Thinking in Four Dimensions

Creativity and Cognition in Contemporary Dance

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Note:


Throughout *Thinking in Four Dimensions* this camera image indicates a web link to video footage

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Introduction

Robin Grove and Shirley McKechnie

In 1999, the Australian Research Council (ARC) funded a project named Unspoken Knowledges, the aim of which was to explore the kinds of creative thought involved in choreography. A strange enterprise, to investigate choreographic thinking, when still, for many theatre-goers, choreography is little more than a fitting of steps to music. But that old view assumes that the steps already exist, so all a choreographer need do is to 'arrange' them. Perhaps that used to be true of classical ballet; it would hardly apply today; and in any case what our project wanted to trace was the emergence of movement that was expressive in new ways, and expressive therefore of new ideas and feelings. The focus, therefore, was on contemporary dance.

Under the auspices of the Victorian College of the Arts, two highly regarded choreographers were commissioned to produce original pieces whose evolution would be documented using digital camera, logbooks, interviews, discussions and workshops. Anna Smith composed *Red Rain*, a 40-minute ensemble piece for seven dancers, while Sue Healey in conjunction with performer Michelle Heaven created a 20-minute solo, *Not Entirely Human*.

But before the pieces were even begun, we as chief investigators—Shirley McKechnie from the School of Dance, Victorian College of the Arts, and Robin Grove from the Department of English, University of Melbourne—had spent many hours explaining the

proposal for Unspoken Knowledges to interested parties around Australia. We spoke with people from across the performing arts and the humanities—indeed, from a range of disciplines and institutions: educators, creators, researchers, and advisers.

The idea was to make it clear what the project hoped to do, and why such investigations mattered. We discovered that both academics and dance practitioners had a lively interest in what was being proposed, and since the SPIRT scheme (Strategic Partnerships between Industry, Research and Technology)—under which ARC funding might be accessed—required industry support, we were fortunate to secure the backing of two peak bodies, the Australian Dance Council (http://www.ausdance.org.au) and the Choreographic Centre, Canberra (http://www.thechoreographiccentre.org.au).

Gaining Clarity

In the course of these discussions over a range of disciplines, our own ideas grew clearer, but we were also increasingly aware that we needed skills beyond those that we brought ourselves. With some hesitation, therefore, we approached the Macarthur Auditory Research Centre (http://marcs.uws.edu.au) at the University of Western Sydney, which already had a high reputation for its work on the production and reception of music: music cognition in composers and audiences, that is. Could they help in our investigation? With a hesitation equal to our own, if not even warier, the answer came back that MARCS might be able to assist, but had to warn us that it was not used to dealing with dance, let alone innovative choreography. Courageously, however, the Deputy Director of the Centre, Dr Catherine (Kate) Stevens, flew to Melbourne, met with McKechnie and Grove, and for the first time in her life saw a male academic in a suit demonstrating steps from classical ballet. No wonder that on her return flight, the heavens opened and lashed the landscape with a violent hailstorm (April 1999). 'It was the sound of worlds colliding!' she said.

The collaboration with MARCS proved of extraordinary benefit to the project. What the cognitive psychologists contributed can only be compared to the wonderfully generous offerings of choreographers and dancers, for if scientific approaches were stretched to accommodate the non-verbal, intuitional procedures of the studio, the latter were challenged by tough questions such as 'Do we know

what the audience actually gets from this episode, and how does that line up with what the choreographer wanted to convey?' Interdisciplinarity is seldom a comfortable double bed.

Recording the Process

With whatever difficulties, however, the research got under way; the choreographers began their work, and the investigators accumulated an unprecedented record of the process. For the first time, an archive could be put together not just of dress rehearsal adjustments, but of the second, twelfth or twentieth shot it might take to embody some particular idea.[1] The digital record shows material being generated, developed, and often discarded or reworked. It provides remarkable evidence of how dance makers may go about the job of summoning into being something that didn't exist before they started …

That raises the question of how a choreographer could know that this unseen thing—this particular deployment of limbs in space and time—was really the movement that was wanted. What kind of knowledge is this that comes in advance of its object? What is this 'knowledge' about? Several times we found ourselves pondering what T.S. Eliot wrote of the writer's labour in bringing to birth a poem:

> He has something germinating in him for which he must find words; but he cannot know what words he wants until he has found the words. … What he starts from is nothing so definite as an emotion, in any ordinary sense; it is still more certainly not an idea. It is an obscure impulse.[2]

An entry in choreographer Anna Smith's journal, 22 July 1999, seems to meditate on similar experience:

> I always feel as though I am over-anxious to know the work; what it is. But it is not alive yet, so how can I possibly expect to know what it is? It has to breathe its own existence, and I have to be patient, to allow it to evolve itself. The work is an organism that creates its own body, so to speak.

Again, Eliot writes of a poem tending 'to realize itself first as a particular rhythm before it reaches expression in words'.[3] The idea

that a poem might start its existence, not in words or ideas, but out of something like a pulse, or a drumbeat, a musical phrase, interestingly 'de-intellectualises' the craft. But to say that is not to denigrate it. The investigation of dance-making showed that non-verbal processes could indeed be forms of thinking, opening imaginative possibilities otherwise unattainable.

After all, from infancy onwards we interpret the world not just intellectually, but through our senses, our physical intelligence. We gather understanding through facial expressions, tones of voice, the things we smell and taste and touch. Through such understandings, we move to imagining a whole world that might be: the region of speculation, possibility, forecasting, memory, and art. And since dance is one of the few arts made out of our own bodies (singing is another), and because it generally employs all the body, not just some specialised parts, it is well placed to act out our sense of ourselves as individuals and as social groupings: as gregarious yet lonely, as skilled yet vulnerable. In short, as that paradoxical phenomenon, embodied minds—which is to say, hungry, reflective, sexual, consciously mortal creatures.

