Laban's effort theories are based on inner impulse and bodily movement initiation, their qualitative range of intensities facilitate their application and integration when choreomediating objects and programming in interactive installations. The four motion factors in Effort-Shape or Laban Movement Analysis (LMA)[52] are polar opposites of time, space, weight and flow (Laban 1950: 77).

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[52]Effort-Shape was developed in the United States as a part of Laban Movement Analysis (LMA). LMA was the term used during my studies in the dance department at the University of California, Los Angeles (1991) "LMA refers to the body of work that was organized when the Laban Institute was formed in NYC in 1978. Once this Institute was formed the LMA certification program brought about the use of this term versus effort/shape. Effort-shape was used in the 1960-1970s with the aid of Warren Lamb who taught Irmgard Bartenieff Laban's last thinking on the material of movement around 1958. Both terms relate to the American teaching of Bartenieff Fundamentals, Space Harmony, Effort and Shape Theory and Motif writing/Observation" (Quoted from Judy Gantz my LMA teacher at UCLA).

**Survey of the Aspects of Weight, Time, Space and Flow Needed for the Understanding of Effort.**
**The Effort Graph: Representing the Four Motion Factors**

W= Weight
T = Time
S = Space
F = Flow

Fine Touch
W
Flexible
S
Direct
Free
F
Bound
T
Sustained
Sudden
Firm
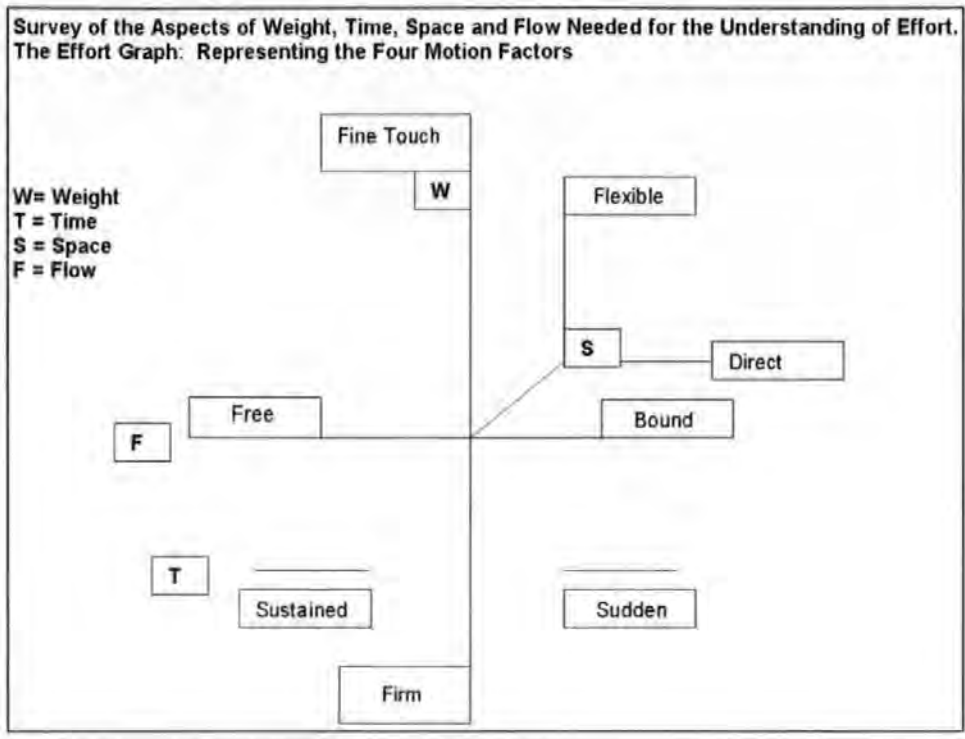
Figure 2-3: The Effort graph

The four motion factors in Laban Movement Analysis (LMA): Weight, Time, Space and Flow were an effective tool in choreomediating qualitative movement rapports in the movement-based interactive art installations presented in this thesis. They helped to discern and translate qualitative movement differences across material forms. This LMA schematic proved to be an efficient means of communicating movement ideas to engineers and computer scientists. In *trajets* for instance, a selection of movement qualities were transposed into the parameters of the software programming activating the screen motor's rotation steps, directions, duration, variations of acceleration and deceleration, and in the force threshold potential configured between the participant and the screen.

In *Shifting Ground* these motion factors were used to differentiate qualitative movement

expression from the three dancers of different geographic locations and qualitative efforts of

the dancers into the video dance sequences. In these video dance sequences the qualities of

weight, time, space and flow were manipulated through cinematic and electronic techniques.

Here, the motion factors serve not only to describe the qualitative intensities of the Laban's

original "dancer's body," but the "cinedance or videodance body." Laban's seminal work in

articulating these motion factors is of direct interest to the installations presented in this thesis

and will continue to be a tool of refining movement specificity in the research to come.


## 2.2) Birdwhistell's Kinesics

Whereas Laban's theories focused primarily on the outwardly expressive and emotive bodily

movements of individuals, theories in communication studies theorise dialogical processes of

transaction between people. Communication studies usually assumes that there is a

relationship, a sharing of common experience between the emitter and recipient.

Anthropologist Birdwhistell (1950-1970s) was interested in bodily movement communication

as a social phenomenon. He created an analytic modality of movement description based on

"movement transactions" of the body and its environments which he coined *Kinesics*. For

Birdwhistell, movement interpretation and meaning depended upon, "The particular biological

system and the special life experience of any individual will contribute idiosyncratic elements

to his kinesic system" (Birdwhistell 1970: 183-184) (*appendix 3, pg. 146*).


*Kinesics* is a method of bodily movement observation and analysis developed with specialised

technological instruments, language and notation. Birdwhistell recorded people's movement

patterns (Kinesic recording) with audio-visual recording instruments and analysed the

recordings in slow motion playback. In parallel he developed kinegraphs (notation system)

and specialised descriptive terms to decode people's movement as related to a social communication system. (Birdwhistell 1970) Birdwhistell's "kinegraphs" segment the body into eight or more parts (i.e. head and neck, pelvic region, etc...) in relationship to the "cultural-body"[53] being studied.

## 2.2.1) Qualitative Transactions

In contrast to Laban's geometrical individual-based emotive body-medium of the kinesphere, Birdwhistell highlights the body-medium as produced by and producer of transactional experiences. Birdwhistell focused on the social, contextual, patterned and community nature of movement transactions, whereas Laban focused more on individual's movement impulses and efforts. As Birdwhistell progressed to describing finer movement qualities, however, the closer his terminology came to resembling that of Laban. He even recommended readers to consult Laban's analytic methods of Labanotation to appreciate a finer understanding of bodily movement specificity (Birdwhistell 1970: 255).

In movement-based interactive art Birdwhistell's notion of transactions can be adopted to describe the choreomediated feedback processes between people and animated objects in local and distributed environments. The focus in these artworks, however, is not on a narrative-based "messages" communicated, but on the qualitative movement dynamics (Laban) between the public and the choreomediated space and the ways in which these "transactions" impact the public's kinaesthetic experience. The thesis considers these transactions or qualitative movement rapports of both inanimate and animate objects as kinaesthetic and part of a "field of movement."

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[53] Birdwhistell adapted his notation to the cultural codes of a given social group.

## 2.3) Summary

The notion of the kinesfield builds upon Laban and Preston-Dunlop's kinesphere. The kines*field* extends the kines*phere* by highlighting dynamic bodily (kine) relationships coupled with the environment (field). Birdwhistell's notion of the transaction is conceptually adopted as it focuses on dynamic reciprocal processes of communication which transpire between people and objects. Whereas Laban focused on the body as the initiator or emitter of qualitative movement (motion factors), Birdwhistell focused on the transactions between *communicants* or two or more social-biological-cultural bodies.

In the following chapter the notion of the kinesfield is elaborated by illuminating the physiological conditions which enable bodies to transact with others, inanimate objects and the environment. They describe the ways in which the participant's "kines" (sub-unit of bodily movement) can transact and map itself to the environment (field) in the choreomediated installations presented in this thesis.

# CHAPTER THREE: BODILY MOVEMENT PERCEPTION

Whereas Laban's body-medium's referential spatial frames are unidirectional and geometric (kinesphere, infinite space and dynamosphere) the guiding referential factor in the movement-based interactive installations are in the transactional dynamics between people and the environment. In these installations, this dynamic or kinesfield is materialised with choreomediated relational experiences which are intended to encourage the public to feel their own bodily movements both as distinct and as partners "mapped" with the environment. In the field of dance, these transactional experiences between bodies can be likened to the partnering dynamics in Contact Improvisation or martial arts where bodies move in relationship to changing weight of each other's bodies.

This chapter examines how the shared, partnered and relational experiences in movement-based interactive installations give rise to physiological processes of bodily movement identification and communication defined by scientists in the fields of psychology, physiology and neurophysiology. These physiological and social processes are inherent in the human condition affording movement transactions (identification, communication) to occur with others, objects, itself and the environment. These processes help to illuminate how the installations have the potential of cultivating the participant's "kinaesthetically aware body."

## 3.1) Physiological Conditions Underpinning the Kinesfield

Physiologists have shown that metabolic, mobile, and sensory-motor physiological processes allow our bodies to interact and perceive movement within ourselves and the environment. These notions implicitly underpin the research undertaken in the Choreomedia Laboratory

guiding the kinaesthetic logic of each installation and the integration and qualitative feedback in software and hardware design.

In the context of this thesis, these physiological processes help to conceptually "un-frame" the spatially defined body medium as geometric (kinesphere) to one that focuses on the ways in which bodies "transact" with others, objects and the environment. These processes are not necessarily overtly visible as motion, as some are subjective processes, which enable humans to communicate and identify within a moving environment (people, objects, and natural phenomena).

### 3.1.1) "Unframing" Bodily Movement

Bodily movement, as a subject of scientific research has primarily been concerned with observing and recording motion. "The simplest change to observe in a body is the apparent change in its position with time, which we call motion" (Feynman 1963: 8-1). Observation of bodily movement or motion is difficult to isolate and frame. As neuroscientist Berthoz notes:

> Body movement is defined as a change in position in relation to another object, frame of reference, or system of co-ordinates. But the Galilean principle of the relativity of movement is implicit in the concept of the frame of reference. The '$\lambda$" threshold can be considered as the point of origin of a frame of reference for the mobilization of motor neurons. In displacing '$\lambda$", the level of control specifies a new reference point and produces movement (Berthoz 2000: 113).[54]

If movement is indeed change, relative to a positional frame of reference which shifts, then our frames of reference are in and of themselves dynamic. Berthoz's description of the frame of reference as continuously dynamic is of direct interest to this thesis. If the frame of

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reference is dynamic, then why not shift the locus of discussion to the dynamic and "un-frame" the moving body? In this thesis, the kinesfield as a term is taken on board to unframe the body in the Euclidean sense and to centre the discussion on the movement transactions between people – objects and spaces.

### 3.1.2) Dynamic and Transactional Processes of Bodily Movement

Our mobile human bodies move in and out of different frames of reference or contexts (with varying degrees of awareness.) As human bodies we move through contexts in reaction to, or with feedback between our bodies and the environment employing a range of physiological processes to enable "body to environment mapping." A selection of these physiological processes and conditions are in a sense "body mapping modalities." Motor babbling, mimesis, empathy, kinaesthesis, proprioception and perceptual systems are conditions which allow bodies to identify and communicate with others and their environment. In total they illustrate how bodily movement from infancy is in a perpetual and dynamic relationship with the environment. These are the means through which we gather, map and negotiate movement experiences between our subjective state and the environment. An examination of these concepts serve to illuminate some of more subtle characteristics of the kinesfield.

As infants we begin mapping our environment with sporadic bodily movements. Kuenzell (2000) defines this mapping as motor babbling which "… leads to a concept of the self, to a mapping between the environment and the perceived environment …" (Kuenzell 2000:1). According to Kuenzell, motor babbling is the mechanism by which infants identify their bodies with the environment. It allows infants to situate and adjust themselves in the

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[54] Berthoz quotes Feldman in (Berthoz 1994: 113).

environment. Motor Babbling is of direct interest to the conceptual description of the kinesfield as it describes a physiological process which humans use to map space through movement. As humans mature they begin mapping and internalise movements by imitating each other with mimesis. With Mimesis we "… get hold of something by means of its likeness… – a copying or imitation, and a palpable, sensuous, connection between the very body of the perceiver and the perceived" (Taussig 1993:21).

Empathy on the other hand, is a means of identifying oneself in the 'Other'. Philosopher Evan Thompson (2002) highlights how empathy relates to knowing, feeling and responding to the world both as bodily and inner felt. Empathy is an "…involuntary coupling or pairing of my living body with your living body in perception and action… (and) the imaginary movement or transposition of myself into your place" (Thompson 2002:7). Mimesis and empathy are integrated and choreomediated into movement-based installations interactions. For instance in *Raumspielpuzzle*, the participant sees the visual feedback of their hand movements as mimicked in the video feedback or as transposed in the visual feedback of the body of the other participant.

3.1.3) Kinaesthesis and Perceptual Systems

In the installations presented in this thesis, empathy is closely entangled with kinaesthesia and the haptic systems. Kineasthesis,[55] coined by Charles Bell in 1826, describes the receptive and

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[55] Note that this is spelled either as kinaesthesis or kinesthesis. I have respected the author's spelling when in citations.

afferent awareness of our muscles or our "muscle sense" (Gibson 1966: 111).[56] In 1900,

neurophysiologist Charles Sherrington extended the definition of kinaesthesis and described

*movement pick up*[57] and interaction as a consequence of our biological conditions of

proprioception and exteroception.[58] During the mid 20th century, physiologist Gibson (1904-

1979) challenged the term proprioception and divided it into: intraceptive (between parts of

the inner body), proprioceptive (as an inner-felt reaction from the outside) and exteroceptive

(what we see or hear) categories (1966 Gibson). He believed that proprioception and

exteroception created a more complex composite of perceptual systems and introduced the

notion of *muscular proprioception* (muscles), *articular proprioception* (joints and tendons),

*vestibular proprioception* (inner ear – notions of balance, acceleration), *cutaneous*

*propriocetion* (skin and body tissue), *auditory proprioception* (cochlea inner ear- sound), and

*visual proprioception* (receptors in eyes) (1966: 37). Within the context of this thesis, these

perceptual systems are at times described variously as kinaesthetic, kinaesthetic systems[59] or

haptic systems. The Haptic system, is a common Gibsonian term[60] that describes and includes

both physical touch of the body in contact with a given surface (e.g. pressure/temperature) and

the kinaesthetic (Gibson 1966: 98).

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[56] Boring (1942) claimed that somaesthesis ("soma" means body) defined bodily sensation as a more
accurate description of the movement (compared to kinaesthesis) of organs and tissues and not only
joints and muscles (1966:98).

[57] Gibson uses this term (Gibson 1966: 52).

[58] Proprioceptors, or receptors located at the end of organs in muscles, joints, and the inner ear are
located in our tendons. They are called Golgi receptors. Exteroceptors are receptors in eyes, ears,
nose, mouth, and skin (Gibson 1966: 33).

[59] Dance kinesiologist Sally Fitt notes that, "The true motor memory is stored in the cerebral cortex and
is assisted by the kinaesthetic sense, but full motor memory goes beyond the scope of kinesthesia.
Nevertheless, in common usage, the two are often thought of as one and lumped together under the
term kinaesthetic sense. This common use of the term kinaesthetic includes perception and memory of
motion, position, motor coordination, and integration of sensory information" (Fitt 1988 266).

Gibson's perceptual and haptic systems help to differentiate and appreciate the multimodular nature of kinaesthetic perception. The movement of materials (videos, screens, sound, lighting, interface design) integrated into the movement-based interactive installations can be read through Gibson's taxonomy of exteroception and proprioception. Gibson's taxonomy invites researchers in this field to consider the multimodal nature of the kinaesthetic with its varying proprioceptive modalities. For instance, when I stand on the springboard in *Shifting Ground*, I am made aware of one action, that is, mapping my weight to the real time feedback (exteroception) of video regions and scale. Physiologically speaking, however, the kinaesthetic condition and perceptual systems are negotiating vestibular, visual, and audiotory proprioception.

## 3.2) Kinaesthesis and Movement-based Interactive Art

This thesis collectively locates the physiological processes of motor babbling, mimesis, empathy, kinaesthetic and perceptual systems under the common thematic umbrella of kinaesthetic and embodied systems. These processes describe how humans transact with others and the environment and underpin the physiological principles at play in movement-based interactive art. The artistic and social intent of movement-based interactive art is to entertrain (train through pleasure) one's awareness of the embodied dynamics between itself and its environment. As such the installations serve not only as artistic artworks, but also as physiological playgrounds which like the movement awareness methods outlined in the

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[60] Somaethesis may be the more appropriate term to adopt in future artistic research which includes internal biological and biofeedback processes, yet in the context of this thesis and the literary sources cited haptic sensations and kinaeasthesia are employed.

following chapter cultivate a "kinaesthetically aware body." Theatre and cyberspace

theoretician Sally Jane Norman stated (1995),

> New forms of investing and "owning" bodies will be devised, but for this, we need
> greater understanding of bodily identification processes at work in the "real" world.
> Kinesthetics and haptics in virtual space lend themselves to new ways of gauging
> and enjoying bodily presence. This calls for fine analysis of the complex
> interworkings of our perceptive modalities (the five senses, plus what growing
> numbers of neurophysiologist are referring as the sixth muscular sense[61]) and our
> ingrained, visceral sensitivity to morphological and textural dynamics (Norman
> 1995: 9).

This thesis supports Norman's position and acknowledges that the field of dance and

technology and movement-based interactive art must seek to better understand the

physiological implications of the bodily movement perception in technologically-mediated

research.

3.2.1) Kinaesthesis and Cognition

Historically researchers such as Jean Piaget (1949),[62] James Gibson (1950-70s) and Gestalt

theory (1913) have contributed to our understanding of kinaesthetic and embodied systems as

they relate to perception. They address the importance of bodily movement and

environmental dynamics to perception. Jean Piaget's work on cognitive constructivism[63]

(1957) directed our attention to linking physical experience as gained through assimilation or

accommodation and not simply through pre-organised maps of representation. Whereas

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[61] See Jean-Pierre Roll's "Le Sentiment d'incarnation. Arguments neurobiologiques" (Odyssud 1996: 18-31).

[62] This follows a historical trajectory initiated by Hermann von Helmholtz (1878) Théodule Ribot, (1890) William James (1890), Charles Sherrington (1900).

[63] For an extensive list of Piaget's publications between 1918-1990 see the Jean Piaget Society http://www.piaget.org/aboutPiaget.html.

Gestalt theory extended the idea of lived experiences focussing on "whole systems" instead of individual parts. According to Gestalt theorists,

> The programme to treat the organism as a part in a larger field necessitates the reformulation of the problem as to the relation between organism and environment. The stimulus-sensation connection must be replaced by a connection between alteration in the field conditions, the vital situation, and the total reaction of the organism by a change in its attitude, striving, and feeling (1924 Wertheimer[64]).

The "stimulus-sensation connection" is very similar to that of the body-medium experienced in movement-based installations through technologically choreomediated feedback. Schmidt's *motor schema* is also similar to the kinesfield in that bodily movement is not based on cause-effect parameters, but multimodal and perceptual relationships. According to Schmidt,

> When a person executes a move to reach a goal, he stores up four types of elements: the initial conditions, provided by the senses; the program for the motor command, which Schmidt calls "specification of past responses"; the sensory consequences of the movement, like outcome. The schema is not the set of these data, but their relationships (Berthoz 2000: 18).

The kinesfield in the movement-based interactive artworks like Schmidt's movement schema, focuses on the body and its environment as a relational dynamic. For instance, the participants who beta-tested *Raumspielpuzzle* note the relational and oscillating interplay between the others movements, their movements, and the inverted feed back images and the sound. The ensemble of these movement-action responses are based on expectations of patterned movements, estrangement from altered feedback and the meeting of the other, through structured improvisatory play.

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[64] From Wertheimer's talk at the Kant Society, Berlin, 07-12-24 on line archived from (Ellis 1938) from http://www.enabling.org/ia/gestalt/gerhards/wert1.html (20-10-02).

3.2.2) "Percaction"

It became apparent during the course of this thesis that the installations had the possibility of

linking and mapping (through feedback techniques) perception and action for the visiting

public to experience and embody. Movement-based interactive installations elicit one's

attention to action-reaction movement perception through processes of visual and sonic

mapping and feedback. Here the actions and perception are not separate, but continuous and

co-constitutive. As such, this continuous interplay of perception coupled to action is described

in this thesis as "percaction." The notion of percaction introduces dance to align itself with

research in studies such as Neisser's *Perception-Action Cycle* (1976), Schmidt's *Motor

Schema*[65] (1977), Thelen and Smith's *Situated Cognition and Dynamic Interaction* (1994) and

Varela, Thompson and Rosch's notion of *Enaction* (1999) which provide a filter through

which to better understand action-perception in movement-based interactive art. Research in

perception-action studies provides evidence of how cognition (which was primarily

considered a mental activity) is becoming ever more theoretically coupled to contextual

embodiment through one's bodily movement. These research areas provide experiential and

theoretical filters through which to better understand action-perception in movement-based

interactive art. A full elaboration of embodied cognition is beyond the scope of this thesis,

however, it has become apparent that action-perception studies create a theoretical umbrella

through which to filter the psychophysical implications of the body-medium in movement-

based interactive arts.

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[65] The Motor Schema is "memorized relationships…between several sensory or motor components of action (like position of limbs, the state of a target in space…)" (Berthoz 2000:17).

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## 3.3) Summary

Traditionally, physiological research in dance has focused on the individual's structural and neuromuscular characteristics of movement. These installations presented in this thesis, shift the focus of attention to physiological dynamic processes which underpin movement identification and communication with the self and between people. The concept of the kinesfield which lies at the heart of this thesis, physiologically highlights the perceptual systems regarding human beings modalities of communicating and identifying with others and the environment.

The following chapter addresses action – perception feedback methods within the context of physical practices. These methods, which constitute my dance and physical research background, share a common thematic concern in linking action to perception through experiential bodily participation and practice. They are relevant to the installations in the ways in which they condition a "kinaesthetic aware-body" which is fine-tuned to "physically listen" to itself and the environment.

# SECTION THREE: MODALITIES OF INSCRIBING BODILY

# MOVEMENT

# CHAPTER FOUR: MOVEMENT AWARENESS METHODS AND SYSTEMS

Whereas physiologists "describe" bodily movement identification and communication through perceptual processes such as mimesis, empathy and kinaesthesis; physical practitioners "inscribe" the same perceptual processes with experiential methods of movement awareness mapping. These practices have been distinguished from dance techniques through the use of the terms "body therapies," body awareness "systems" or "movement awareness methods" (Myers 1980: 1-6). Both movement-based interactive artworks and movement awareness methods such as *Alexander Technique* (Frederick Matthias Alexander (1869-1955)

*Feldenkrais* (Moshe Feldenkrais (1904-1984); *Ideokinesis* (Lulu Sweigard (1940-1980s); *Gyrotonics* (Julio Horvath (1950-) and *Hellerwork* (Joseph Heller 1940-) share an intentional logic[66] in that they train the "kinaesthetic aware body" using multimodal assisted feedback.

Movement awareness methods are a means of heightening one's awareness of the complexity of bodily movement and they inspire the manners in which feedback is choreomediated into the artworks presented in this thesis. This chapter highlights the ways in which bodily movement mapping, feedback, and estrangement are experientially integrated into movement awareness methods. These experiential methods are an integral part of my physical training and underpin my approach to movement-based interactive art.

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[66] Philosopher Andrew Benjamin (1994) uses the term "intentional logic" to mean "…that task that a specific text, or painting, sets out to enact. The object is, within this logic, envisaged as the site, as well as itself being the manifestation of the task as enacted" (Benjamin 1994: 13-14).

## 4.1) Mapping Movement

Like movement-based interactive art these practices are based on experiential methods which "map" specific movements through feedback. In technologically-mediated art (i.e. CD Roms, Net Art) we often associate feedback with physical touch with hands, or computer mouse driven interactivity. When we introduce inner movement mapping sensibilities, however, then 'physical touch' interactive methods increase in scope. Movement interaction is not only based on one to one feedback, but multimodal crossed body-to-environment mappings. These mappings introduce multimodal feedback variations to choreomedia applications in movement-based interactive art. These methods or systems are practiced by both performers and non-performers who want to enhance movement awareness. They are based on participatory feedback where qualified teachers assist individuals through focusing and guiding student's attention to movement patterns.

## 4.2) Characteristics of Movement Awareness Methods

As a whole, these methods share the following six characteristics: the use of breath as a constant and fluid partner of movement; physical, verbal or machine based perceptual feedback, attention towards enhancing mobility and range of motion; decreasing inefficient use of extraneous movement; awareness of internal and external movement patterns, and mapping experience to felt body-mind kinaesthetic sensation and memory. These methods use various modalities of feedback to cultivate one's attention to the influence of gravitational forces on bodies and movement. They reveal bodily patterns and tensions gathered from movements which resonate in the body from lived experience. They are meant to "undo" or "re-pattern" new movements and draw attention to the way in which life experiences inscribe the body.

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In one sense, the movement-based interactive art installations presented in this thesis provide the choreomediated conditions for generating kinaesthetic relationships between bodies and the environment through technologically crafted feedback systems. Such feedback systems introduce an opportunity for the participants to become aware of their own bodily movements mapped to a choreomediated environment. In the context of this thesis, the movement methods such as Alexander Technique, Feldenkrais, Gyrontonic, Hellerwork, introduce feedback tools and techniques such as touch, guided and verbal somatization (body imagery), repetition and attention, specialised machines and destabilise the general public's bodies. They share a common interest with movement-based interactive arts in mapping action-reaction, stimulus-sensation and kinaesthetic awareness.

## 4.3) Modalities of Feedback Employed

Practitioners of these methods and systems train the body to become aware of bodily movements through connections occurring between thought, imagined images and the environment. Each method brings attention to kinaesthetic knowledge from various practice-based modalities. Alexander Technique, Feldenkrais, Gyrotonic, Hellerwork, and Ideokinesis are examples of the methods which exercise bodily felt movement awareness with participatory based feedback techniques. In contrast to dance techniques these methods do not directly train artistic based expression. Rather, the methods are experiential and founded on making people aware of their bodily movements kinaesthetically and more in contact with their surrounding environment.

The Movement Awareness Method "movement," also known as the "movement-movement" (Myers in Dance Magazine Feb 1980: 1), can be traced back to Mabel Todd's book, The Hidden You and The Thinking Body published in 1936. Todd began teaching what she called

"psychophysical" methods at the beginning of the 20<sup>th</sup> century. The methods proposed a
"Gestalt-like" (*chapter three*) merging of our mind/body/environment consciousness. Todd's
contention was that mind and body awareness were both necessary for movement awareness,
"It is as profoundly true that we are as much affected in our thinking by our bodily attitudes as
our bodily attitudes are affected in the reflection of our mental and bodily states" (Todd
quoted in Myers: Dance Magazine July 1980).

Todd developed movement games such as "rocking the joints" to make the students aware of
their own bodily habits associated with gravity, weight, breath and balance. She believed in
destabilising the dancer's body, (putting them in an unaccustomed position) and asking them
to be aware mentally of the physical changes in their bodies (Myers 1983). This method of
directing consciousness to the physical methods are analogous to ways in which feedback
underpins my approach to movement-based installations. This concept of estrangement or
destabilisation is used implicitly in the springboard in *Shifting Ground* which "rocks" or
destabilises the participants sense of their body weight. They see the visual inscription as
moving left as their body moves right.

## 4.3.1) Somatization

Body-Mind Centering teacher and founder Bonnie Bainbridge Cohen, describes the visual and
mental mapping of images to movement as somatization. Alexander Technique, Feldenkrais
and Ideokinesis use somatization to elicit movement awareness and change. Alexander
Technique consists of re-patterning movement with the teacher's use of somatization and
tactile guidance. Medical Doctor George V. N Dearborn realised the importance of Alexander
Technique's methods and argued that the "warp of the sensation-fabric" or the "kinaesthetic"
is the "dynamic index of its body" (Barker 1978: 41). In the movement-based interactive

installations, the intent is to elicit attention to one's "dynamic index" in the "kinaesthetically woven" multimodal choreomediated interactions.

The Feldenkrais Method also uses verbal instruction and imagery as a psychophysical feedback mechanism to induce physical sensation and bodily re-mapping. For Feldenkrais, bodily movement is based on "temporal and spatial changes in the state and configurations of the body and its parts, such as breathing, eating, speaking, blood circulation, and digestion" (Feldenkrais: 33-39). His method involves transposing and mapping images onto the body. Imagined objects are mapped onto the body, to help read and feel movement within the body. For instance, the "pelvic clock" exercise releases the lower spine as one imagines the hands of the clock with the movements of the pelvis in a clockwise direction (3 to 6 o'clock, 12 to 3 etc...). The clock is an object which is visually transposed through one's imagination onto the pelvis. This exercise shows how visual, muscular and articular proprioception and intraceptive systems intersect. These mapping techniques create a feedback loop between movement and the imagination.

Sweigard's Ideokinetic Facilitation or Ideokinesis also associates visual images to body parts. Here the body becomes a visual and sensuous map. Sweigard focused on the mechanical, anatomical and neuromuscular conditions and mapping of bodily movement. This practice later became known as *Ideo-Kinesis*. In her book Human Movement Potential: Its Ideokinetic Facilitation (1974) Sweigard, links "ideo" or idea to "kinesis" or "the physical movement induced by stimulation of the muscles." *Ideokinesis* is a process of using images to re-pattern the body's neuro-muscular systems. This method involves 'thinking' movement which she coins "ideation" or "thought and visualization." This involves "seeing the location of the movement, seeing the direction of the movement, and wanting to move" (Myers 1983: 18).

For Sweigard, imagined movement is an ideokinetic facilitator. Ideokinesis shows how the body state changes through processes of somatization and trains the student to couple the idea of an "imagined" and "real body" simultaneously.

These movement methods and systems train individuals to link movement to awareness or perception to action. Movement-based interactive art installations follow the same trajectory. The public does not learn a new bodily "movement expressive technique" which they can repeat in other situations (like dance technique gestures). Instead they experience movement sensations which are mapped to their kinaesthetic memory. Such modalities of multimodal feedback in movement-based interactive installations invite the participants to become kinaesthetically aware of their moving body with the environment and experience variations of "haptic touch" (Gibson 1966).

4.3.2) Touch-Based Practice

Hellerwork combines deep tissue touch-based body work, movement re-education and dialogue between the practitioner and the client. Heller drew on Rolfing[67] techniques, but wanted to reduce the intensity of pain and correlate psychological themes to zones of the body. He asked his clients to describe the emotional, visual, mental associations that bodily touch triggered. For me, the most significant attributes of Hellerwork is the manner in which one's inner felt corporeal cartography is multi-sensory and cross-mapped. For instance, a specific touch on my left calf triggers movement sensations in the area around the right hip and gradually along the back. These methods reveal to which extent movement sensations are complexly mapped into our bodies and show how inner bodily sensations are not based on one

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to one spatial cause-effect mappings. The concept of bodily cross-mapping is being integrated into sound and image feedback in *Raumspielpuzzle*. Here we are studying engineer-specific physiological responses with the interface design of sound and image feedback.

### 4.3.3) Machine Based Methods

Gyrotonic or Body Kinetics assembles movement knowledge from yoga, dance, gymnastics, and swimming. This practice involves exercises both with and without specialised machines rigged with weights, straps and rotating spools. All of the exercises emphasise spiral and undulating bodily movements. Each session begins by rubbing one's hands together to generate heat between the palms so as to bring awareness to the small electromagnetic field that the body emits. The hands then outline the contours of the body (without touching the body) to connect the body's electromagnetic field to the environment. This process of drawing attention to the *space as energy* around the body is described as an "air-bath." The "air-bath" activates one's awareness of space as palpable and dynamic.

The Gyrotonic method or system also includes exercises on specialised machines which encourage spiralling movements. Gradually after adapting to the machine, the movement between the body and the machines become fluid. As one becomes acquainted and comfortable with the machines, the emphasis is on the quality of the movement, alignment and breath. What remains in the body is the quality and sensation of the movement, not a memory of the machine and the movement as separate. This is similar to the process of adaptation I experience in the technologically-mediated feedback experiences *trajets* and *Raumspielpuzzle*. Focussing on the movement experience and not a cumbersome interface became a clear

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[67] Ida Rolf (1896-1979) developed "Rolfing" a deep tissue manipulation practice.

objective after presenting *Shifting Ground*. As Robb Lovell (*chapter one*) noted, the distracting presence of mechanics of the interface impeded his attention to the qualitative movement experience.

## 4.4) Variations of Physical Feedback

My experiential embodiment of these methods developed a kinaesthetic sensibility to the various modalities in which the body is malleable and responsive to being "mapped." Physical research with these methods made me aware of the diverse and modular nature of feedback (imagination, touch, machines and voice). My ongoing physical research with these methods has made me realise the ways in which feedback can vary, both in its method, and its influence and presence in the body. Movement feedback has varying characteristics and degrees of impact on our body memory and mental awareness. Feedback is often considered as being immediate, yet these physical movement methods experientially taught me that feedback can have various characteristics.

These variations relating to the lapse of time between awareness and sensation, and spatial mapping highlights our attention to the complexity of lived movement awareness. Physically speaking, they bring attention to feedback variations which are:

> *direct* –an immediate body-mind linking of an exercise or correction,
>
> *sustained* –a connection is made that stays with you,
>
> *call-back* – an experience can be called-back by thinking/touching the feeling that was experienced.