Through art, we become aware of ourselves on these or similar terms, and articulate or shadow forth this awareness. The arts, then, are a way of society communicating with itself, sometimes about matters not fully brought to consciousness—for there are many occasions when we cannot be certain even of what we feel, and since clear-cut answers are impossible, we rely instead on judgements that we must simultaneously trust and hold tentatively. The make-believe world of imagination gives room to entertain possibilities in this way, and so provides irreplaceable experiences of our own nature and its potentialities. That is why as a species we produce so much art.

Cumulative Experience

What did this mean in the dance studio? Well, *Red Rain* began not with steps or demonstrations of what the choreographer wanted, but with a long process of delicate, exploratory interplay as the group was given spoken cues that each dancer had to interpret for herself. A cumulative many-personed dance-making took place. Individual movement-shapes were created and grew more detailed and finely formed as they were edited and revised.

Gradually, with transits from each shape to the next, body-phrases were built up—as if the body were being enabled to utter itself, or to be uttered by a more-than-personal language to which words gave only the flimsiest clue: 'Right elbow behind back, shoulders tilting, left hand reaching … ' In responding to these prompts the dancers all improvised solutions of their own, which were at the same time collaborative achievements.


http://www.mup.unimelb.edu.au/ebooks/0-522-85144-4/videos.html#RedRain

How different from the old assumption that creativity is a sort of royal jelly, capable of being produced only by specialised creatures. On the contrary, when all the participants contributed to what was being made, more art was released, so that week by week everyone involved danced better and discovered richer potentials in themselves. This was possible, though, only because there was time for the shared work to put down tap roots, unfold, and grow. Time, indeed, was the huge benefit brought by the ARC funding.[4] Neither dancers nor choreographers were at the mercy of commercial schedules; rather, discovering how long it might take to think through a choreographic conception was exactly what they were being paid to do.

The artists involved in Unspoken Knowledges, then, were not secondary to the academic enterprise: they were indispensable to it. As research assistants and research associates they creatively embodied the subject of our enquiry, and without them the investigations could not have happened.

New Works

Meanwhile, with *Red Rain* coming into existence, other dance-works also arrived at a stage where they could be performed and/or developed in new directions. Sue Healey's *Not Entirely Human* is discussed in Chapter 3; her *Niche* project is a further example of sustained dance-evolution (see Chapter 5). Anna Smith began to devise a new ensemble piece, *Quiescence*. Chief investigators McKechnie, Stevens and Grove, took video material and papers detailing aspects of the research to conferences in Australia and abroad. All these activities began to attract awards and other national and international recognition. Fuller details appear in Appendix 1: Some Outcomes, p. 202.

Late in 2001, however, the three funded years of 'Unspoken Knowledges: Expanding Industry Productivity and Value through Strategic Research into Choreographic Practice' drew to an end—with the investigators not exhausted by the lengthy title their project had been dragging around, but certainly aware that much still needed to be done. Never expecting a second ARC grant of money, they nonetheless assembled another funding application 'just in case', and were astonished when it succeeded. Clearly, there is something about 13-word project titles.

Conceiving Connections: Increasing Industry Viability through Analysis of Audience Response to Dance Performance set out to consider three questions:

What elements encourage audiences to respond to dance works with insight, pleasure and understanding? How does previous knowledge, experience and education affect audience responses? How can skills of perception, synthesis and imagination be enhanced?

This time, in addition to Ausdance and the Australian Choreographic Centre, we gained the Australia Council for the Arts (http://www.ozco.gov.au) as one of our 'industry partners', and also enjoyed the growing rapport of the VCA and the MARCS regions of the project as they became increasingly acclimatised to one another.

Providing Answers

How were the three stem-questions of the project addressed? Since 2002, by applying cognitive psychology's pre-test, intervention and post-test procedures, Conceiving Connections has been mapping aesthetic, cognitive, emotional and kinaesthetic responses to particular contemporary dance-works. An Audience Response Tool (ART) —in effect, a meticulous questionnaire—has been developed and used at metropolitan and regional performances to gain responses from carefully varied audiences.

At the same time, in conjunction with the Quantum Leap Choreographic Youth Ensemble, Canberra, a nine-month 'dance-enrichment' program is being evaluated by a doctoral candidate, dancer Shona Erskine, with film and live performance being drawn on for a study of audience development. In all, there is much work in progress, and *Thinking in Four Dimensions* is just an interim report on some observations arrived at so far.

This published symposium comes out of a research forum at the Victorian College of the Arts under the aegis of the Melbourne International Festival, October 2003. And because dance-practice has been central to each of the ARC projects, text is subordinate to visuals in the immediately following section (Two Traditions), which is an introductory comparison of classical ballet to contemporary dance. It puts some features of each form under the magnifying glass. Individual chapters in the first half of the project then discuss:

- Dance as a nurturing act of intersubjectivity (1, 'Why do we Dance and Sing?': Stephen Malloch, with further commentary by Agnes Petocz in chapter 2).
- Choreography as intellectual and affective enquiry (3, 'Show Me What You Just Did': Robin Grove, with further reflections by John Sutton).
- The evolution of a suite of dance works (5, Navigating Fine Lines: Sue Healey and dancers).
- Cultural and social patterns in complex entities (6, 'Dancing Memes, Minds and Designs': Shirley McKechnie).