Direct, sustained and call back feedback have been identified by the participants in the movement-based interactive installations. For instance, Ruth Gibson[68], after participating in *Shifting Ground* at (IDAT 1999) stated that the sensation of the springboard and black textured crystals on her feet remained with her in her body memory. This is an example of "sustained" feedback.

## 4.5) Summary

These methods continue to inspire me to create artworks which do not necessarily invite the public to imitate or reproduce a specific aesthetic and stylised form of artistic and expressive gesture, but instead to build metaphoric and experiential maps to their embodied awareness and state. These methods reveal how embodied feedback is not a one to one relationship but cross-mapped spatially and temporally (direct, sustained and call-back). Somatization draws attention to the malleability of the body. In other words, the body can be remapped through various feedback methods, including thought, guided imagery, physical movements and machines.

The body's kinaesthetic state can be "touched" or stimulated through various modalities. The body-medium becomes inscribed with mapping techniques both in movement-based interactive art and movement awareness methods. These techniques cultivate and materialize one's awareness of one's kinesfield. The following chapter extends the notion of movement mapping and feedback to technologically-mediated methods that are not only a characteristic

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[68] Ruth Gibson, a London-based performer and choreographer recalled this memory during the Monaco Dance Conference, December 2000.

of the movement-based interactive installations but also as a constant condition of daily

technologically-mediated routines in daily life.

In the previous chapter it became evident that movement awareness methods and systems "map" bodily movement and perception through experiential feedback-based modalities. In the movement-based interactive artworks presented in this thesis, specific technologies are used to engage real-time feedback of the participants' bodies to create relational experiences of action-reaction mapping. Mapping in these installations does not separate the subject of movement experience, from its *representation*, but instead seeks to develop a participatory dynamic which continuously maps and *renders present* movement perception between the participant and the given feedback experience.

Since the subject of movement experience is not separate from its representation, the question of technologically-mediated embodiment is brought to light. Technologically-mediated embodiment, or the relationships among bodies and technologies, has been addressed by a select group of theoreticians and practitioners who seek to dissolve the subject-object dichotomy or distinction among bodies and machines not only in art but in daily habits and perception. These theories are of direct interest to this thesis as they focus on movement transactions and continuous relationships between the body and technologies. Such continuous relationships illustrate the reciprocity between the inner and outer exchanges (between the body and the environment) which are relevant to the materialization of the kinesfield. The theories concern bodily sensory extension (Etienne-Jules Marey, 1830-1904), transindividual processes (Gilbert Simondon, 1958), sensory replacement and instrumentality (Lisa Cartwright, 2000), informatics and the post-human condition (Katherine Hayles, 1993-2003), multistable possibilities (Don Idhe, 2000) and haptic visuality (Laura Marks, 2000). In this chapter, these theories are used as critical frameworks to develop the notion of the

kinesfield as it is materialised through processes of kinaesthetic inscription choreomediated in movement-based interactive installations.


## 5.1) Technologically-Mediated Embodiment and the Kinesfield

Generally speaking, technologically-based methods, in the visual domain, document or map movement with specialised recording and inscription tools or technologies such as notation, kinography, photography, film and video. With such technological traditions, the experience of movement becomes separated from its spatio-temporal condition and is mapped as a representation or artefact of a given moment of movement, such as a photograph, graph or video. The integration of real-time processing with computer technologies in the movement-based interactive artworks reduces significantly the gap between action and representation.


It is a contention of this thesis that the technologically-choreomediated environments brought forth in these movement-based installations materialise the kinesfield with the assistance of both custom-made and existing real-time feedback. For instance, the screens in *trajets* rotate in response to the participant's physical displacement and position in relationship to each screen. The ensemble of dynamic relationships in this installation space is experienced as a movement field. The participants improvise in a structured, choreographed space with simple or common movements (weight shift, walking and hand movements) in response to the technologically-mediated conditions of the installation. Such feedback introduces continuous movement feedback as well as interactive "surprises" (*trajets*), unfamiliar movement reflexes/estrangement (*Shifting Ground*), and multi-stranded feedback patterns (*Raumspielpuzzle*). These modalities of feedback map bodily movement and are directly connected to the technologies from which they emerge.

## 5.2) Bodily Movement Inscription: Etienne-Jules Marey

Etienne-Jules Marey's (1830-1904) research and technological inventions of movement recording techniques set a historical milestone for movement feedback, inscription and the notion of the kinesfield. A pioneer and inventor of time-motion studies, Marey explored the real-time recording and analysis of the movement of people, animals, air and water. He believed that "movement" was the basis of all human and machine studies (Figure 5-1 and 5-2). "From the invisible atom to the celestial body lost in space, everything is subject to motion ... it manifests itself in all the functions, it is even the essence of several of them" (Braun 1992:14).

Marey's work set a historical precedent for the kinesfield, as the subject of movement was studied across animate and inanimate material forms (animals, humans, forces, atmosphere, smoke etc...) with real-time inscription techniques. For instance, he studied movement by optically marking the human body, connecting air pumps to horse's hooves, and analysing trajectories of air current (Figure 5-1).
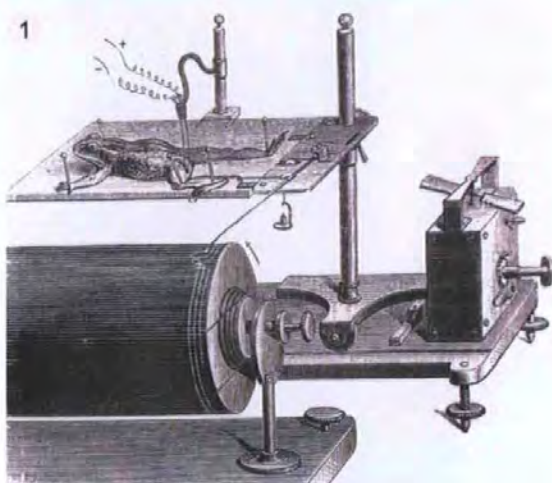
Marey's simple myograph and a graph of the muscular contractions showing from bottom to top the progressive influence of fatigue. 1866. *Méthode graphique*.

Marey's portable polygraph in use. 1868. *La Nature*. May 1879. New York Public Library.

**From the top to the bottom:**
1-Méthode graphique myographe 1866
2-Marey's portable polygraph 1868
3-Animal mechanism, inscription of the horse's gait 1872
4-Méthode graphique of gait 1872

Marey's synoptical bar notations and drawing by Emile Duhousset of the horse at full trot: the white lines represent the right front and rear hooves and the shaded lines the left ones. The white points on the chart correspond to the position of the horse represented in the drawing. 1872. *Animal Mechanism*.

Leather bracelet for the inscription of the horse's gait. 1872. *Animal Mechanism*.
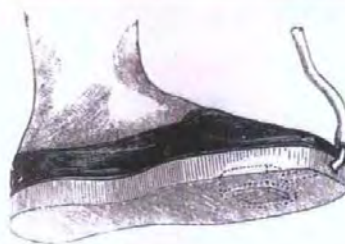
B.
(A) Experimental shoe connected to the inscribing cylinder and stylus. 1872. *Méthode graphique*.
(B) Experimental shoe with hollow chamber to measure the length and rapidity of the step and pressure of the foot on the ground. 1872. *Animal Mechanism*.

Figure 5-1: Marey's Inscription Instruments (Braun 1992)

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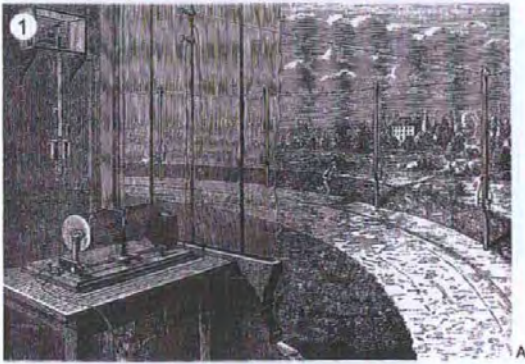
Physiological Station: (A) Arrangement of the track, telegraph relay poles, and indoor odograph. 1882. *La Nature*, September 1883. New York Public Library. (B) Man signaling his passage to the indoor odograph, 1883. Collège de France.

(A) Joinville soldier walking. 1883. The metric measurements at the bottom of the images have been emphasized in the negative. (B) Joinville soldier running. 1883. (C) Joinville soldier running. 1883. Negative (reversal) print. Note that in these earliest examples, the head is not covered, and the joints are connected with nail-studded lengths of wood. Collège de France.
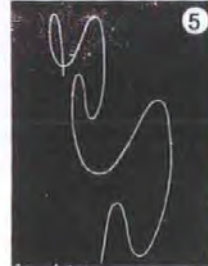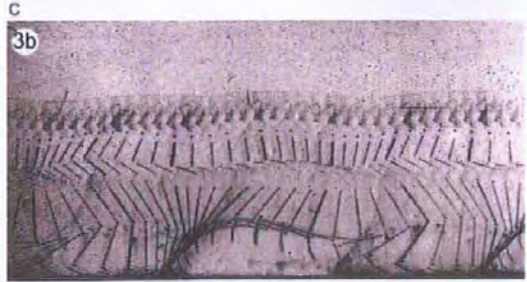
Slow run, stereoscopic photographs of a point on the coccyx of a moving subject, 1885. Cinémathèque Française.
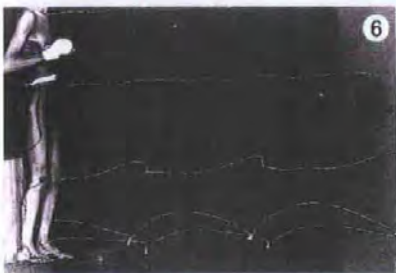
*From the top to the bottom:*
1-Physiological station 1882
2-Man in odograph 1882
3-Soldier walking 1883
4-Walk with stiffened knees 1884
5-Stereoscopic photograph of point on the coccyx 1885
6-Locomotor ataxia 1887

Figure 5-2: Marey's Inscription Instruments (Braun 1992)

Marey created such technological systems to investigate and better understand human, animal and atmospheric movement. He felt that humans were ill equipped to perceive movement and that instruments should be considered as "new senses of astonishing precision" (Braun 1992: 40). Marey believed that technologies extended or created new senses. His contributions towards extending and translating bodily movement, developing optical motion capture and movement-based technologies far exceeds the investigatory topic of this thesis. Here, Marey's work is being addressed from the perspective of real-time moving mapping and feedback as it relates to the notion of "rendering present" bodily movement through feedback systems.

Referring to Marey's early horse movement, graphic research, and movement inscription in general, cultural critic Cartwright points out that:

> As the horse's body motored the inscription device, so the kymographic inscription reconfigured the conception of the living body from within, rendering it an ordered living system – a system beset represented by graphical, temporal forms like the calibrated kymographic line or the incremental cinematic image for example. Physiology's laboratory instruments and human physiology thus became mutually constitutive processes (Cartwright 2003: 24-26).

Cartwright's observation that Marey's instruments are mutually constitutive processes is relevant to the argument of technological embodiment this chapter presents, and is implicit in the movement-based interactive art installations. It is through such constitutive processes of technological-mediated embodiment that the body-medium becomes materialized as a kinesfield in the installations presented in this thesis.

## 5.3) Mutually Constitutive Processes of Bodily Inscription

In *Shifting Ground* and *trajets,* the real-time inscription of the participant's weight transfer or trajectories in space *feed back* to the participant's experience and constitute a continual flow of movement. This continual movement flow of kinaesthetic inscription is evident in *Shifting*

*Ground,* as the visual traces of the weight shift create a dynamic link between the body and its weight shift, and in *trajets*, when the public experiences a simulated magnetic force field and visual mapping as feedback. These choreomediated processes of kinaesthetic inscription materialise a continuous experiential dynamic between the body and a multimodular responsive environment. As such this thesis argues that they materialize the notion of the body-medium as kinesfield.

## 5.3.1) Technologies and the Kinaesthetic Condition

Whilst movement-based interactive art installations use technologies to draw attention to embodied movement transactions, they can also be read as a microcosm of a larger, technologically-mediated kinaesthetic condition we experience in daily routines. Technologies intersect continuously with our sense of movement inside, around and far away from our bodies. Vibrations from the car, acceleration in a plane, deceleration in a train, or a descent in an elevator are all kinaesthetically-felt, technologically-mediated experiences. These experiences extend the range of one's movement repertoire and kinaesthetic condition. It is a contention of this thesis, (which aligns itself with Idhe, Marks, Hayles and Simondon's position) that every technologically-mediated action we undertake, or with which we are engaged, is embodied. As such, such mediated actions cultivate one's kinaesthetic system. In other words, technologies, present around us constitute the body's (Gibsonian) perceptual systems.

## 5.3.2) Taxonomy of Technologies and Perception

Perceptual systems are mutually co-constitutive with technologies which magnify *(e.g. telescope)*; translate *(e.g. electroencephalograms)*; measure *(e.g. thermometer)*; record *(e.g. video)*; increase efficiency *(e.g. zippers)*; enable survival *(e.g. air tanks)*; mobilise *(e.g.*

*trains)*; simulate *(e.g. 3-d replica of bodily organs)*; chemically alter *(e.g. alcohol)*; digitally convert *(e.g. computers)* and introduce artificial limbs *(e.g. needle)* for humans to discover, create, understand and survive in the environment. In the CD-ROM (*23-Technological-Kinaesthetic Systems*), Table One illustrates historical examples of technologies made to transcribe bodily movement itself. Produced from 1700-2000 these technologies and tools are from primarily dance, physiology and the military. Table Two provides historical examples of inventions which inscribe movement into human beings' kinaesthetic conditions. This table uses the taxonomy of terms above to distinguish the manner in which the technologies influence perception and thus one's kinaesthetic system (*24-TKS-Table Two*).


## 5.4) Multistable Technologies and Movement-based Interactive Art

"No technology (*however*), is one thing, nor is it incapable of belonging to multiple contexts" (Ihde 2002: 106). As Idhe points out, the same technologies can be applied to different contextual objectives. He argues that technologies have multiple and contextual applications or "multistable possibilities." For instance, the technology of the surveillance video camera can be used to give the security guard "multiple eyes" into rooms in a building that he cannot physically access simultaneously. Or we can record and replay a child's birthday party and use it as a "memory assistant." In the Choreomedia Laboratory, the "multistable" nature of existing technologies are exploited, in as much as new software and hardware are developed.


In the installations presented in this thesis, existing technological objects are recycled to create new applications, or tools to generate a given kinaesthetic quality. In *Shifting Ground*, the optical-sensored and pulley-based springboard linked to the participant's weight transfer is a re-modelled joystick used in computer games and the TGV's (train grande vitesse – the French fast train service) robust springs (*25-CML-SG-Video-SG-2*). The screen door sensor

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for *trajets* is an infrared motion detector commonly used as a garage door light activator. The magnetic simulation of the screens, custom-made motor drivers, motors and a magnetic simulation software program were created by team members, yet were always built upon existing technological artefacts. For instance, Robb Lovell's computer vision software "Eyes" (*trajets*) and David Rokeby's computer vision software "The Very Nervous System[69]" (*Raumspielpuzzle*) are employed to detect the public's presence and position. These computer vision tools evolved from NASA's initial lunar research[70] of digital image processing. These examples illustrate the varying potential or multistable nature of technological objects and applications.

## 5.5) Technology as Transindividual and Relational

Regardless of their contextual appropriation, however, sociologist Simondon[71] argues that the technological object embodies the human efforts that contributed to its genesis and as such, describes the technological object as "transindividual." He acknowledges that human efforts remain relationally embodied in the technological object or invention itself. According to Simondon, the technical object, as invented, conceptualised and desired by the human subject becomes the support and symbol of the relation that we would like to coin "transindividual"[72]

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[69] *Eyes* has evolved into a computer vision tool by Robb Lovell. David Rokeby created the *Very Nervous System* as a tool for artistic computer vision and mediated events.

[70] Images needed to be processed from distant remote places. In 1964 the Jet Propulsion Laboratory in Pasadena began using digital processes to capture satellite images of the moon. The field called "digital image processing" emerged after these early experiments.

[71] "Il faut pouvoir réintroduire en elle la conscience de la nature des machines, de leurs relations mutuelles et de leurs relations avec l'homme, et des valeurs impliquées dans ces relations." *We have to re-introduce the conscious nature of machines, their mutual relationships and their relationships with man and what is implied by these relationships* (Simondon 1989: 13).

[72] "L'objet technique ... qu'il a été inventé, pensé et voulu, assumé par un sujet humain, devient le support et le symbol de cette relation que nous voudrions nommer transindividuelle."

(Simondon 1965: 247-256). In other words, the nature of the technological object embodies the human intent and is thus inscribed with human, not only machine-like relationships to society. Transindividual suggests here that human intent, labour (physical efforts and imagination) become impregnated within technological objects. As such the technological object is coupled to the human condition, and is not a separate discursive subject.