In the second half of this volume, the initial wide-ranging approaches are complemented by an artist's view of contemporary dance-making in Australia: chapter 7 contains an interview with choreographer Chrissie Parrott, and discussion by Michelle Potter, Curator of Dance, National Library of Australia. The effect of information and dance experience on psychological responses to dance is analysed by Renee Glass, APAI scholar at MARCS in chapter 8. 'Growing Choreography' is the title and subject of chapter 9, by Mark Gordon, Director of the Australian Choreographic Centre. In chapter 10, Dance Perception and the Brain, Ivar Hagendoorn considers perceptual structures and evolutionary perspectives, while Catherine (Kate) Stevens' Trans-disciplinary Approaches to Research on Contemporary Dance (chapter 12) surveys current methods and future possibilities in developing theories of choreographic cognition. Throughout the collection, brief Responses to individual chapters extend or challenge material under discussion.

The collection is framed by this Introduction from two of the chief investigators, and a concluding reflection (chapter 14, Unspoken

Dialogues) by dance scholar and researcher into arts management, Hilary Crampton.

This collection of essays is just a start. We hope that *Thinking in Four Dimensions* is already lighting the blue touchpaper of other projects destined to soar higher and scatter more brilliant light on this terrain whose first features we believe we have started, however uncertainly, to discern.

Endnotes

1 For a detailed account of how *Red Rain* was developed, see: Kate Stevens, Stephen Malloch and Shirley McKechnie, 'Moving Mind: The cognitive psychology of contemporary dance', *Brolga: An Australian journal about dance*, 15, June 2001, pp.55–67 and pp.169–187 of this book.

2 T.S. Eliot, 'The Three Voices of Poetry', *On Poetry and Poets*, 1961 (1957), p.98.

3 T.S. Eliot, 'The Music of Poetry', *On Poetry and Poets*, ed. cit., 1961 (1957), p.38.

4 For various readings of the situation facing Australian choreographers in earlier decades, see the articles by Card, Crampton, Grove, Sykes, listed in Bibliography below. Almost any issue of the quarterly, ed. Michelle Potter, *Brolga: An Australian journal about dance*, Dec. 1994—, would also contain relevant material.

Prologue: Two Traditions

Robin Grove

Classical ballet is enjoyed by many people these days, and perhaps still more would like it if they had the chance. But it does often feel like insider-territory. And if that's how ballet seems, contemporary dance can appear even more exclusive. So one aim of our research–projects has been to investigate how appreciation of both kinds of dance might be increased. The following material came out of an experiment in heightening audiences' pleasure and understanding of the two different styles.

We start at ground level, with the foot.

In ballet, as you know, feet are pointed as soon as they leave the floor.

Even when dancers sail through the air and rebound, through big gestures and quick ones you see that stretch and land, stretch and land. Female dancers often rise up on a fully arched foot even before they leave the ground. It's as though they're already hovering in the air, so in the studio they practise this stretch of the foot by sliding it out till the whole instep works.


http://www.mup.unimelb.edu.au/ebooks/0-522-85144-4/videos.html#Battements

The foot brushes through on the flat, then stretches, and finally leaves the floor because it's got as far as it can without losing contact. But insteps are worked like this, not just to show off your beautiful arches, or help you jump higher. What we see is the foot longing to be released from the floor, but constantly drawn to it. In other words, these arched feet reveal the tug of gravity, the law that governs all our movements, even when they seem most free.

Gravity, moulding the foot as it begins to flex, and the arm as it starts to curve, is like a constant reminder of what rules our lives—the power of the state, perhaps, or the King. It may be invisible, but it determines all you do. We'll return to this in a moment.

Meanwhile, the foot in contemporary dance has different opportunities.


http://www.mup.unimelb.edu.au/ebooks/0-522-85144-4/videos.html#ModernFeet

Sometimes soft and limp, relaxed or heavy, elsewhere aggressive, kicking, wriggling: modern feet can be wildly individualistic. No single power, not even gravity, seems to determine how they must behave. And as with the foot, so with the whole body.


http://www.mup.unimelb.edu.au/ebooks/0-522-85144-4/videos.html#Classical

In ballet, movement radiates from a single centre of control (in the lower back and solar plexus). The arms symmetrically enclose the head, the legs unfold from the column of the spine, limbs counterpoint each other. It is like a little solar system, where the planets in their different orbits all go round the sun. Contemporary dancers, by contrast, often activate several control-points at once.


http://www.mup.unimelb.edu.au/ebooks/0-522-85144-4/videos.html#Shimmy

A shoulder revolves in its socket independently of the rest of the body, or waves of movement seize the spine and torso in almost frightening spasms.

In other words, contemporary dance is much more likely to express diversity, non-conformity, even conflict, than classical ballet

with its ideals of harmony, beauty, proportion. I'm not talking about themes or stories; it is a matter of what is built into the structure itself.

All forms of dance tell us about the societies that produce them. Is it any wonder that *Swan Lake*, choreographed under the tyrannical regime of the Czars, is full of images of entrapment? Even the famous dance of the little swans has pathos as well as comedy in its criss-cross, locked-together patterns. The four dancers repeat their steps in unison, and then repeat again. Not till the last second of their dance can they free their arms and momentarily try to be airborne, before sinking on their knees.


http://www.mup.unimelb.edu.au/ebooks/0-522-85144-4/videos.html#LittleSwans

I wouldn't call it a happy dance. But then, even at its most beautiful, classical ballet obeys a regime—a power—that reminds us it evolved in the courts of the French monarchy, where the king's presence, though sometimes invisible, was always absolute. That is why the very arch of the foot can signify gravity, that universal tension which is forever drawing us to the centre. Under the surveillance of the Sun King (Louis XIV) at Versailles, you never escaped. At the same time, you always had to act like an aristocrat, no matter how much it hurt. Which is why another feature of the classical style is its turn-out of legs and feet. Starting in the pelvis, the legs rotate, to present themselves in profile—which shows off the double curves of the leg, but also suggests that the dancer has nothing to hide; he or she is exhibiting the body in as open a way as possible. The neck and shoulders are kept free, the hands are uncluttered; everything is as visible as it can be, like the ideal courtier who has no secrets from his master.