Simondon's ideas are eminently relevant to movement-based interactivity, in that the technologies created are embodied with the choreographic intentions and human efforts of the artists who wrote the software, built the motors, edited and performed in the videos and so on. To extend this concept of transindividual relationships among humans and technological objects, computer vision in *trajets* and *Raumspielpuzzle* is used primarily for feedback and detection; however, the detection system becomes integrated and "embodied" within the artistic experience and fabric of the piece. Here the sensing technology of computer vision is not only the tool of detecting presence and movement quality, but also a visual real-time dynamic map of the participant's movement.

Both Hayles (1993) and Ihde (2002) acknowledge such reciprocity between the body and technologies. As Ihde points out, "What stands out first is that all human-technology relations are two-way relations" (Ihde 2002: 137-138). Hayles also looks at the entanglement among the body and digital technologies and recognises that virtual experiences are embodied. She coins the term "informatics" and the "posthuman condition" to describe the network of human

bodies and computer systems and states that, "Virtual reality takes the body closer to feeling itself but it also reconfigures the body's sensory motor patterns"[73] (Hayles 1993).[74]

Cartwright and cultural critic Jonathan Crary[75] (1992) take this argument further by stating that "technological processes supplement or replace sensory perception" (Cartwright 2003: 23). Where this may be applicable in certain medical and scientific practices, it is not directly relevant to movement-based interactive art or its sister art, cinedance, discussed in the following chapter. In these artworks, the intent is not to replace human biological movements (i.e. artificial or limb replacements) but to stimulate awareness of one's kinaesthetic states by introducing alternative embodied relationships. For instance, in *trajets*, the simulated force field that is materialized between the participant and the screen created a magnetic-like bodily rapport between the body and a screen that we do not habitually experience. Here the technological-kinaesthetic-inscription characteristics of the installations bring forth new movement rapports and relational processes through interaction of felt movement. They do not replace the body, rather, they intend to stimulate and anchor the participants in their "kinaesthetically-aware body." At the same time, the installations introduce new movement interactions within a movement field of moving objects, other participants and the given choreomediated environment. As such the body-medium of the participant has the potential to be experienced as a movement dynamic within a movement field.

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[73] Hayles notes that navigating through a virtual world with a data glove requires learning a particular hand movement to image technique which affects the "users" neural patterning.

[74] For more see N. Katherine Hayles article "Virtual Bodies Flickering Signifiers" (1993) 1-14 and as cited in this article's notes: Mark Weiser's term *Embodied Virtuality* in "The Computer for the 21st Century" Scientific American 265 (September 1991) 94-101 and Hayles The Posthuman Condition.

[75] 19th century art and theory critic teaching at Columbia University, USA.

## 5.6) Haptic Visuality

Technologically-mediated inscription is similar to Gibson's notion of haptic systems. That is, one does not have to physically touch a technologically-mediated object or event to be kinaesthetically "inscribed." Historically, the most developed technologically-mediated art form which inscribes one's kinaesthetic condition is cinema. The audience's empathetic identification with moving images is a sort of haptic or kinaesthetic inscription. A film inscribes sensations into the seemingly passive seated audience member. Cinedance, a genre of both cinema and dance, extends the body-medium of the audience through movement empathy and haptic perception. Video and cinema critic Laura Marks (2000) describes this dynamic phenomenon as Haptic Cinema. Movement-based interactive art is a continuum of this haptic empathetic tradition in cinema, video and cinedance.

> Haptic cinema does not invite identification with a figure – a sensory-motor reaction – so much as it encourages a bodily relationship between the viewer and the image. Consequently, as in the mimetic relationship, it is not proper to speak of the object of a haptic look as to speak of a dynamic subjectivity between looker and image. Because haptic visuality tends less to isolate and focus upon objects than simply to be co-present with them...I am suggesting that a sensuous response may be elicited without abstraction, through the mimetic relationship between the perceiver and a sensuous object (Marks 2000: 164).

In haptic cinema or haptic visuality, "the eyes function like organs of touch" (Marks 2000: 162). Marks' terms are similar to Martin's (1933) metakinesis, and Thompson's (2002) description of empathy and mimesis (*chapter 3*). The "dancing body" is often defined by or associated with outwardly expressive and rhythmic movements; however, as Marks and Martin argue, we can experience movement and feel like we are dancing without overtly moving and with inner-felt kinaesthetic sensations. Such a sensibility is choreomediated into the materials used in the installations presented in this thesis.

Cinedance theorist Bruce Elder furthers this argument by stating that,

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> The connection between the self and world grounded in the identity of the flow of the energy beyond and within the body enable videodance and filmdance – art forms that make us aware of the energy within the body even as they depict behaviour in the external world – to be a means for exploring the complex interrelations between motion and emotion, between action and affect, between an **event's dynamic structure** (my emphasis) and its structure as a system of information (Elder 1998: 298).

Cinema and technologically-mediated experiences create dynamic, corporeal links among the **event's dynamic structure** or technologically-mediated experience. As such, technologies co-construct one's kinaesthetic repertoire of movement sensation and experience. Such dynamic structures are present in the manner in which the installations presented in this thesis are choreomediated. The "dancing" experience is grounded in creating movement rapport betweens one's kinaesthetic state within a space organized with media, objects and other participants, and encourages movement to be apprehended as an immersive state of the space. This thesis argues that this experience materializes the kinesfield for the visiting public.

## 5.7) Summary

The intentions of the technologically-mediated interactions that arise in the movement-based interactive installations presented in this thesis lie not in replacing existing movement gestures or senses, but through the introduction of unfamiliar interactions, activating one's "kinaesthetically-aware-body." While these installations use technologies to exercise, enable and stimulate one's kinaesthetic condition, they also bring to light the way in which technologies are entangled with daily movement habits and perception. Because of this condition, technologies are not separate from movement perception, but entangled in the manner in which we come to experience, understand and perceive movement.

The following chapter discusses a selection of technologically-mediated artworks from photography, kinetic arts and cinema which create alternative forms of the body-medium. These are considered as sister arts to movement-based interactive arts in that they bring forth alternative realities of the body-medium that this thesis argues constitute our artistic movement repertoire. These technologically-mediated artworks create a historical umbrella which allows movement-based interactive arts to be historically contextualized.

# CHAPTER SIX: TECHNOLOGICALLY-MEDIATED MOVEMENT-BASED ARTS

As discussed in the previous chapter, the installations presented in this thesis, *Shifting Ground, trajets* and *Raumspielpuzzle,* integrate technologies to materialise kinaesthetic movement experiences for the visiting public, described here as a kinesfield. This chapter builds a thematic bridge between these installations and a selection of historical, technologically-mediated artistic innovations in photography, kinetic arts, cinema and performance[76] which extend embodiment across material forms. These historical artworks are of particular significance to this thesis as they intersect conceptually and artistically with movement-based interactive arts.

This chapter addresses these technologically-mediated artistic examples by considering the typologies of kinetic artist Frank Popper's classification of movement in art (Popper, 1968); and filmmaker Allegra Fuller Snyder's categories of dance and cinema (Snyder, 1967) and by introducing three terms to distinguish the manner in which bodily knowledge crosses and transposes itself artistically into material forms. This thematically situates movement-based interactive art within an interdisciplinary and historic artistic context and not only as a response to the dance and technology community of the 1980s (resulting from the popularity of computer technologies). The selected artworks provide evidence of the ways in which artists extend embodiment across materials and technologies and as such, set a precedent for movement-based interactive art. Furthermore, they illustrate how bodily movement crosses

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[76] This thesis acknowledges that historically, there are many examples of dance choreographies which use technologies to transcend the biological limitations of the body such as the pointe shoe introduced in the ballet *La Sylphide* 1832.

materiality. As such, the body-medium becomes a composite of dynamics of materials that introduce notions of the kinesfield.

## 6.1) Typologies of Movement-Based Art

### 6.1.1) Kinetic Arts

In the 1920s Naum Gabo and Antoine Pevsner introduced the term "kinetic rythmics" later referred to as "kinetic arts" in the "Realist Manifesto." The word, "dynamic" or "mobile" was used to describe movement in the plastic arts. Kinetic art, "includes two or three dimensional works in actual movement, including machines, mobiles and projections, whether controlled or uncontrolled..." and "virtual movement in which the spectator's eye responds quite clearly to the physical stimuli." According to Popper, kinetic art is constituted by "Abstract Visual Inducements, Movement or Invention by the Spectator, Machines, Mobiles, Light and Movement, and Spectacle and Environment" (Popper 1968: 95). Popper also defined "six ways of viewing"[77] movement in his taxonomy of kinetic arts. These include:

> image of movement ... movement of the artist's hand and his whole body ... eye movements of the spectator ... relationship between movement in the plastic arts...movements in the other arts ... physical, psychological or biological movement and movement in the arts in general and real movement in contemporary arts (Popper 1968: 7).

From the above, we could easily find room to situate movement-based interactive arts within the context of kinetic arts. However, when we look closer at the "movements" proposed by

Popper[78] (*appendix 4, pg 147*) it is clear that the audience's embodied kinaesthetic transactions

and *qualitative* (the four motion factors in Laban's effort-shape p.67) embodiment are given

minimal importance. The closest acknowledgement to the role of the embodied

audience/public is found in *point 13*: "Striving forces (the spectator completes the movement)

and *point 29*: "Animation of the work by the spectator (active participation)" (*appendix 4, pg.*

*147*[79]) (Popper 1968: 95). It seems that here, "movement" is considered as observable

quantitative "motion" from a third person's point of view and not as qualitatively *effortful*

(LMA) or kinaesthetically-felt. This is a gap in Popper's typology that Snyder fills with her

kinaesthetically-informed first person point of view as a dancer and filmmaker.


## 6.1.2) Cinedance

In the 1960s choreographer, ethnographer and filmmaker Allegra Fuller Snyder (1967)

distinguished three categories of dance and film. These included, the *dance filmic document*

(i.e. single camera point of view of the staged dance performance), *the dance translation*, (i.e.

the narrative of the dance is respected but adapted for the camera with close-ups, three camera

shoots, etc.) and *cinedance*, the creation of a new art form which transcends the biological

possibilities of the living, gravitational body and which introduces alternative forms of

embodiment. The latter category of cinedance is of direct interest to this thesis, as it

corresponds to my artistic intent in creating alternative forms of moving bodies and

kinaesthetic sensations through video and installation work.

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[78] The Typology of Movement: Simple Procedures for the Expression of Movement in the Plastic
Arts, 1968.

Synder believed that cinedance and videodance brought the audience kinaesthetically closer to the inner-felt "transformative" dancing experience (versus the act of watching dance or watching motion). She felt that the camera and editing introduced alternative forms of kinaesthetic-felt "space, dimensions, depth, non-gravity, time, movement, expansion of new logic, rhythm and reality" (Snyder 1967: 48-49) (*appendix 5, pg. 149*). Cinedance (and specific experimental and popular films) invites the viewer to "kinaesthetically and internally move" through various locations and qualities of movement. Cinedance also presents diverse and intimate points of view of the body that are impossible for the frontal "dance watching" audience in stage dance performance to perceive. Even though the audience is fixed in their seats watching, cinedance affords the opportunity to internally dance or "kinaesthetically sense and move" to and through temporal and spatially linked dynamic spaces and fictive states on the screen (as discussed in *chapter one*).

## 6.2) Trans-figuring, Trans-forming and Trans-planting Bodily Movement.

Building on Snyder's kinaesthetic-felt observations, Popper's motion-based classifications, and Birdwhistell's notion of transaction (*chapter 2*), this chapter introduces three categories which differentiate the ways in which bodily movement is translated or transposed into material forms through processes of technological mediation. These categories are not exhaustive and are presented as tools to illuminate the ways in which bodily movement becomes altered through the artworks described in this thesis. These categories, *trans-figuring, trans-forming* and *trans-planting* describe primarily visually based art forms. *Trans-figuring* describes artworks whereby the human body's figure oscillates between being

visually recognisable and not recognisable in the artwork; *trans-forming* describes those artworks in which the figure of the human body is no longer recognised, though through its abstraction, is sensationally and kinaesthetically-felt; and *trans-planting* characterises artworks which are based on bodily movement characteristics not recognizable as bodies or not necessarily sensed as kinaesthetic. The works discussed in this chapter illustrate these categories and are presented from the perspective of the artist and/or the way in which they thematically alter and contribute to an artistic movement repertoire.

### 6.2.1) Technologically-Mediated Artworks

#### 6.2.1-a) Loïe Fuller (Performer)

Loïe Fuller (1862-1928, United States) was a performing artist who extended the physical range of her moving body through the use of cane-shaped wooden appendages, fabric, and light. Coloured light was projected onto the undulating fabric creating the illusion of being at the same time its own light source and immaterial (Réunion des musées nationaux 2002: 74). Fuller performed a series of dances with titles such as *Dance of the Serpentine* (1892), *The Lilly* (1900) and *The Butterfly* (1892) *(26-GALLERY-trans-figuring)* which carved moving shapes in space by combining the dynamic and undulating folds and the reflections of light on the voluminous fabric enveloping her body.

Figure 6-1: *Loïe Fuller Dancing* (1900)

In these performances Fuller transformed her bodily movement into shapes and patterns as she

moved her arms and the custom made fabric wings or kinetic screens around her body. Her

movement was carefully crafted so that it would create specific patterns in space. Both the

costume/screen and the bodily gesture were choreographed in accordance with their own

physical and mathematical rules (Réunion des musées nationaux 2002: 47).[80]

In terms of the categories proposed above, Fuller's performances *trans-figured* her body into

animal and floral metaphoric illusions with visual and kinetic flow of light, mechanics, bodily

gesture, and fabric. Fuller extended her technologically-mediated performances by designing

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[80] Giovanni Lista quoted in Musée de l'Ecole de Nancy (2002: 140).

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scenic inventions such as stage sets which used mirrors to multiply the reflections of her movement. Fuller also consulted with physicists Pierre and Marie Curie regarding the use of florescent light to improve the luminous effects in her performance. Fuller patented these scenic inventions and costume designs as new performing technologies (Chauvin Nancy Musée 2002: 86).

Artists today continue to incorporate projection either onto the body, as evident in the work of the Austrian media artist Klaus Obermaier's and dancer Chris Haring's Company D.A.V.E (Digital Audio Video Engine) or into 3D and scenic space, in the work of Canadian visual artists Michel Lemieux's and Victor Pilon's 4-D Company. Yet, the particularity of Fuller's extension, projection and technologically - altered body sets a historical precedent for movement-based interactive installations in terms of the way in which screens, media and body together trans-figure embodiment through processes of technological-mediation and alter and or extend the medium of the body.

6.2.1-b) Bragaglia Brothers (Photographers)

Another example of *trans-figuration* can be found in the photographs of the Italian Bragaglia Brothers. Arturo (1893-1962 Italy) and Anton Guilio Bragaglia (1890-1960) coined the term: "Fotodinamismo futurista" or "Photodynamismo" in their manifesto, written in 1911 and published in 1913 in Italy. This manifesto articulated their interest in generating the sensation of movement with specialised photographic processes. The Bragaglia brothers photographed simple human gestures such as bowing the head, playing an instrument, and sitting on a chair. They emphasised and retained the traces of the motion, rather than simply presenting a frozen moment or a quote of the bodily position. They described the body-medium that materialised in their photographs as triphasic, and believed that their photographs revealed the true material

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and "immaterial body," that is the *ethereal, astral* and *mental bodies*,[81] with works such as the above *Russian Dancer Ia Ruskaia* (1928), *Portrait of Arturo Bragaglia* (1911) and *Changing Positions* (1911) (*27-Gallery- trans-figuring scroll down page*).



Figure 6-2: Russian Dancer Ia Ruskaia (1928) Anton and Arturo Bragaglia (*27 Gallery-trans-figuring*)

These photographs introduced the importance of flow, visual traces and trajectories to photography. The Bragaglias believed that such photos captured the "sensational" essence of movement and not simply its reproduction. Their technique consisted of keeping the shutter speed of the camera open as long as possible while the subject being photographed moved. This created a trajectory of the movement smeared between two bodily postures or positions, creating a "moving echo" effect. The Bragaglias insisted in creating a memory of the dynamic sensation of movement with the intent of highlighting "the environment in all its volumes, disturbed and convulsed by the revolution the body's movement gives it ... the environment

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[81] "the **ethereal body** that is vital energy – considered physiologically – which sustains the physical molecules with its breath of life ... Then there's the **astral body** which is sensitivity, imagination, animal passion...More sentimental and instinctive than rational ... Then there's the **mental body** which is the will, intelligence, guide, higher thoughts, the Greek *psyche* of the Greeks, the Latin *anima*. (Braun 2001: 1).

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that we know and feel still more in the action of motion than in the tranquillity of stasis"
(Braun 1996: 40-41).

Their interest in movement as environment and their photographs which create "smeared" trajectories of movement, inspired the initial video material and scenic design of *trajets*. The idea of creating video material that created a sensation of movement trajectories across space, along with its metamorphosis and decay, was artistically integrated into *trajets*'s projected images and screens *(28-CML-T-Choremedia Process- Table and T-1 to T-5)*. Both Fuller's and Bragaglia's artworks illustrate how the body multiplies and propagates beyond the physical reach of the body through the use of technologies. This thesis argues that these artistic gestures begin to disrupt the notion of the body as singular, and both fragment and materialize it as an extended skin or field.