By contrast, contemporary dance more often works with inner impulses.


http://www.mup.unimelb.edu.au/ebooks/0-522-85144-4/videos.html#SweepingBeans

This movement, travelling along the hidden pathways of nerves and veins, is closer to the visceral imagination of our post-Freudian

world of the instinctive, the subconscious, or pre-conscious. Unlike ballet, it seeks the ground;


http://www.mup.unimelb.edu.au/ebooks/0-522-85144-4/videos.html#Equilibre

it may be angry, aggressive, and doesn't mind looking strange, even grotesque.

You can fling yourself around even, especially if you are a woman—for the founders of modern dance were mostly women (Isadora Duncan, Mary Wigman, Martha Graham). They were not concerned with prettiness; they had more significant things to show. So it was appropriate that one dance-work created in the first phase of our project was an all-woman meditation on grief, loss, protest, vulnerability, and renewal.

Red Rain, by Anna Smith, was composed for seven dancers and lasted three-quarters of an hour. Liquid washings were its opening sounds. As the stage glimmered into light, crimson air fluttered through columns of paper, like the spine of a book—many books—with stories somewhere inside. The gestures of one dancer poised agonisingly above another nestled at her feet resembled a silent scream. Later, bodies would be outlined for a moment, as if washed up from the ocean, only to be effaced again. Cries and percussive outbursts sounded through the music (*The Ghost Opera*, by Tan Dun), but gradually the work composed itself into a threnody with moments of great dignity and calm.


http://www.mup.unimelb.edu.au/ebooks/0-522-85144-4/videos.html#Meredith

As if embarked on a ship composed of gentle breathings, Meredith Blackburn bestowed a kind of blessing on the waters that carried her enigmatically away. All the dancers bore her up, and she belonged to them all. At other moments, figures glided through the curtain of paper bones as if passing from one world into another.


http://www.mup.unimelb.edu.au/ebooks/0-522-85144-4/videos.html#PartingCurtains

And the work ends with a torrent, then a diminuendo of pouring

noise, a deluge gathering itself in, after having fertilised the earth.

In work such as *Red Rain*, the old star system has disappeared. There is no hierarchy of ballerina, soloists, etc. Instead, as we might hope in a democracy, everyone contributes to the production of meaning. And these two styles of dance—the 'aristocratic', as we might call ballet, and the 'democratic'—are built around very different relations to the ground and to the space surrounding the dance. They have separate creative aims. Ballet wants to exhibit the body in vivid outline, opening itself inside a sphere of harmonious movement. Contemporary dance, by contrast, is more concerned with the interior life of self and body. It doesn't seek those beautiful neat conclusions to every phrase, where the feet keep landing in fifth position. The world has become more open-ended, much less afraid of expressing its pain and anger and ecstasy.

These are just a handful of things about dance-practice, which we can see as a symbolic language. To understand contemporary dance and classical ballet in this fashion—as cultural indices—helps us to go back to them with a deeper appreciation of what each does, and also what it does not do.

1

Why Do We Like to Dance and Sing?

Stephen Malloch

Introduction

Wherever humans are, there is dance, music-making and music-listening: in the concert halls, jazz clubs and dance venues of the West, in pieces from Japanese Gagaku, in African dance and drumming, in songs and games with infants, and in children chanting songs and moving rhythmically together as they play. We recognise and sympathise with these humanly organised gestures in sounds and movement–gestures organised simply or with much culture-specific complexity. These gestures 'speak' to us, and move us; dance and music are communicative in ways that are often far more direct than words.

Bjørkvold calls our sympathy for artfully organised gesture our *muse-icality*. 'To lose our muse-icality,' he writes, 'would be to lose a profoundly essential part of our humanity'.[1] John Blacking, one of the most influential ethnomusicologists of the 20th century, believed that the value of music-making and listening (and, by extension, dancing, which so often accompanies music-making) lies in its ability to act as a vehicle for the expression and communication of both individual and social experience. 'The function of music is to enhance in some way the quality of individual experience and human relationships; its structures are reflections of patterns of human relations, and the

value of a piece of music is inseparable from its value as an expression of human experience.'[2] Ellen Dissanayake argues that the origin of the temporal arts—music, dance, mime—is to be found in early mother–infant interactions.[3] This chapter explores some of the evidence for dance and music being integral to being human.

Timing

Dance, music, indeed everything that we do, occurs through time, the fourth dimension through which we move. Our ability to appreciate and create dance and music is inextricably bound to our ability to appreciate their unfolding narratives of gestures. To do this we need a sense of time. Coherent 'mind-time' is a largely neglected area in the discipline of psychology. Addressing this lack of investigation, Wittman and Pöppel [4] postulate 'a general temporal principle of interpersonal communication'. They argue from psychophysical evidence that human time, in both perception and behaviour, rests broadly on two frequency levels:

1. A high-level frequency of around 30 milliseconds, which is the minimum time interval necessary for humans to perceive two events as separate.
2. A low-level frequency of around 3 seconds, which is responsible for human perceptual integration of events into 3-second units of the 'psychological present'.

We experience the world through a common sense of passing time, and human communication, be it linguistic or gestural, takes place within this common mind-time. The expressive and the perceptual side [of human communication] are both embedded in a temporal framework in which the contents are transmitted. Communication, therefore, can be characterised as an interplay of temporal information segments exchanged between two persons (or a group of people). These information segments are constrained by the temporal integration mechanisms of the brain. (Wittman & Pöppel, op. cit.)

Trevarthen[5] also addresses the question of mind–time. He proposes that an integrated body-imaging core system (which he calls the Intrinsic Motive Formation) forms among the cells proliferating in the brain of a human embryo, and, once formed, persists throughout

life. As co-ordinator and regulator of human movement, the Intrinsic Motive Formation contains a system of generators of neural and body-moving time that he calls the Intrinsic Motive Pulse—or IMP. Trevarthen suggests that our whole being—thought, emotion and movement—is bound up with a system of pulse-generators, and these pulse-generators will be the common ground for our generation and appreciation of the gestures of voice, sound and body in dance and music.

Infancy Research

Gestures of voice and body (including touch) are the basis for adult–infant communication; communication takes place through the prosody of the infant-directed speech, the infant's participation in this (Trehub, Trainor & Unyk, 1993 [6]; Malloch, 1999/2000 [7]), and the facial and gestural movements of both parent and infant (Fogel & Thelen, 1987 [8]; Weinberg & Tronick, 1994 [9]). Evidence for the intrinsic and multimodal nature of our temporal framework and pulse generators is seen in various studies of infants, for example Malloch, 1999/2000 (op. cit.). In recent research on infant babbling, two groups of babies with normal hearing were studied at 6, 10 and 12 months. One group was exposed to the usual environment of spoken language, and one group, born to profoundly deaf parents, was not systematically exposed to spoken language but saw signed language. [10] Across infant ages, they found that the rhythm of the predominant hand gestures of the hearing speech-exposed babies had a frequency of 2.5 Hz, whereas hearing sign-exposed babies had two distinct rhythms for the hand gestures—a fast one (2.5Hz—the same as that for the first infant group), and a slow one, 1 Hz. Remarkably, the latter was carried out predominantly within a restricted space in front of the body typically used for signing—the infants were learning sign language and were 'babbling' with their hands just as infants will vocally babble. Infants appear to be sensitive to the gestures of communication no matter the modality, and they seek out, mimic and create gestures of communication using voice and body. The authors conclude that 'all babies are born with a sensitivity to specific rhythmic patterns at the heart of human language, and the capacity to use them.'

We are very good at recognizing the timing in others' gestures of speech and body. Conversational analysis (Jaffe & Felstein, 1970 [11];

Siegman & Felstein, 1979, 1987 [12]), in which films or video recordings of adults in spontaneous engagement are measured moment-by-moment, has shown that humans interact with one another at unconscious speed and accuracy as we synchronise our own vocal and bodily gestures as well as synchronise with those of others in subtle rhythms of exchange (also see the work of David McNeil, e.g., McNeil, 1992). [13]

This ability to perceive and remember the gestures of another starts very early. Infants are capable of learning the sound of their mother's voice from before birth, and can recognise melodies and poetic verses that were presented to them pre-natally (DeCasper & Fifer, 1980 [14]; Fifer & Moon, 1995 [15]; Hepper, 1995 [16]; Lecanuet, 1996 [17]). And infants, at between two to five days old, can discriminate languages not spoken in their home on the basis of rhythm alone. [18]

Infants can assess the quality and appropriateness of the timing of human gestures. They are born with the expectation that a caregiver will behave in a communicative fashion, and in happy, healthy interactions between young infants and adults these interactions are based upon contingency.[19] If a mother and infant are happily interacting, and the mother is distracted, say by another adult walking into the room, then the infant is quite capable of waiting till the mother's attention returns without becoming upset[20]. However, asking the mother to use a 'still face' and to remain silent while looking at her infant will make the infant distressed—the infant looks away from the mother, and subsequently withdraws (Murray & Trevarthen, 1985; Weinberg & Tronick, 1994). The infant has an expectation of how the mother will communicate. Further, if the infant is presented with the mother on a television screen, who then reacts with her infant in real time, the infant responds happily. However, if the infant is presented with a video of the mother recorded from a *previous* happy interaction, the infant becomes distressed and then withdrawn while watching this animated, but completely unresponsive 'mother' (Murray & Trevarthen, 1985; Nadel, Carchon, Kervella, Marcelli, & Reserbat-Plantey, 1999).[21] Thus, even if the infant receives animated vocalisations and body gestures from the mother, these are found highly distressing unless they are contingent on the infant's own vocalisations and body movements (and infants can probably assess gestures of other infants in a similar manner).[22]

'Real life' examples of non-contingent maternal gestures of voice and body towards an infant can be observed in mothers suffering from post-natal depression (PND). Infants of depressed mothers often become avoidant or distressed.[23] If the mothers' PND continues, protesting behaviour may become integral to the infant's communicative repertoire. It has also been suggested that a mother's PND affects an infant's brain development.[24] However, the healthy parent can also play with contingency. In teasing, the infant's expectation of a certain type of interactive timing can be manipulated within certain bounds with the result that great fun is had by both parties.[25]

Narratives of Gestures

From the above discussion, it appears that an infant has a great drive to be an active participant in the use of communicative gestures, and the healthy parent supports this communicative drive. The Papouseks, who have done much to reveal the nature of innate human musical skills, describe the mother's specially attentive behaviour as 'intuitive parenting'.[26] They conclude that it is the essential external regulator of the child's cognitive development, as well as being the emotional regulator of inner states of arousal and physiological maintenance. We have seen that the infant's communicative expectations include sensitive assessment of whether the gestures that the infant sees and hears in the other 'fits' in time and quality with the infant's own behaviour, and this 'fit' is vital for the infant's wellbeing. Dance and music therapy use this intrinsic human capacity, explicitly playing with many sequenced gestures of voice and body, without the need for words, to form mutually created links between therapist and client, so that both can share companionable narratives of feelings and thoughts through time.[27]

The shape of contingent interactions can be captured through tracking the pitch curves of a mother's speech as well as the movements of both mother and infant**.**