6.2.1-c) Moholy-Nagy (Kinetic Artist)

Like the Bragaglias, Hungarian artist, Moholy-Nagy (1895-1946) was interested in creating dynamic forms and sensations across material forms. He researched dynamic-constructive systems of forces by creating moving sculptures. His sculptures cross both the *trans-forming* and *trans-planting* categories outlined in this thesis *(29-GALLERY- Hybrid)*. In other words, when Moholy-Nagy's *Space Modulator* (Figure 6-3) is not moving, the object is not recognised as a human body, but when the curved shapes in the sculpture move, their rotational, undulatory and spiralling kinetic attributes have the potential of being kinaesthetically apprehended.

Figure 6-3: Moholy Nagy's *Space Modulator* (1940) (29 *Gallery-hybrid*)

Moholy-Nagy with Alfred Kemeny (1922) wrote a Manifesto stating that the dynamic-constructive "system of forces can only be experimental demonstration devices for the testing of connections between man, material, forces and space" (Moholy Nagy 1965: 238). This exchange among man, materials, forces and space is similar to ways in which movement-based interactive art installations create dynamic systems through participatory embodiment and choreomediated interactions. The kinetic and kinaesthetic qualities he transposed into the sculptures are similar to the kinetic and kinaesthetic characteristics of the motorised screens in *trajets*. In stillness (without images projected) the screens are hanging objects, however, when the screens move, they become kinaesthetic.

### 6.2.1-d) Len Lye (Filmmaker and Kinetic Artist)

Moholy-Nagy's interest in materialising mechanical and optical forms of rhythmic movement is similar to Len Lye's bodily attitude toward rhythmic creativity in film and sculpture. Len Lye (1901-1980), a New Zealand painter, filmmaker (primarily animation) and kinetic artist had a relationship to the filmic medium which was extremely physical and actively embodied; he painted and etched directly onto each frame. He invested his full bodily attention as he etched the rhythmic variations directly onto the film *Free Radicals* with blades and combs

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(first created in 1958 and reworked in 1979) (*30-GALLERY trans-forming-Free Radicals video*) (Re-voir 2000: 16-26). Lye literally danced as he was making films,

> I (Lye) wiggled my whole body to get a compressed feeling into my shoulders –
> trying to get a pent up feeling of inexplorable precision into the fingers of both
> hands which grasped the needle and, with a sudden jump, pulled the needle through
> the celluloid and completed the design...I try to pin down a kinetic figure on film to
> make a feeling I feel at the back of my head – or is below my ears at the back of my
> of my neck ... it (art) symbolically finalizes the drive in every cell of our body to
> self-replicate; harmonizes this stress in the polarity conditions of our organism
> (body-brain, male-female, and inner-outer) (Revoir 2002: 22-25).

Lye felt that there could be such a thing as composing motion and elaborated his artistic practice by asking himself the question "why can't there be figures of motion?"[82] Indeed some of his films could be described as cinedance in as much as the films "pull the viewer in" or empathize (*chapter 3*) with changes of tempo and dynamics through rhythmic interplay between the sound and image.

### 6.2.1-e) Adolphe Appia (Scenographer)

Rhythm is a common subject of bodily transposition in the artists' works presented in this thesis. Swiss-born scenographer Adolphe Appia (1862-1928) was inspired by Swiss movement and music pedagogue Emile Jaques Dalcroze's[83] (1865-1950) pedagogy of bodily movement and rhythm. Dalcroze's ideas and methods of rhythmic studies known as "eurhythmics" inspired Appia to consider the rhythmic nature of scenic design. Appia was interested in creating three-dimensional stage spaces that could emphasise the three-dimensional nature of the moving body. He wanted to transplant the bodily movement

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[82] Biography taken from Len Lye Foundation (1975) p.15 published in Len Lye (2000) *Re -Voir Video.*

characteristics Dalcroze highlighted into stage spaces: "L'idée d'espace ne nous a été donnée que par les mouvement du corps..." (Appia 1921 : 39). *The notion of space was given to us only through the movement of the body (my translation).* Appia wanted to design with volume, light, and rhythm in such a way that the body would be able to be fully expressive. Equally, he felt that the notion of "body" had to be considered both as "lieb" and "plastic." "C'est du corps, plastique et vivant, que nous devons partir pour revenir à chacun de nos arts et determiner leur place dans l'art dramatique. Le corps n'est pas seulement mobile, il est plastique" (Appia 1921: 20). *It is from the body, both plastic (as in plastic or visual arts) or live which should be our point of departure to return to all art forms to determine their role in dramatic arts (my translation).*

Appia and Dalcroze both appreciated the dialogical relationship between stage space and movement, or better put, among rhythm, weight, volume, depth, and empathy. Appia respected Dalcroze's work in characterising qualities of bodily movement and saw how scenic design necessitated a bodily movement-based sensibility. Appia felt that three-dimensional perspectives were necessary to accommodate rhythmic and moving bodies. He believed that three dimensional stage designs had to replace the flat backgrounds which added no contrast or opposition for actor's movements on stage. *Rhythmic spaces,* (1909) is an example of a scenic design which integrated movement principles.

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[83] Both Appia and Dalcroze sought to understand the relationships among bodily movement, rhythm and space (Dalcroze, 1965).

Figure 6-4: Appia's *Rhythmic Spaces* (1909) (*Gallery-trans-planting*)

In reference to the categories used in this chapter, Appia *trans-planted* movement knowledge into spatial design in order to enhance movement transmission and transactions to occur between the actors and the audience *(31-GALLERY-Trans-planting)*. In his writings, however, it is possible to appreciate his attention towards "embodied spaces" for movement transactions to occur (*appendix 6, pg. 150*). Appia saw corporeal presence as a priority and saw the need to better frame movement, in order to "feed" and feel it. *Rhythmic Spaces* appears to be a simple set today, but the idea of having steps, columns and light play was at the time innovative. Appia's stage design was based on the styles of locomotion and stillness where stairs and inclinations could provide the appropriate conditions to highlight dynamic variations of bodily movement (Appia 1921: 39). Here spatial design and body movement converge, as in *trajets*, as the conceptual and material resources of a kinaesthetic stage space or environment.

## 6.3) Embodied Filmmaking

Like the artists mentioned above, film and video makers have also coupled bodily movement with technological and artistic materials. Russian Dziga Vertov[84] (1896-1954) described the camera as a "kino-eye," whereas American experimental filmmaker Stan Brakhage (1933-2003) referred to it as a "flesh window." Brakhage clearly stated that it was his aim to "... explore the possibilities of exercise, to awaken my senses, and to prepare my muscles and joints with the weight of the camera and the necessary postures of holding it.[85]" He extended this notion of technological embodiment by linking his body to the camera and editing "... so that I can carry that weight in the balance of these postures through my physiological reaction during picture taking and to some meaningful act of *the edit*" (*my italics*). Brakhage's daily ritual of callisthenics helped him link the movement of the camera to that of his body.[86]

Others have focused not only on the biological resemblance of the camera to the eye, or the kinaesthetic properties of film, but the influence film has on one's nervous system. For experimental filmmaker Paul Sharits (1943-1993), "Light–color-energy patterns generate internal time-shape and allow the viewer to become aware of the electrical-chemical-functioning of his own nervous system" (Sharits 1969: 13-14). In the same spirit, dancer and cinema maker Amy Greenfield (1974) described her physical relationship to video as follows:

> For me, dance, choreography and video are one thing – they all proceed from the dance of electrons. My energy as a video dancer comes from finding the rhythm of electrons within myself. It's a direct sensation of travelling, charged particles which

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[84]Originally Denis Arkadyevich Kaufman, Vertov changed his name to "Dziga" which he claimed sounded similar to the mechanical noise of the camera.
[85] Brakhage cited from Haller, Robert A. (ed.), (1982) Brakhage Scrapbook Collected Writings 1964-1980 New Paltz: Documentext. p.123 in (Elder 1998: 315).
[86] *Ibid.*

generate heat ... even when I'm not moving. Video dance is what's underneath, what can't be seen ... transmission, not projection ... To be as natural and transparent as in one's most private moments for the camera ... the energy can be transmitted through the monitor into another person's insides ... Caring for my video equipment, I learned to care for my own body.[87]

I share Greenfield's, Vertov's and Brakhage's attention to technological embodiment in my own artistic and technologically-mediated working process. The process of editing, for instance, is for me a haptic[88] experience. Choreoediting, or qualitatively organising movement sequences on the screen, is coupled with and through my kinaesthetic sensibility. This sensibility includes weight transfer, rhythm, fluidity, dynamics, points of initiation and counter point. The act of choreoediting creates a dynamic pull between the material properties of the moving image, and my kinaesthetic experience and awareness.

Choreoediting follows a trajectory based on techniques established in experimental film, cinedance and/or video art. Generally speaking, experimental film makers, cinedance and video artists are not interested in storytelling narrative techniques, but in creating visual poems or exploiting the formal materiality of the medium itself. In my particular artistic experience of cinedance, choreoediting choices extend the body-medium and movement repertoire by firstly, introducing new forms of movement sensation and identification which challenge our biological laws of embodiment. And secondly, by allowing inanimate and animate objects to share the same movement field (i.e. McLaren's *Chairy Tale* 1957). These two characteristics also describe the ways in which the notion of the "kinesfield" is choreomediated in the movement-based interactive installations in this thesis. The public in movement-based

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[87]Greenfield cited by Lorber, Richard (1977) Videodance Unpublished Ed. D. dissertation Columbia University Teachers College p. 52 in (Elder 1998: 297).
[88] J.J. Gibson (1966) describes haptic as touch (pressure, temperature and kinaesthetic sensation).

interactive art are introduced to alternative forms of fictive embodiment and share a

movement-field with inanimate objects.


## 6.4) Cinematic Influences on Fictive Embodiment

Artists have experimented and exploited the material and technological properties of camera,

editing (both analog and digital), chemical processing, electronic and digital effects to create

fictive embodiment. Fictive embodiment and kinaesthetic responses are generated by

coupling bodily movement sensibilities with cinematic techniques such as close-ups, double

exposure, compositing, lighting, focus, depth of field, framing, point of view, reversed action,

freeze frame, accelerated action, slow motion, flashbacks and flash forward. These cinematic

techniques link movements of bodies and objects in a continuous field of motion and also

create fictive bodies. Filmmaker Slavko Vorkapich (1965) noted, "With little training a film-

maker will be able to feel kinaesthetic responses to seen movements not only of human bodies

in motion but of objects in motion as well." Filmmaker Ed Emshwiller, (1967) described the

elasticity of space and time in cinedance.


> When the dancer is used in filmic terms, rather than dance terms, **space and time
> are flexible.** (my emphasis) The images projected on the screen may seem to
> move forward and backward in time, may be discontinuous, in fast motion, frozen,
> repetitious, or simultaneous. The dance can appear to shift instantaneously from
> one location to another, can be compressed, elongated, distorted or seen from
> widely varying perspectives (Emshwiller 1967[89]).


The following table describes how space and time are flexible and trans-figure, trans-form and

trans-plant bodily movement through cinematic techniques. The images in these films and

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[89] Special insert of Dance Perspectives 30 Magazine entitled Cine-Dance, page numbers
not indicated.

videos internally transport our bodies to fictive embodiment and entertrain one's kinaesthetic "imagination" or "image in action." They are evidence of the ways technologies alter the dynamic-felt body-medium. The far right column describes how the movement quality is trans-planted, trans-figured or trans-formed.

Table 1:  Cinedance and videodance examples

***(The items in bold are in the Gallery section of the CD-ROM)*** *(32 and 33 Gallery)*

| Title | Format | Date | Choreographer Filmmaker | *New movement sensations and body mediums.* |
|---|---|---|---|---|
| Vita Futurista | 35 mm length unknown | 1916 | Arnaldo Ginna | Trans-planted:  Moving images of objects of transportation mobility and people edited together.  Subjective and objective points of view intermixed. |
| Opus I | 16 mm 8 min | 1920 | Walter Ruttman | Trans-formed:  Animation of paper on film which brings forth a dynamic, visual, abstract dance of moving objects. |
| **Wax Experiments**<br><br>**Lichtertanz Study 12**<br><br>**32  Pencil Test** | **16 mm 9 min**<br><br>**16 mm 5 min**<br>**16 min 1 min** | **1921-26**<br><br>**1932**<br><br>**1941** | **Oskar Fischinger** | **Trans-planting/Trans-forming:  Wax melted on the film appears as organic matter.**<br><br>**Trans-forming:  Lines etched onto the film and rhythmically associated with sound score.**<br><br>**Trans-forming:  Pencil drawings of shapes converging together.** |
| Ballet Méchanique | 16mm 15 min | 1924 | Fernando Leger | Trans-figured and trans-planted:   300 images of people and objects edited very quickly and rhythmically together. |
| The  man  with  a  movie camera. | 35mm | 1929 | Dziga Vertov | Trans-figured and trans-planted:  Fast editing linking daily images into a rhythmic interplay between bodies of Russians and city life. |
| Diving  Sequence  of  the Olympic Games |  | 1936 | Leni Reifenstahl | Trans-figured:  The diver flies in the "Diving sequence" of the Olympic games in Berlin. |
| **33 Ritual in Transfigured Time** | **16mm 16 min** | **1945-6** | **Maya Deren** | **Trans-figured:  Various methods employed. The video on the CD-ROM (GALLERY-Trans-figuring) shows Deren's body alternating between negative and positive printing cinematic effects as a continuous shot.** |
| Seven  Brides  for  Seven Brothers | 35mm 1 hr 42 min | 1954 | Stanley Donen | Trans-figured:  Choreoedited scenes of dancers doing a folk-like dance around and on a picnic table. Dynamics of jumps and leaps are exaggerated through editing. |
| Chairy Tale | 16mm 10 min | 1957 | Norman Mclaren | Trans-planted and trans-formed:  Duet between a chair that moves and an individual.  The chair is a dancer. |
| New York, New York | 16 mm 15 min | 1958 | Francis Thompson | Trans-figured:  Kaleidoscope, prisms, wide-angle lens and a mirror piece alter people in New York.  The distorted buildings and people create liquid and fluid transformations of bodies. |
| Nine Variations On a Dance Theme | 16 mm 13 min. | 1966 | Hilary Harris | Trans-figured:  Fragmentation and Nine points of view of the same dance phrase linked to nine styles of editing. |
| Pas de deux | 16mm 14 min. | 1968 | Norman McLaren | Trans-figured and trans-formed:  White lit dancers, multiple exposures of a single film frame creating traces of movement. |
| Thriller,  music  video  by Michael Jackson | Video 17 min | 1982 | Michael Jackson | Trans-figured:  Many techniques including fast cuts of points of view that create the "dance-like effect" and metamorphic changes. |
| Alive from Off Centre Video TV, series | Video  – length variable | 1986 | WNET TV A  variety  of choreographers  and directors | Trans-figured:  A television series which experiments with different videodance techniques.  Often chromakeyed, video pyrotechnics present bodies in alternative locations, flying and embodied with superhuman abilities. |
| Airdance Video | Video 15 min | 1987 | Elizabeth Streb (C) Michael Schwartz (F) | Trans-figured:   The framing of the camera creates a non-gravitational space for the dancer. |
| Birds | 35  mm 10 min | 2000 | David Hinton and Yolande Snaith | Trans-formed and trans-planted:  Archival footage of birds movements choreoedited together to create a bird dance. |
| Crouching  Tiger  Hidden Dragon. | 35 mm 115 min | 2000 | Ang Lee | Trans-figured:  Body flies and has super human powers. Time splice photography is used to suspend motion. |

In many ways cinedance sets an artistic framework that has been adopted and extended into movement-based interactive art.  The interactive art examples in this thesis extend the 4 x 3 frame into three-dimensional spaces in order to elicit physical identification and fictive

embodiment in participatory-based choreomediated installations. Cinedance, as a particular aspect of filmmaking and video, has a conceptual and thematic impact on my practice and choreomediated installations. The artworks discussed above and movement-based interactive arts contribute alternative perspectives, points of view and fictive embodiment that cultivate one's kinaesthetic awareness and repertoire. Movement-based interactive art installations are part of a continuum of these traditions.

## 6.5) Summary

The artworks presented in this chapter illustrate the extent to which bodily movement characteristics converge with technologies to create alternative forms and kinaesthetic sensations. It is a contention of this thesis that these artworks, along with the movement-based interactive artworks, constitute a historic field of technologically-mediated, movement-based artistic exploration. Movement-based installations – being a composite of dance, plastic arts, kinetic arts and cinedance continue and extend these artistic traditions by inviting the public to transact within the participatory-based installations. Here the public transacts with *trans-figured, trans-formed* and *trans-plant*ed choreomediated materials. As such, the publics' body-medium is dynamically coupled to fictive and kinaesthetic, choreomediated environments that materialize the notion of the kinesfield.

# SECTION FOUR: THE KINESFIELD

## CHAPTER SEVEN: THE KINESFIELD

It is a contention of this thesis that the movements of the public, objects, images, sound, and architecture in these installations constitute a "movement field." In the installations, the movement fields are created with continuous movement transactions, feedback, and fluid relational experiences among bodies, objects, sound, air currents and images. As such, the practice of movement-based interactive art challenges the ways in which dance traditionally describes the relationships among space, objects and the body. It is for this reason that the kinesfield as a term was taken on board to describe the participant's body-medium not as separate from its environment, but as dialogically and dynamically coupled.

In the movement-based installations presented in this thesis, the choreomediated body-environment relationship is not based on simple cause-effect rapports – where the body moves on one hand, and the object (screen, interface, video) on the other, but instead on the continuous, qualitative movement transactions amongst the ensemble of materials. Here the participant identifies itself, through various processes of mimesis, empathy or kinaesthetic sensations of estrangement. These processes are choreomediated through visual (i.e. visual traces of participant's weight in *Shifting Ground*), architectural (i.e. as in *trajets* where twelve screens and images change positions and projections) and sonic (i.e. as in *Raumspielpuzzle* where the sound score changes depending upon the participants hand movements) interactions.

With these choreomediated, continuous movement transactions, the installations can be described as artistic *"mise en scènes[90]"* of movement. The artistic intention of these *"mise en scènes"* is to magnify and heighten the public's awareness of how their bodies couple to the environment through various processes of direct, indirect and continuous action-response and feedback experiences. This chapter examines this coupling, which is at the heart of this thesis, first by summarising the experiential characteristics of the kinesfield, and secondly, by illustrating the ways in which the kinesfield echoes philosophical and sociological descriptions of the body-medium by Hans Jonas (1966), Maurice Merleau-Ponty (1962) and Henry Lefebvre (1991).

## 7.1) Characteristics of the Kinesfield

The kinesfield is a term which describes the body-medium as a relational dynamic between itself and its environment. In the movement-based interactive artworks submitted with this thesis, the kinesfield is materialised by inviting the public into an artistic venue which affords choreomediated conditions of triphasic participatory embodiment, multimodal kinaesthetic feedback interactions, and destabilisation/estrangement. Here kinetic spaces are choreomediated to provide the conditions from which dynamic interactions can be experienced by the visiting public. Such conditions are intended to elicit attention to the participating public's kinaesthetic sensibilities of their own body and the environment.

This focuses the attention away from the "body" on one hand and "space" on the other, and towards the body coupled with space-time as a rhythmic and relational dynamic, acting,

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[90] In these installations the organization of kinetic objects and kinaesthetically-based feedback provide

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responding and moving within an environment. The coupling thus shifts the locus of attention towards the movement transactions that occur among the public, materials and the environment. The attributes of the environment in the installations are atmospheric (i.e. air currents in *Shifting Ground*), biological (i.e. each participant's body and imagination), natural laws (simulated magnetism in *trajets*), objects (images on screens in all installations) and social interactions (playing with a partner in *Raumspielpuzzle*). As such they create the conditions which materialise dynamic relationships among the participants and the given choreomediated environment.

## 7.1.1) Psychophysical Attributes

Although the concept of the kinesfield emerged from creating large-scale environments, it can be used to describe the dance performer's mental and imaginary condition. In other words, the kinesfield could be theoretically extended outside of the movement-based interactive art practice to illuminate dance and performance experience. For instance, the kinesfield can be extended to: dancer Kim Itoh's descriptions of the wall, public and décor as being active and dialogical during his performance *(chapter 1)*, telematic performer Hellen Sky's sensation of embodying the remote virtual images and the local dancers' movements as an interconnected space *(chapter 1)*, or video artist Amy Greenfield's inner-felt experience that electrons in the video screen are kinaesthetically connected to her movement space *(chapter 6)*. This internal and experientially felt sensation of coupling the body to space is rarely described in dance and technology literature. Dancer and writer Kozel is one of the few writers who articulates such subjective coupling of technologically-mediated performance with phenomenological

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the conditions or "mise en scenes" for dynamic and participatory movements or "play" to take place.

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methods. (Kozel 1994-2002) When performing, Kozel feels "kinaesthetically touched[91]" with the images in technologically-mediated performance.

Kozel's, Greenfield's, Sky's, and Itoh's performance-based descriptions highlight a condition which echoes philosopher Valéry's (1931) description of the dance performers' *resonance-loop*, Thompson's (2002) *empathy and imaginary movement transposition* and Preston-Dunlop's (1978) inclusion of the *psychophysical and internal* as an extended zone of Laban's kinesphere. It is an artistic intention to consider such layered resonance loops in the ways the installations are choreomediated. Drawing from my dance performance background (1981-1995), dance is not geometrically felt as segmented into zones, but as dynamic, inner felt sensations that couple imaginary, bodily and environmental elements. When dancing, I felt qualities of inner and outer spaces converge as unbound, intersecting, differential dynamics. The kinesfield can be understood as constructed from these intersections of mental perceptions and physical interactions.

The dynamic and relational transactions which are choreomediated in these installations are accentuated by establishing contexts within which the participant can focus attention to both inner and outer felt movements. The choreomediated conditions of these installations are created to assist the public in attending to their own kinaesthetic state and to the movements of the space. For instance, the installation spaces are dark and dimly lit so that the participants can focus and better sense the nuances of movement interactions choreomediated in the installations. Equally, the choreomediated interactions are based on minimal repeatable

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91 Kozel, Susan (1998) "Spacemaking: experiences of a virtual body." *The Routledge Reader in Dance Studies*, (editor A. Carter.) London and New York: Routledge, pp 81-88.

movement patterns (standing, shifting weight, walking, moving hands) which encourage the public to adapt to the kinaesthetic logic of the relational dynamics put into place.

## 7.1.2) Relational Dynamics Versus Space

This thesis argues that the choreomediated conditions of these installations invite the participant to experience their body-medium in the movement-based installations as a relational dynamic. Laban's definitions of the kinesphere, infinite space and the dynamosphere (Laban 1966: 10) were a meaningful contribution to the artistic, academic and educational dance community because his seminal work established theoretical descriptions of the body coupled to space. Laban's body-medium (*chapter two*), however, is based on inner efforts that originate from within the body and move outwardly, excentrically into space. Preston-Dunlop's extension of the kinesphere of internal and "shared space[92]" are of direct interest to this thesis as they couple the subjective and intersecting spatial zones of the body-medium. Her descriptions, however, begin with the inner efforts which originate from the body and internally move outwardly into space. Here, incoming stimulus from the environment is not well addressed in the definitions of the kinesphere. The proposed kinesfield situates the body-medium not as originating within the body, but as a dynamic among itself and its milieu.

Artistically speaking, these installations are not based on creating conditions within which the participants emotively express themselves outwardly. Instead, multi-textural and multimodal, kinetic environments afford the participants an opportunity to engage in minimal movement

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[92] Preston-Dunlop introduces the term "shared spaces" to describe the intersection of kinespheres in the martial arts (Preston-Dunlop, 1978).

vocabulary, transactional and technologically-mediated experiences with objects, mirrored movements, sound and/or others. The dynamic relationships which constitute the body-medium's sensibility are described as a kinesfield.

## 7.2) Social and Philosophical Context

Social theorist Henri Lefebvre (Lefebvre 1991)[93] articulates this dynamic coupling by highlighting rhythmic exchanges. For Lefebvre, the body is practico-sensory and is both producer of and produced by space "...social spaces are given rhythm by the gestures which are produced within them, and which produce them ..." (Lefebvre 1991: 216). He argues that,

> Bodies (each body) and **interbodily space** (my emphasis) may be pictured as possessed of specific assets: the materials (heredity, objects) which serve as their starting point, and the matériel which they have available to them (behaviour patterns, conditioning-what are sometimes called stereotypes). For these bodies, the natural space and the abstract space which confront and surround them are in no way separable, as they may be from an analytic perspective (Lefebvre 1991:213).

In these installations it is the artistic intent to accentuate the **interbodily** dynamic of the public and highlight the space as palpable and in flux. For instance, the space between the body and screen appears to be tensile in *trajets*, as the simulated magnetism creates a tension between the public's bodily positions and the screen. Equally, in *Raumspielpuzzle*, the space becomes active and material as the sounds create a textured palpable space.

This material nature of space resonates with the phenomenological descriptions of Merleau-Ponty (1964). Phenomenologist Merleau-Ponty describes the space surrounding the body as a continuum of the body, or as "chair" or fleshspace.

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> *Flesh of the world,* described (apropos of time, space, movement) as segregation, dimensionality, continuation, latency, encroachment--- That means that my body is made of the same flesh as the world (it is a perceived), and moreover that this flesh of my body is shared by the world, the world reflects it, encroaches upon it and it encroaches upon the world (the felt [senti] at the same time the culmination of subjectivity and the culmination of materiality), they are in a relation of transgression or of overlapping (Written May 1960) (Merleau-Ponty: 1968:248).

Fleshspace describes the interlocked connection or chiasmus between the body and space.

Biological phenomenologist, Jonas, like Merleau-Ponty, describes this coupled state of the body and time/space as mutually co-constitutive. Jonas described the biological nature of the "body" as "organism," and "environment" as "lifeworld." For Jonas, the human condition is biologically predisposed to sense movement with our metabolic and mobile attributes (Jonas 1966: 10). According to Jonas, the human condition innately knows or perceives the "lifeworld" because its "organism" state is constituted of the same materiality.

> The observer of life must be prepared for life. In other words, organic existence with its own experience is required of himself for his being able to make that inference, which he does make all the time, and this is the advantage – perenially disowned or slandered in the history of epistemology – of our "having" that is, being bodies. Thus we are prepared by what we are (Jonas, 1966: 82).

Here the human condition is such that bodies, coupled to environment, feel movement kinaesthetically and mobilise themselves in and through dynamic contexts or systems. The installations presented in this thesis can be read as bringing forth the conditions which materialise Jonas's "organism-lifeworld" coupling Merleau-Ponty's fleshspace. The concept of the kinesfield is thematically and theoretically associated with this coupling. The kinesfield

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[93] Lefebvre's The Production of Space was originally published in French (Production de l'espace) in 1974 and was only translated into English in 1991.

is not a referential frame for the body-medium as in Laban's geometric kinesphere, dynamosphere and infinite space, but a conceptual description which highlights kinaesthetic, relational and dynamic transactions of the moving body with its environment. The above theories are conceptual tools and methods that support the coupled body-space medium of the kinesfield as presented in this thesis.

The installations presented in this thesis are in one sense a microcosmic construction within which the phenomenological (Merleau-Ponty, Jonas), physiological/ecological (Gibson) and social (Birdwhistell, Lefebvre) descriptions of body and space interactions are materialised through *triphasic participatory embodiment, multimodal kinaesthetic conditioning* and *destabilization/estrangement*. While Merleau-Ponty, Jonas and Lefebvre have fertilised the theoretical and philosophical ground from which the body-medium of the kinesfield can be embedded, artistically speaking, movement-based interactive art can be seen as materialising such body to environment coupling through the public's participatory and technologically-mediated embodiment. The movement-based interactive art installations are in one sense materialised movement fields that have the artistic intent of drawing attention to the body-medium's coupled condition.

7.3) Summary

This chapter has reiterated the characteristics of the kinesfield and contextualized its theoretical position with existing body-medium concepts outside the field of dance. Here, the kinesfield shifts the locus of attention away from the *body* or *dance* and *machines* or *technology* as separate subjects of discourse, and focuses instead on the qualitative, relational and differential movement dynamics which take place among them. The kinesfield is based on one's experiential embodied state as linked in a dynamic between itself and the

environment. It is my artistic and social intent to create artworks that invite and enable the general public to experience their bodily and interbodily states. The kinesfield is not a "frame" for the body-medium as is the kinesphere, but an experiential-based conceptual description which highlights kinaesthetic transactions among the body and the environment.

## CHAPTER EIGHT: CONCLUSION

This thesis has illustrated the experiential and conceptual characteristics of the publics' body-medium in the three movement-based interactive artworks completed during the course of this doctorate research: *Shifting Ground, trajets* and *Raumspielpuzz*le. The objective of making these installations was to explore ways in which the general participating public could experience the flux of their coupled body-to-environment state of being. This thesis was based on the exploration of this coupling and the ways in which the participant could discover qualitative, kinaesthetic rapport through the movements of screens, sound, images, and other people.

The thesis has provided evidence that these installations introduce a paradigm shift of the body-medium of the dancer/public as a kinesfield. The body-medium as kinesfield highlights bodily movement interactions and dynamic relationships that take place through the choreomediated installations. This paradigm shifts the locus of attention away from *the body* and the *technological interface* as separate subjects of discourse, to the relational and differential movement dynamics which take place between them.

This chapter summarises the artistic intent of creating the movement-based installations and the body-medium as a kinesfield which emerged from it. This is followed by a critique of the limitations of the research and its methodological approach. The final section outlines future artistic and theoretic research objectives in post-doctoral research.

## 8.1) Summary of Intent

Realistically, in our daily condition, total awareness of moment-to-moment bodily and environmental movements is impossible. In daily life we cannot perceptually grasp the simultaneous and polyphonic movements in our bodies comprised of up to 1000 muscles and over 100 joints and interactions with others and the environment (Bardy, 2002: 39). As mobile beings in a moving world, our sense of movement inside and around our bodies is in a continual state of flux.

The artistic objective of making these installations is to crystallise and materialise movement interactions using choreomediated methods, which in turn bring the publics' attention to their inhabitance of qualitative movement transactions. It is a contention of this thesis, that like dance techniques, movement awareness methods, inscription tools, movement-based art forms and specialised movement languages, movement-based interactive installations afford movement perception by creating a dynamic microcosm which inscribes the body with partnered video, visual traces of weight, pathways and sound. The installations presented in this thesis materialise the coupling between the body and its environment in such a way that the participants have the opportunity to experience such dynamic relationships.

The installations presented in this thesis are intended to elicit the visiting participant's "kinaesthetically-aware body," through dynamic interactions within choreographic and technologically-mediated movement environments. The artistic intent of these installations was based on creating the conditions and the potential for the public to *entertrain* their kinaesthetic sensibility across material forms. The three key characteristics choreomediated to create these conditions in the installations are described as *triphasic participation; multimodal kinaesthetic conditioning* and *destabilisation/estrangement*. It is argued that these

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provide the artistic potential for the visiting public to inhabit their body-medium as a kinesfield.

The goal of these artworks (*Shifting Ground, trajets* and *Raumspielpuzzle*), however, was not only to create artwork presented to the public, but to act as the basis of theoretical research in an area that remains ill defined. It was a strategic and theoretic decision to situate the term kinesfield within a historical dance context that Laban initiated in the 1920s. Despite Laban's focus on the "outwardly expressive-dancer," it is clear that his theoretical, investigatory motivations of movement were larger in scope than he was able to undertake in his lifetime. The interdisciplinary investigative interests of movement that Laban outlined in Science of Dance (*appendix 2, pg. 145*) clearly illustrate his appreciation of movement in its various forms of materiality.

In the spirit of Laban's eclectic interest of movement, this research nests movement-based interactive art within a cross-disciplinary, historic, thematic umbrella of technologically-mediated, movement-based artistic artefacts in performance, photography, cinedance and kinetic art for two reasons. One, to provide evidence that technological mediation of the body is not a contemporary digital computer culture by product. And two, that it is through the use of technological-mediation that artists have created other forms of dynamic and fictive embodiment.

## 8.2) Limitations of the Research Methodologies

The difference with the historical artworks presented in chapter six and the movement-based interactive installations discussed in chapter one lies in the participatory nature of the invited public and their role in physically contributing to the artistic nature of the work. Because of

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the participatory factor, it is difficult to analyze the experiential, embodied visit of each

member of the public. To address this concern, this thesis introduces the notion of

experiential embodied methodologies to emphasise and to create a context within which

"dance experience" can be subjectively addressed. It is a contention of this thesis that because

movement-based interactive installations, like dance, are experiential and embodied in nature,

they cannot be merely described through notated or videotaped descriptions. The descriptive

methods of embodiment included in this thesis – experiential based, reflective, retrospective

and introspective – are pertinent in "turning the dancing experience inside out" and in

focusing on the inner sense of movement, not simply on its "motion-based" output as viewed

by an outsider.

Methodologically, however, experiential embodied methodologies are at their infancy. It has

become apparent during the course of this thesis that two possible avenues of research could

assist in attaining a stronger and more critical account of subjective experience. These include

an examination of phenomenological and psychological methods discussed in Pierre

Vermersch's "Introspection as Practice," Clare Petitmengin-Peugeot's "The Intuitive

Experience" and Francisco Varela's phenomenological "Present-Time Consciousness" in

Varela and Shear's The View from Within: First-Person approaches to the Study of

Consciousness[94] (1999). These methods build upon the phenomenological methods developed

by Merleau-Ponty and Husserl. "Praxis-based" methods (1986) in applied anthropology are

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[94] For Varela's article on "Present Time Consciousness," and Vermersch's outline of "Introspection as Practice," see Varela, Francisco and Shear (1999), The View From Within: First-person Approaches to the Study of Consciousness. San Diego: Imprint Academy.

another avenue of research as they use rigorous and collaborative reflective methods[95] instead of observation-based, "outsider" methods which do not consider the implications the research has on the community being researched.