The top panel of Figure 1 shows a two-minute-long extract of the pitch of a mother's voice as she chats to her 13-week-old infant. Below the pitch graph are two-dimensional plots of the infant's and mother's body movements as recorded from a camera side-on to the interaction—the infant's right hand (plotted in the y dimension), the

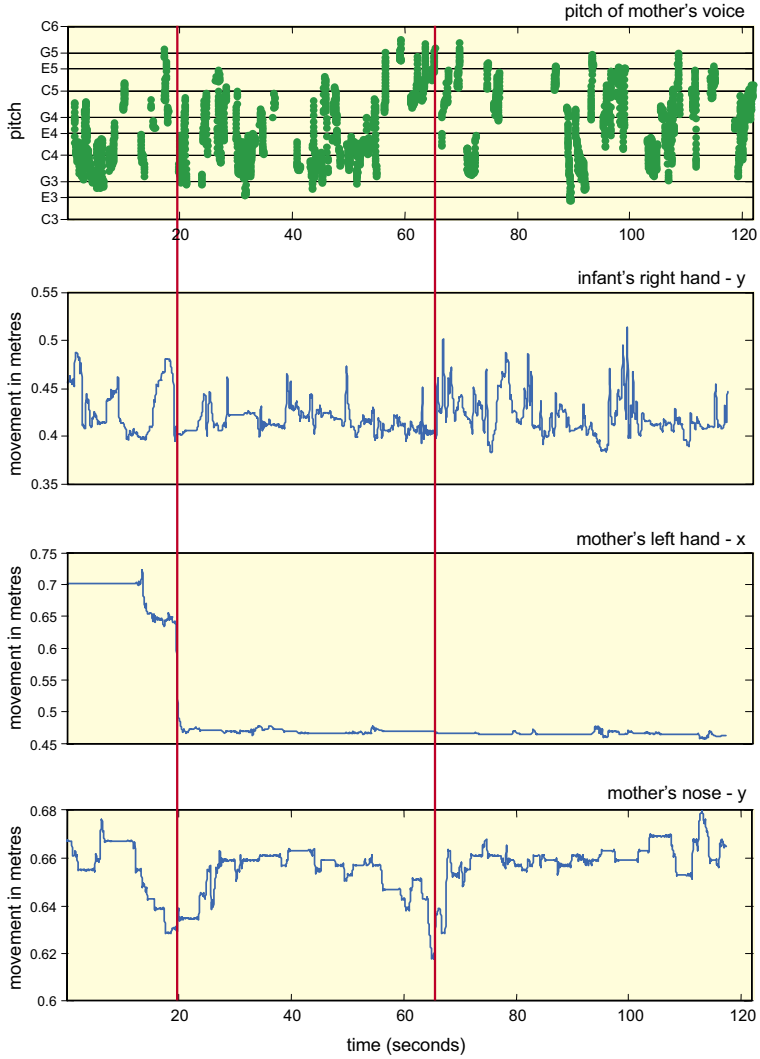


Figure 1. *Pitch and movement graphs of 120 seconds of healthy mother-infant interaction.*

mother's left hand (plotted in the x dimension), and the mother's head movements as measured from the tip of her nose (plotted in the y dimension). These graphs suggest that the gestures of voice and body of both mother and infant mutually support one another. Two large drops in pitch in the mother's voice (as shown by two vertical lines) coincide with larger or busier movements of the infant's right hand, a movement towards the infant by the mother's left hand, and, by the mother's face, a cycle of moving towards and away from the infant.

This narrative of gestures carries emotional meaning for both participants, meaning carried by what Daniel Stern calls 'vitality contours' which make up 'affect attunement'. Affect attunement is 'the performance of behaviours that express the quality of feeling of a shared affect state, but without imitating the exact behavioural expression of the inner state'.[28] Affect attunement is a multi-modal phenomenon, where the affect of a vocal and/or bodily gesture is attuned to by another, and expressed in a different form from the original. According to Stern, this largely unconscious 'recasting' of events is necessary to 'shift the focus of attention to the … quality of feeling that is being shared.' For example, an infant excitedly vocalises an upward then downward pitch movement, and the mother smiles and moves her head with the vocalisation so that the tip of her nose describes an inverted U. Stern would say that the vocalisation and the mother's expression and head movement share the same vitality contour, composed of the amodal qualities of intensity and

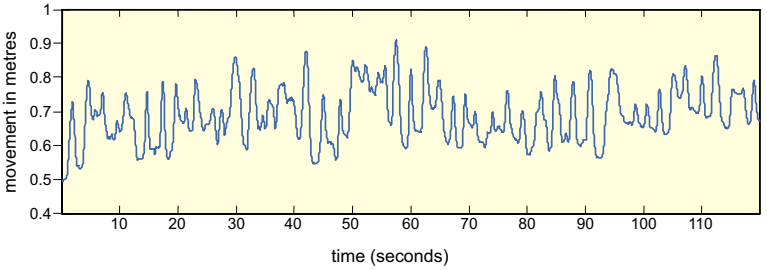


Figure 2. *Graph of depressed mother as she moves towards and away from her infant (plotted in x dimension).*

timing. Vitality contours are the mechanisms by which affect attunement takes place.

In comparison with figure 1, figure 2 shows the movement of a different mother's head back and forth as she chats with her 15-week-old infant for two minutes. This is the movement of a mother who is severely disturbed with post-natal depression. The first mother seems to show a movement narrative with her approach and withdrawal from her infant. The second mother seems to be stuck in the repetition of a stereotypical back and forth movement. The 'musicality' of the movement has been lost, and the infant protests throughout this interaction.