Movement-based interactive art is also at its infancy. It has become apparent through the process of the research that choreomediating feedback and "sense," both as in "sensation" and "understanding," is not only a choreographic but equally a technological problem. It is for this reason that the term "choreomedia" was introduced. Choreomedia underscores the importance of the artistic organization and attention necessary to choreograph qualitative movement across diverse materiel forms. The members of the choreomedia laboratory are aware of the necessity of addressing the physiological, artistic and technological conditions of movement-based interactive art not as separate but as integrated. This is an ever present concern and will be a central consideration in my post-doctoral research.

## 8.3) Post-doctoral Research

My future research in the area of movement-based interactive art will be based on exploring participatory-based interactions for the general public which take into account real-time "action and perception," or "percaction" with multimodal movement mapping. The movement-based interactive installation *trajets* is evolving in such a way that technological conditions will be better able to accommodate larger groups of people along with new video/screen choreographic inter-relationships. This progression of the research includes a partnership with the Spanish company *High Touch*, which is commissioning *trajets* to be

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[95] Clifford, James and George E. Marcus, (eds) (1986) Writing Culture: The Poetics and Politics of

presented in public museums. To accommodate larger groups of participants, the computer

vision detection, now limited to detecting one to three people, will be improved to detect

larger groups by using a custom-made floor comprised of sensors. Secondly, more qualitative

variation in the intensity of the image feedback (i.e. slightly changing the brightness of an

image, having an image decay over a time period associated with the participants' presence

and movements) will be integrated by introducing real-time video processing. Thirdly, there

is a continued investigation in real-time movement mapping, both in *trajets* and

*Raumspielpuzzle*, in terms of the formal properties of the materials and the way in which

individuals can interact with multiple perspectives of their movement interactions. Finally,

the sonic gesture-mapping in *Raumspielpuzzle* will continue in its beta-testing phase (with

different research communities, see below) before undergoing its final design in 2004. This

includes researching the use of Heliodisplay image technologies. Heliodisplay is a projection

technology which projects onto

air particles instead of a two dimensional screen. Such projection technologies allows the

participant to physically "touch" the 3D-like image suspended in the air.


The Choreomedia Laboratory is extending its future research to integrate processes of the

action-perception studies in order to develop more complex stratified levels of engagement

and feedback. These research directions are all based on developing kinaesthetic rapports

between one's inner felt state and the environment as a dynamic or kinesfield. This includes

partnerships with neurophysiological and human interface design laboratories and artistic

institutes (i.e. national musical conservatory in Geneva Switzerland; the human-design

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Ethnography. Berkeley: University of California Press and Wulff, Robert M. and Shirley J. Fiske, (eds)
(1987) Anthropological Praxis: Translating Knowledge into Action. Boulder: Westview.

interface group at the neurophysiology lab LIRM: Laboratoire Informatique Robotique Montpellier in Montpellier, France and the INFO-COM department at the Université Paul Valéry, Montpellier France).

## 8.4) Concluding Statement

In the 1930s, dance writer and contemporary of Laban, Fritz Böhme noted the impact that theoretic movement investigations was having on the world of dance and movement. He stated that,

> dance as an art form became conscious of its material, dance as a cultural factor became more aware of its social connections, and dance as a product of historical movement became more informed about is actual past. What it (dance) actually is cannot be achieved only through technical exercises or imitation; it must be spiritually grasped and embodied by individuals (Maletic 1987: 22).

The intent of this practice-led doctoral research was to illuminate the practice and become more aware of the impact of its cultural implications and historical context.

Artistically and socially speaking, however, the driving force and intent of making the movement-based interactive installations presented in this thesis was in providing the conditions and potential dynamic opportunities for the general public to grasp and embody qualitative movement as it transverses material forms. As Laban stated, "Movement has a quality, and this is not its utilitarian or visible aspect, but its feel. One must do movements, just as one has to hear sounds, in order to appreciate their full power and their full meaning" (Ullman 1980: 189).

# APPENDICES AND BIBLIOGRAPHY

## Appendix 1: CD-ROM Manual

The CD-ROM must be viewed prior to and at the same time of reading this thesis. The CD-ROM is a digital appendix. It includes video footage, photographs, diagrams of the artworks discussed in the text, along with explanations of the choreographic process.

In the written thesis, the blue numbers in parenthesis (i.e. 1) indicate the number to select on the first page (index page) of the CD-ROM. The numbered referenced pages will take the reader directly to the referenced page on the CD-ROM. Otherwise, the whole site is organized into sections which can be accessed by a freely selecting the section and clicking the mouse.

The CD-ROM is organised into five sections:

### 1.The Kinesfield

> Introduction
> Acknowledgements

### 2.Choreomedia-Laboratory The three installations, *Shifting Ground, trajets* and *Raumspielpuzzle* are outlined in four sections:

> a. Description (includes the artistic intent)
> b. Installation and Technical Layout
> c. Video and Images (documentation of the installation)
> d. Team Members

### 3. Experiential Embodied Methodologies

The dancer's interviews (*chapter one*)
The expert's critique of *Shifting Ground* (*chapter one*)
Author's Dance background

### 4. Gallery of Referenced Artworks

The images and selected video of the artists described in (*chapter six*)

### Trans-figuring
### Trans-forming
### Trans-planting
### Hybrid

### 5. Kinaesthetic Technological Inscription (*chapter five*)

Two Tables
1) Selection of bodily movement inscription technologies and notations.
2) A selection of technologies influencing kinaesthesis.

## Appendix 2:  Laban's Science of Dance

1. The cognitive-theoretical, psychological, and physical determinants of the movement of living beings.  This involves the concept of effort the inner impulse for movement and its articulation into qualitative and quantitative components. The four regulators of intensity as being force, time, space and flux or lability and their respective polarities are described as weak strong fast slow extended narrow and mobile rigid.  Intensities are also referred to as dynamic traits or dynamic qualities.

A. kinetic content (degree of lability) referring to flux or flow
B. dynamic content (degree of tension) referring to force
C. rhythmic content (degree of velocity, speed) referring to time
D. metric content (degree of extension) referring to space.

2. The geometrical and crystallographic theory of space the way crystals are formed is similar.  The icosohedron $27^{th}$ points in space and general space.

3. The monuments of the visual arts in sculpture, painting fine arts, including hieroglyphics and abstract signs for numbers and concepts as well as ornamentation. (line, wave, spiral, circle)

4. The musical cognitive-theoretical research about harmony.

5. The written theoretic documents on old dances as well as on mantic religious ceremonial and ritual movement forms.

6. The theories of movement acrobatics, the art of fencing, and sport.

7. The mimetic tradition of acting.

8. The practical tradition of the European art dance as well as of folk and ethnic (Maletic 1987: 156).

# Appendix 3:  Birdwhistell's Description of Kinesics

Like other events in nature, no body movement or expression is without meaning in the context in which it appears.

Like other aspects of human behaviour, body posture, movement, and facial expression are patterned and thus, subject to systematic analysis.

While the possible limitations imposed by particular biological substrata are recognized, until otherwise demonstrated, the systematic body motion of the members of a community is considered a function of the social system to which the group belongs.

Visible body activity, like audible acoustic activity, systematically influences the behaviour of other members of any particular group.

Until otherwise demonstrated such behaviour will be considered to have an investigative communicative function.

The meanings derived therefrom (sic) are functions both of the behaviour and of the operation by which it is investigated.

The particular biological system and the special life experience of any individual will contribute idiosyncratic elements to his kinesic system, but the individual or symptomatic quality of these elements can only be assessed following the analysis of the larger system of which he is a part (Birdwhistell 1970: 183-184).

## Appendix 4: Popper's Typology of Movement

*Figuration of movement*
1. Academic pose taken up by a model
2. Agitation of the characters
3. Simple figuration
4. Figuration of several successive movements in the same work (enactment)
5. Figuration by signs (symbolic)
6. Figuration by successive scenes
7. Movement denoted by external signs
8. Figuration of instability of characters or objects

*Representation of movement*
9. The choice of the right moment, reconstruction of before and after
10. Several successive moments in the same character or object
(or several characters or objects synchronised in different attitudes or positions)

*Formal suggestions*
11. Contrasts between sensible data
      Values (luminosity)
      Colours
      Forms
      Graphics
      Volumes
      Transparency
      Texture

12. Contrasts in the composition:
      Cutting out by arabesque
      Change in size
      Change in axes (and displacements in relation to the diagonal)
      Change in positions
      Dynamo-plastic arrangement
      Disequilibrium of volumes

*Precise perceptual suggestions*
13. Striving forces (the spectator completes the movement)
      Ambiguity in structure
      Scintillation of colours
14. Perceptual itinerary (viewing)
15. The trace of the instrumental gesture (action–painting)
16. Virtual movement and trompe-l'oeil

*Photographic procedures*
17. The snapshot (immobile mobility)
18. Superimpression and superimposition (and juxtaposition)
19. Photographic disjunction (decoupage)
20. Stroboscopic views (decompose and juxtapose)

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*Filmic procedures*
21. Cinematic procedures (decompose and recompose)
22. Filmic animation of a picture
23. Ciné-picture
24. Techniques of animated drawing

*Movement expressed by movement itself*
25. Simple mechanical movement
26. Electro-mechanical, electronic, thermal, hydraulic and magnetic movements
27. Mobiles (suspended objects)
28. Projections, reflections, refractions of light (variations in projected colours and forms)

*Various procedures*
29. Animation of the work by the spectator (active participation)
30. Movement through the growth or deterioration of the material
31. Repetition of formal elements (permutational order)

(Popper 1968: 216-217).

# Appendix 5:  Snyder's Description of Cinedance

Space: "Film space is infinite, but dance exists in clearly defined space ... Is stage space really dance space?  Is dance inherently oriented to the observer?"

Dimensions: "While film is in fact two-dimensional and dance is three-dimensional, in experience their roles are reverse ... In film we find ourselves a part of it, involved, 'in it,' 'with it.'  Theatre dance happens in a frame in front of us."

Depth: "Film has a simulated depth that is achieved by a 'moving into' sequence.  This sense of depth gives us an active, rather than surface, participation in film."

Non-gravity: "Through film it is possible to achieve a non-gravitational orientation with space."

Time: "What in reality we experience as a whole, in film we experience in fractionated units.  The simultaneous time of observed reality must be re-organized into the sequentially observed time of film."

Movement: "In filmic terms, time is movement – movement developed from the sequential progression of elements, movement as we see it or feel it." (Notion of the audience as dancer through movement of the camera.)

Expansion of time into a new logic: "To broaden, heighten, deepen an experience, elements from beyond the circumscribed moment of reality, elements that extend into another area of time, are added.  This makes the potential of time infinite in film.  Once reality has been broken down into elements of visual experience, any time combination is possible."

Rhythm: "The basic unit of rhythm in film is the idea-phrase, or the perceptual phrase, which is similar to the breath-phrase in dance.  As one breath presupposes another breath, so a breath-phrase in dance presupposes the impulse to move on to the next phrase.  The idea-phrase in film also involves this natural impulse to move on."

Reality: "The manipulation of the elements of film results in a new experience in which we are involved and participate" (Snyder 1967: 48-49).

## Appendix 6: Appia's Description of Bodily Movement and Stage Design

... Le mouvement, la mobilité, voilà le principe directeur et conciliant qui réglera l'union de nos diverses formes d'art pour les faire converger, simultanément, sur un point donné, sur l'art dramatique ... (Appia 1921: 19).

Il va de soi que c'est l'Idée du corps vivant que nous avons prise ainsi comme élément essentiel; il est évident qu'en abordant la pratique de l'art vivant, l'on se trouve en face des corps – le sien compris et que, si le corps est le créateur de cet art, l'artiste qui est possédé de l'Idée possède implicement tous les corps (Appia 1921: 78).

Il en sera de même pour l'Art vivant: les forces employées à l'étude corporelle se transfuseront, automatiquement, dans l'organisme réfléchi des autres, pour des productions et des fins que l'effort corporel, à lui seul, rendrait plus difficile (Appia 1921: 79).

# BIBLIOGRAPHY

Anon. (1967) "Cinedance," Dance Perspectives 30, summer.

Appia, Adolphe. (1921) L'oeuvre d'art vivant. Geneva: ATAR.

Arbeau, Thoinot. (1967) Orchesography (1589) New York: Dover Publications.

Allsopp, Ric and Scott deLahunta (ed.), (1987) The Connected Body. Amsterdam: Amsterdam School of the Arts.

Ascott. R. (1993) Telenoia. In: R.Adrian (ed.), Kunst im Netz. Graz: Steirischen Kulturiniative.

Baird, Freedom. (1998) The Un/Real Duel: Intimacy and Agency Through Interaction with a Virtual Character. Cambridge: Massachusetts Institute of Technology.

Barba, Eugenio and Nicola Savarese. (1995) L'Energie qui Danse. Lectourne: Bouffonneries.

Bardy, Benoit. "La Beauté du geste." (2001) *Centre de Recherches en Sciences du Sport (UPRES 1609) Faculté des Sciences Orsay. Spécial Recherche Plein Sud.* p. 39.

Barker, Sarah. (1978) The Alexander Technique. London: Bantam Books.

Baroni, Guido. (1998) "New Insight in Human Motor Control through Quantitative Analysis of Intra-Vehicular Activities in Long Term Space Flight." Milano: Politecnico Di Milano. Ph.D. Thesis in Biomedical Engineering.

Bartenieff, Irmgard with D. Lewis. (1980) Body Movement: Coping with the Environment. Paris: Gordon and Breach Science Publishers.

Becker, Barbara. (1998) "Corps propres, corps étrangers, corps virtuels." In *Charleville–Mezières: Institute International de la Marionnette Proceedings* pp. 1-3.

Becker, Barbara. (2002) unpublished paper "Marking and Crossing Borders."

Benjamin Andrew. (1994) Object Painting London: Academy Editions.

Bergson, Henri. (1991) Matter and Memory. New York: Zone.

Berthoz, Alain. (Giselle Weiss) (trans.) (2000) The Brain's Sense of Movement (1997 Le Sens du Mouvement) Cambridge: Harvard Editions.

Best, David. (1974) Expression in Movement and the Arts, a Philosophical Enquiry. London: Lepus Books.

Boal, Augusto. (1985 [1979]) Theatre of the Oppressed, C. A. and M. L McBride (trans.) New York: Theatre Communications Group.

Braun, Marta. (1992) Picturing Time: The Work of Etienne-Jules Marey (1830-1904) Chicago: The University of Chicago Press.

---------------- (1996) "Phantasmes des vivants et des morts. Anton Guilio Bragaglia et la Figuration de l'invisible." *Etudes photographiques*, n° 1, novembre pp. 40-55.

Centre National de la Danse. (2002) Oskar Schlemmer l'homme et la figure d'art. Paris: Centre national de la danse.

Chauvanne, Blandine. (2002) Loïe Fuller et la Création Contemporaine. Paris: Editions de la Réunion des Musées Nationaux.

Clifford, James and George E. Marcus, (eds.) (1986) Writing Culture: The Poetics and Politics of Ethnography. Berkeley: University of California Press.

Cohen, Bonnie Bainbridge. (2002) Sentir, Ressentir et Agir. L'Anatomie Experimentale du Body-Mind Centering. Bruxelle: Contradanse.

Compton, Michael. (1964) Optical and Kinetic Art. London: Tate Gallery.

Corin, Florence. (1999) Danse et Nouvelles Technologies. Brussels: Contradanse.

------------------ (2001) Vu Du Corps. Brussels: Contradanse.

Crary, Jonathan and Sanford Kwinter (1992) Incorporations. New York: Zone.

Dance and Technology Zone. http://www.art.net/~dtz/.

Dalcroze, Emile Jaques. (1965) Le Rythme, la Musique et l'Education. Lausanne: Edition Foetisch.

Deleuze, Gilles. (1983) Cinéma 1: L'image-mouvement. Paris: Les Editions de Minuit.

------------------ (1985) Cinéma 2: L'image-Temps. Paris: Les Editions de Minuit.

Deren, Maya. (1945) "Choreography for the Camera." In *Dance* October pp. 10-11 and p. 37.

--------------- (1946) "Ritual in Transfigured Time." In *Dance* December pp. 9-13

--------------- (1953) Divine Horsemen: The Living Gods of Haiti Kingston: McPhereson and Company.

--------------- (1960) "The Creative Use of Reality." in Gyorgy Kepes, (ed.), *The Visual Arts Today* pp. 154-170.

---------------- (1960) "Cinema as an Art Form" in Lewis Jacob's (ed.), Introduction to the Art of Movies. pp. 253-265.