Communicative Musicality

Malloch (Malloch, 1999/2000 op.cit.; Trevarthen & Malloch, 2000 op. cit.; & Malloch, 2002) [29] building on the research reported above, use the term 'communicative musicality' to describe the contingent sharing of space and time that occurs between healthy adult and infant. Communicative musicality is the ability to engage and sympathise with the humanly shaped passage of time, and consists of those attributes of human communicative behaviour (as expressed through gestures of voice and body) that underlie co-ordinated companionship. It is the communication that takes place through the intentions (underlying impulses for actions) and affect carried by the 'music-like' qualities of a care-giver's and infant's joint vocalisations in combination with the joint 'dance-like' gestures of their bodies and facial movements.

This music-like behaviour is not music *per se*, but the expression through time of an innate impulse to communicate feelings and intentions. It has been suggested that communicative musicality is a fundamental human skill at the source of dance and music (Trevarthen & Malloch, 2000 op. cit.; Stevens, Malloch, McKechnie, 2001).[30] Communicative musicality consists of three attributes—pulse, quality and narrative. 'Pulse' is the regular succession of discrete behavioural events that enables us to anticipate when something will occur between another and ourselves. Because humans share a brain-based sense of organised time, in both perception and motor behaviour, the sharing of a sense of pulse comes easily to us. The 'quality' of an interaction consists of the contours of the gestures, as expressed by

changes in the pitch and timbre of the voice, and in the shape and velocity of the bodily movements. The combination of pulse and quality go together to create 'narratives' of expression, they embed an emotional feeling in the gesture, and narrative structures enable us to anticipate what will happen next. The perception and production of pulse and quality, and their fusion into narratives of expression, appear not only to be vital in early infant-adult communication, but also to lie at the heart of our ability to engage and sympathise with others at any age. Communicative musicality is an embodied expression of the combination of motor pulse and emotional quality.

Teacherese

This combination of motor pulse and emotional quality can be seen in another field of human activity where, as in caring for an infant, one person guides another. This is the field of teaching and learning. Research on classroom conversation by Fred Erickson suggests that a shared dialogic pulse facilitates effective engagement between a teacher and a class, and that children can make use of this pulse to gain the teacher's attention. Just as caregiver and infant are seen as mutually influencing each other, so teacher and student are seen as mutually influencing each other—the teacher perceived as a person in relationship, both student and teacher actively engaging with each other (Moll, 1990 [31]; Rogoff, 1990 [32]).

Erickson's work is influenced by the neo-Vygotskian approach, which sees all cognition as socially situated in interactions (see Vygotsky, 1978 [33]; Wertsch, 1985 [34]). His interest is not so much in the linguistic content of the exchanges, but in the dynamics of the classroom discussions, in particular in analysis of the timing of interactions.[35] As Erickson says: 'timing appears to be what holds the whole ecology of interaction together in its performance'.

To demonstrate this, Erickson presents exchanges between a teacher and class represented as music notation. Through this method, Erickson shows that a regular metrical pulse occurs as teacher and students take both sequential and overlapping turns in question and answer and comments. He says that there is a particular moment at which an answer to a question is expected to be given, and children can 'steal' answer-turns from each other, or fill a space

left by another's non-answer. He finds that information-salient words (for example, the S, in 'this letter is an S') fall on the beat, the children's attention directed to this moment of important information.

This way of characterising the nature of classroom interaction suggests that an effective learning environment will clearly display these attributes, while a less effective environment will show the lack of these attributes (just as healthy mother-infant interaction shows narrative form, but depressed mother-infant interaction lacks this.[36] Malloch, Scott and Črnčec had university education lecturers rate videos of classroom interactions along a scale of student engagement. They found that low ratings of pupil engagement were significantly associated with duration of teacher pauses, number of student/student interruptions, number and duration of student/teacher overlapping turns, and number and duration of instances of student background chatter.[37] Low ratings were thus associated with characteristics of the learning environment that suggest poor timing organization—a breakdown in the sorts of behaviour that Erickson describes as vital in the 'ecology of interaction.'

The Humanity of Music

It is argued here that our capacity to create and appreciate dance and music is based in our drive to reach out to others in contingent interaction through time; we wish to participate in the gestures of co-ordinated companionship and to sympathise with the vitality contours embedded within the gestures of that companionship. This being the case, it would be expected that there would be explicit recognition of the human communicative gestural nature inherent in the temporal arts. Certainly anecdotally this appears to be true—we talk about melodies or dance gestures as being lively, warm, rushing, proud, tranquil: all attributes that are readily applied to the gestures that people make. One of the few studies to investigate this explores the possibility that the vocabulary of musical expression concerns psychological aspects of people.[38] Participants were played 24 music extracts (all without human voice), and as a sensory comparison asked to taste a number of different foods. In response to the music and the food, they were asked to choose words from pairs of words that fell into four categories:

1. People traits, for example, male/female, young/old, good/evil.
2. People states, for example, gentle/violent, joyful/sad.
3. Movement, for example, stable/unstable, leaden/weightless.
4. Adjectives rarely applied to people, for example, bright/dull, prickly/smooth, sweet/sour.

The person-categories male/female, good/evil, angry/pleased and gentle/violent showed significantly higher levels of information content (i.e., greater deviation from chance) in responses to the music stimuli than to the food stimuli. In discussing these results, the authors conclude that it appears that 'music is perceived as if it were a person' disclosing some information about him/herself. They go on to say that 'music might be said to have a personality … . In that same sense, the action of a piece of music on any individual will depend on their personality.' Their conclusions support the view that music is derived from those same gestures that we use and sympathise with in our communication with others. We might say that dance and music are, actually or potentially, acts of intersubjectivity. They communicate with us because we move in musical ways with gestures linked into narratives of expression. We are born like this.