Desmond, Jane, (ed.), (1997) Meaning in Motion: New Cultural Studies in Dance. London: Duke University Press.

Elder, R. Bruce. (1998) The Body of Vision: Representations of the Body in Recent Film and Poetry. Waterloo: Wilfrid Laurier University Press.

Feldenkrais, Moshe. (1972) Awareness Through Movement. New York: Harper and Row.

Feldman, A. G and M. F. Levins. (1994) "Origin and Use of Positional Frames of Reference in Motor Control" in Behavioural and Brain Sciences, pp. 723-743.

Feuillet, Raoul Auger. (1700) Chorégraphie ou L'art de décrire la danse par caractères, figures et signes demonstratifs avec lesquels on apprend facilement de soi même toutes sortes de danses. Paris: Michel Brunet.

Feynman R.P., R.B. Leighton and M. Sands. (1963) The Feynman Lectures on Physics. New York: Addison-Wesley.

Fitt, Sally. (1988) Dance Kinesiology. New York: Schimer Books.

Forsythe, William. (1999) Improvisation Technologies. A Tool for the Analytical Dance Eye CD-ROM.

Gibson, James J. (1966) The Senses Considered as Perceptual Systems. Westport: Greenwood Press, Publishers.

------------------ (1979) The Ecological Approach to Visual Perception. Boston: Houghton Mifflin.

Gil, Jose. *Stephen Muecke* (trans.), (1998) Metamorphoses of the Body. (Theory Out of Bounds Series , Vol. 12) Minneapolis: University of Minnesota Press.

Glassner, Andrew S. (1995) Principles of Digital Image Synthesis. San Fransisco: Morgan Kaufmann Publishers, Inc.

Grolier Company of New York (ed.), (1986) Four Hundred Years of Dance Notation. New York: Grolier Company of New York.

Grotowski, Jerzy. (1968 ) Towards a Poor Theatre. New York: Simon and Schuster.

Hanna, Judith Lynne. (1979) To Dance is Human: A Theory of Nonverbal Communication Chicago: University of Chicago Press.

Hayles, Katherine. (1999) How we Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics. Chicago: The University of Chicago Press.

---------------------- (1993) "Virtual Bodies Flickering Signifiers" in *October Magazine*. pp.1-14.

Houghton Mifflin Company, (ed.), (1992) The American Heritage Dictionary of the English Language Third Edition Boston: Houghton Mifflin Company.

Hayword Gallery (ed.), (2002) Force Fields Phases of the Kinetic. London: Gallery Catalogue for the Exhibition.

Hodgson, John. (2001) Mastering Movement, the Life and Work of Rudolph Laban. New York: Routledge.

Holtzmann Kevles, Bettyann. (1997) Naked to the Bone: Medical Imaging in the Twentieth Century. Reading: Addison Wesley.

Husserl, Edmund. (1934) La Terre ne se meut pas. Paris: Les Editions de Minuit.

Husserl, Edmund. (1973) Chose et espace: Leçons de 1907. Paris: Presses Universitaires de France.

Ihde, Don. (2002) Bodies in Technology. Minneapolis: University of Minnesota Press.

Institute of Contemporary Art, Inc. (ed.), (1982) Art and Dance. Boston: Institute of Contemporary Art.

Jonas, Hans. (1966) The Phenomenon of Life: Toward a Philosophical Biology. Evanston: Northwestern University Press.

Johnson, Don Hanlon. (1995) Bone, Breath and Gesture Practices of Embodiment. Berkeley: North Atlantic Books.

Kealiinohomoku, Joann. (1970) "An Anthropologist Looks at Ballet as a Form of Ethnic Dance" *Impulse Magazine* pp. 24-33.

Kelves, Barbara. (1965) "Slavko Vorkapich on Film as a Visual Language and as a Form of Art" *Film Culture # 38* pp. 37-40.

Kozel, Susan. (1995) "Reshaping Space: Focusing Time" Dance *Theatre Journal 12:2*. pp. 3-7.

---------------- (1994) "Virtual Reality Choreographing Cyberspace" *Dance Theatre Journal 11:2*. pp. 35-37.

---------------- (1998) "Spacemaking: experiences of a virtual body." *The Routledge Reader in Dance Studies*, A. Carter (ed.), London and New York: Routledge, pp 81-88.

---------------- Mesh Performance Practices. http://www.meshperformance.org.

Krell, David Farrell. (1978) Basic Writings: Martin Heidegger. London: Routledge.

Laban, Rudolf Von. (1966) Choreutics. London: MacDonald and Evans.

----------------------- (1950) The Mastery of Movement. Estover: Macdonald and Evan.

----------------------- (1928) Schrifttanz: Methodik, Orthographie, Erlaüterungen. Wein, Leipzig: Universal Editions.

----------------------- (1922 or 1920) Die Welt des Tänzers: fünf Gedankenreigen. Stuttgart: W. Seifert.

Lang Roderyk. (1975) Principles of Dance and Movement Notation (1956) London: Macdonald & Evans.

Lawence F. C. (1974) Effort: Economy in Body Movement. London: Macdonald & Evans Boston: Plays, Inc.

Lefebvre, Henri. (1991) (Donald Nicholson-Smith) (trans.), (1974 French) The Production of Space. Oxford: Blackwell.

Lista, Giovanni. (2002) "Loïe Fuller et le Cinéma." Paris: Editions de la Réunion des Musées Nationaux. pp. 71-82.

Longstaff, Jeffrey Scott. (1996) Cognitive Structures of Kinaesthetic Space; Reevaluating Rudolf Laban's choreutics in the Context of Spatial Cognition and Motor Control. London: Laban Centre.

Louppe, Laurence. (1994) Traces of Dance: Drawings and Notations of Choreographers. Paris: Editions DisVoir.

----------------------- (1997) Poetique de la Danse Contemporaine. Paris: Contradanse.

Lye, Len and Re-Voir Video (2000)  http://www.govettb.org.nz/lenlye/default.htm

Maletic, Vera. (1987) Body Space Expression: the Development of Rudolf Laban's Movement and Dance Concepts. Berlin: Mouton de Gruyter.

Marks, Laura. (2000) The Skin of the Flesh Intercultural Cinema, Embodiment and the Senses. Durham: Duke University Press.

Martin, John. (1933) The Modern Dance. New York: A. S. Barnes and Company, Inc.

Massumi, Brian. (2002) Parables for the Virtual. Movement, Affect, Sensation. London: Duke University Press.

Menicacci, Armando. (2001) La Scena Digitale. Venezia: Marsilio Editori.

Merleau-Ponty, Maurice. (1964) Le visible et l'invisible. Paris: Gallimard.

----------------------- (1968) The Visible and the Invisible. Alphonso Lingis (trans) Evanston: Northwestern University Press.

155

Messadié, Gerald. (1988) Les Grandes Inventions de l'humanité. Paris: Berger-Levrault.

Metheny, Eleanor. (1968) Movement and Meaning. London: McGraw-Hill Book Company.

Michelson Annette, (ed.), (1984) Kino-Eye. The Writings of Dziga Vertov. Los Angeles: University of California Press.

Mlodinow, Leonard. (2001) Euclid's Window. The Story of Geometry from Parallel Lines to Hyperspace. London: Simon and Schuster.

Moholy-Nagy. (1965) Vision in Motion. Chicago: Paul Theobald and Company.

Morris, Gary, (ed.), (1996) Moving Words: Re-writing dance. London: Routledge.

Morgan Robert C., (ed.), (2000) Gary Hill. Baltimore: The John Hopkins University Press.

Morse, Margaret. (1990) Video Installation Art: "The Body, the Image and the Space-in-Between" in Illuminating Video (ed.), Doug Hall and Sally Jo Fifer. London: Aperture. pp. 153-167.

Musée de l'Ecole de Nancy. (2002) Loïe Fuller Danseuse de l'art Nouveau. Paris: Editions de la Réunion des musées nationaux.

Myers, Martha. (1980) "Movement Awareness Methods." *Dance Magazine* July 1980 pp. 1-6.

------------------- (1983) "The New 'Science' in Dance Training." Dance Magazine May, June and July.

Nardi, Bonnie A. (1997) (ed), Context and Consciousness: Activity Theory and Human-Computer Interaction. Cambridge: Massachusetts Institute of Technology.

Ness, Sally Ann. (1992) Body, Movement and Culture. Philadelphia: University of Pennsylvania Press.

Newlove, Jean. (1993) Laban for Actors and Dancers. Nick Hern Books: London.

Noll, A. Michael. (1966) "Choreography and Computers" *Dance Magazine.* Philadelphia: Philadelphia Art Alliance.

------------------- (1994) "The Beginnings of Computer Art in the United States: A Memoir." *Leonardo Vol. 27. No. 1*, pp. 39-44.

Norman, Sally Jane. (1995) "Schlemmer's Aesthetics and Digital Body Technologies." *In InterCommunication Body\Performance.* Tokyo: Intercommunication Centre. pp. 59-62.

-------------------- (1996) Arte y Technología. http://www.telefonica.es/fat/enorman.html.

Novak, Cynthia J. (1990) Sharing the Dance. Contact Improvisation and American Culture. Madison: The University of Wisconsin Press.

Odyssud-Blagnac, (ed.), (1996) Les Actes du corps au corpus technologique. Toulouse: Odyssud-Blagnac.

Perrier, Daniel (ed.), (2000) Len Lye. Paris: Editions du Centre Pompidou.

Pitas, Joannis. (1993) Digital Image Processing Algorithms. London: Prentice Hall.

Popper, Frank. (1968) Origins and Development of Kinetic Art. New York: New York Graphic Society.

----------------- (1993) Art of the Electronic Age. London: Thames and Hudson Ltd.

Port, Robert F. and Timothy Van Gelder (ed.), (1995) Mind as Motion. Explorations in the Dynamics of Cognition. Cambridge: MIT Press.

Preston-Dunlop, Valerie. (1978) An Investigation Into the Spontaneous Occurrence of Fragments of Choreutic Forms in Choreographed Dance Works. London: Ph.D. thesis University of London, Goldsmith College.

Preston-Dunlop, Valerie and Susanne Lahusen. (1990) Schriftanz: A view of German Dance in the Weimar Republic. London: Dance Books.

Preston-Dunlop, Valerie and Ana Sanchez-Colberg. (2002) Dance and the Performative, a Choreological Perspective. London: Verve Publishing.

Preston, Stephanie D. and Frans B. M. de Waal. (2002) "Empathy: Its Ultimate and Proximate bases." In Behavioral and Brain Science, 25: 1-72, Publishing.

Rebelo, Pedro. (2001) "On the Coherence of Sonic Space." In CADE Digital Creativity: Crossing the Border. pp. 326-330.

Rodaway, Paul. (1994) Sensuous Geographies. London: Routledge.

Rolf, Ida P. (1977) Rolfing. Rochester: Healing Arts Press.

Rousseaux, Francis. (2003) Le Danseur de Ballet Face au Miroir. Paris: Maison de Science de l'homme.

Rubidge, Sarah. (2003) Unpublished paper. "Sensational Space and Sensuous Geographies."

------------------ (2000) Identity in Flux: A Theoretical and Choreographic Enquiry into the Identity of The Open Dance Work, unpublished PhD Thesis, Laban Centre/ City University London.

------------------(2003) Sarah Rubidge Artist. http://www.sensedigital.co.uk.

Sánchez-Colbert, Ana. (1998) "Space is the Place: A Reconsideration of Laban's Principles of Space for Contemporary Choreographic Education and Choreographic Practice." In Continents in Motion Conference, University of Lisbon, October.

Schechner, Richard. (1994) Performance Theory New York: Routledge.


Schlee, Alfred (1928) Schrifttanz: Methodik, Orthographie, Erlaüterungen. Wein, Leipzig: Universal Editions.

Schmidt, R.A. (1975) "A Schema Theory of Discrete Motor Skill Learning." *Psychological Review, 82,* 225-260.

---------------- (1988) Motor Control and Learning: A Behavioral Emphasis. (2nd ed.) Champaign, IL: Human Kinetics.

Schutzman, Mady and Jan Cohen-Cruz, (ed.), (1994) Playing Boal. Theatre, Play, Activism. London: Routledge.

Sharits, Paul. (1969) "Notes of Films, 1966-68" *Film Culture 47.*

Séris, Jean-Pierre. (1994) La Technique. Paris: Presses Universitaires de France.

Sherrington C.S. (1906) The Integrative Action of the Nervous System. New York: C. Scribner's Sons.

Simondon, Gilbert. (1958) Du mode d'existence des objets techniques. Paris: Aubier.

Smith, A. William, (ed.), (1992) *Dance and Technology I: Moving Toward the Future: Proceedings of the First Annual Conference.* Madison: University of Wisconsin.

----------------------------- (1995) *Dance and Technology III: Transcending Boundaries: Proceedings of the Third Annual Conference.* Toronto: York University.

Smith, Hazel and Roger Dean. (1997) Improvisation, Hypermedia and the Arts since 1945. Amsterdam: Harwood Academic Publishers.

Snyder, Allegra Fuller. (1965) "Three Kinds of Dance Film" *Dance Magazine Vol. 39,* pp. 34-39.

----------------------- (1967) "Untitled Article on the filmic approach to dance." *Dance Perspective, Vol. 30 Summer* pp. 48-51.

----------------------- (1986) "Transformation, Inner Space and the Future of Dance", Paper for the International Seminar of Inner and Outer Space. Indira Ghandi National Centre for Arts, New Delhi. pp. 1-5.

Sorell, Walter (ed./trans.), (1973) The Mary Wigman Book. Her Writings. Middletown: Wesleyan University Press.

Steinberg, Cobbert. (1980) The Dance Anthology. London: Plume.

Taussig, Michael. (1993) Mimesis and Alterity. London: Routledge.

Thelen, Esther and Smith, L.B. (1994) A Dynamic Systems Approach to the Development of Cognitions and Action. Cambridge: MIT Press.

Thompson, Evan. (2002) "Empathy and Human Experience." Santa Barbara: University of California Santa Barbara.

Todd, Mabel E. (1937) The Thinking Body. New York: Dance Horizons.

Trajets Tour (2002) http://www.trajets.net.

Troika Ranch Company (2000) Troika Ranch Home. http://www.troikaranch.org.

----------------------- (1950) The Mastery of Movement on Stage. London: Macdonald & Evans.

----------------------- (1948) Modern Educational Dance. London: Macdonald & Evans.

Valéry, Paul. (1980) "Philosophy of Dance" by Paul Valéry (1871-1945) in The Dance Anthology. (ed.), Cobbett Steinberg: pp. 337 taken from Aesthetics, "The Conquest of Ubiquity," translated by Ralph Manheim, p.225. Pantheon Books, Bollingen Series, New York, 1964.

Varela, Francisco J., Evan Thompson and Eleanor Rosch. (1991) The Embodied Mind. Cambridge: Massachusetts Institute of Technology.

Varela, Francisco and Jonathan Shear, (ed.), (1999) The View From Within: First-Person Approaches to the Study of Consciousness. Thorverton: Imprint Academic.

Veillat, Aline. (2002) Espace-milieu : espace numérique envisagé comme espace palpable, Unpublished PhD Thesis, Paris: Université Paris VIII.

Vergine, Lea. (2000) Body Art and Performance. The Body as Language. Torino: Skira Editore.

Virilio, Paul. (1996) Cybermonde: la Politique du Pire. Paris: Les Editions Textuel.

Vorkapich, Slavko. (1965) "Film as a Visual Language and as a Form of Art." Film Culture No. 35. pp. 37-40.

Vuitton, Louis. (1993) L'Ecriture de la danse. Paris: Bibliothèque nationale/Opéra de Paris.

Wulff, Robert M. and Shirley J. Fiske, (ed.), (1987) Anthropological Praxis: Translating Knowledge into Action. Boulder: Westview.

Wanderley, Marcelo M. (2000) Trends in Gestural Control of Music. Paris: Ircam. (CD-ROM).

Wees, William C. (1992) Light Moving in Time: Studies in the Visual Aesthetics of Avant-Garde Film. Los Angeles: University of California Press.

Wilson, Robert. A. and Frank C. Keil, (ed.), (1999) The MIT Encyclopedia of the Cognitive Sciences. Cambridge: The MIT Press.

Wertheimer Max. (1938) "Gestalt Theory" In Willis D. Ellis, (trans.) Source Book of Gestalt Psychology, New York: Harcourt, Brace and Co.

Wilson, Stephen. (1993) "The Aesthetics and Practice of Designing Interactive Computer Events," In SIGGRAPH 93 Visual Proceedings Art Show Catalog, ACM.

-------------------- (2002) Information Arts: Intersections of Arts, Science and Technology. Cambridge: MIT Press.

Winkler, Todd. (1998) Composing Interactive Music: Techniques and Ideas Using Max. Cambridge: MIT Press.

------------------ (2000) "Audience Participation and Response in Movement-Sensing Installations." In International Symposium on Electronic Art Proceedings, (ISEA) Paris, France.