The Brain and Evolution

To conclude, we will look very briefly at some writings on the brain and evolution that throw light on possible mechanisms that underlie our musical dancing natures.

Recent neurophysiological findings suggest a mechanism that allows us to 'read' the movements of another. In both monkeys and humans, neurones have been identified that fire according to particular meaningful actions of the hands and mouth, rather than with the individual movements that form them. The neurones are categorised on the basis of the specific action that causes them to fire. This action can be as specific as grasping with the index finger and thumb. Di Pellegrino, Fadiga, Fogassi, Gallese and Rizzolatti [39]have shown that a class of these same neurones, which they called 'mirror neurones', fire when the same action is observed being performed by another—the mirror system re-presents in an observer the actions of the other. And as might be expected, an increase in motor-evoked potentials has been measured in the muscles of subjects observing an

action (Fadiga, Fogassi, Pavesi, & Rizzolatti, 1995), but an actual movement in the observer is inhibited.[40]

The above research concerns visually observed actions, but the principles of 'mirroring', or sympathetic motor response, are amodal—they will probably apply equally to any other activity of an organ of sense by which the vitality contour or 'sentic form'[41] of a movement may be apprehended. Indeed, it has been shown that in the monkey audiovisual mirror neurones will code actions independently of whether these actions are performed, heard, or seen.[42] It is probable that our mirror neurone system lies behind our affect attunement and empathetic responses [43], and may be an important part of our appreciation of dance (Stevens *et al.*, 2001; op.cit.). It is also supposed that the mirror system was the evolutionary basis for language, suggesting that gesture was the precursor to symbolic communication (Rizzoloatti & Arbib, 1998 [44]; Tomasello & Camaioni, 1997 [45]).

This ability to mimic**,** to 'join in' and sympathise with another's gestures, is also supported by the existence of an internal body schema. In the neuropsychological literature, a specific body schema device has been invoked to explain a variety of spatial disorders after brain damage, and Reed and Farah [46] propose that this schema, from evidence from those without brain damage, is supramodal, applying to visual and 'proprioceptive' inputs, being used both for encoding the body-position of the self and the body-position of the other. This hypothesis supports the role suggested for mirror neurones.

Turning to the evolutionary literature, Jaak Panskepp believes that the intrinsic emotional sounds we make may be the basis for music, in addition to 'the rhythmic movements of our instinctual/emotional motor apparatus, that were evolutionarily designed to index whether certain states of being were likely to promote or hinder our well-being'. [47] These instinctual emotional sounds and movements underpin Merlin Donald's notion of mimesis—the ability to act, dance and sing a narrative of experiences and emotions by moving the body with expressive rhythm, depicting absent or imaginary events.[48] Donald hypothesises that this would be a necessary first stage in the evolution of the human mind that would prepare the way for language and symbolic thought. He suggests that mimesis would need to come from an ability for voluntary recall of memory, and for reviewing and refining one's own actions. Thus,

according to Donald, our evolutionary ancestors began to 'mime' situations on the principle of perceptual resemblance (e.g., a hunt). Mimesis is essentially metaphoric, and Donald imagines that with mimesis came the ability for humans to understand each other's acting as a dramatic message—an ability essential for the existence of dance and music.

An evolutionary suggestion for the origin of our ability to act rhythmically together—something that musicians and dancers do all the time—is supplied by Bjorn Merker, who suggests that male synchronised chorusing activity (chorusing and possibly moving together around a regular beat), occurring in an evolutionary ancestor common to chimpanzees and humans, may have been used to enable the sound of the group's vocalisations to travel further (due to sound amplitude summation) in order to advertise the presence of food, and to attract wandering females.[49] This behaviour would increase mating opportunities, but discourage other males as the synchronised chorusing would suggest a large organised group. The attraction of females would have made this ability sexually selected. Merker's evolutionary theory for dance and music stands as a male balance to Ellen Dissanayake's suggestion that dance and music come out of mother-infant interaction (op. cit.).

Conclusion

Humans, of all ages, not just infants, need to have their impulses of sympathy attuned to by others. This is the basis of companionship. Humans need to share experiences and skills in order to make sense of them. They need to feel pride in accomplishment, and to experience the admiration of affectionate, generous companions.[50] Dance and music are particular cultural substantiations of this need to share sympathetically with others. To share, we use gestures of voice and body, as well as language. The vital non-linguistic gestures, created within our common mind-time, allow us to share time together in emotionally meaningful ways without the complexity of words. We instinctually sympathise with these gestures.

Given that we are born needing to reach out and communicate with others, it is no wonder that this gestural impulse should lead to the creation of great art, as well as simple ways of sharing our innermost thoughts and feelings. We will continue to reach out to each

other through dance and music—to do otherwise would not be human.

Endnotes

1 Bjørkvold, *The Muse Within* … , 1992, p.xiii.

2 Blacking, *Music, Culture and Experience* … , 1969.

3 Dissanayake, 'Art and Intimacy: How the Arts Began', 2000.

4 Wittman and Pöppel, 'Temporal Mechanisms of the Brain as Fundamentals of Communication … ', 1999/2000.

5 Trevarthen, 'Musicality and the Intrinsic Motive Pulse … ', 1999/2000.

6 Trehub, Trainor and Unyk, 'Music and Speech Processing in the First Year of Life', 1993.

7 Malloch, 'Mothers and Infants and Communicative Musicality', 1999/2000.

8 Fogel and Thelen, 'Development of Early Expressive Action from a Dynamic Systems Approach', 1987.

9 Weinberg and Tronick, 'Beyond the Face … , 1994.

10 Petitto, Holowka, Sergio, Levy, Ostry, 'Baby Hands that Move to the Rhythm of Language … , 2004.

11 Jaffe and Felstein, 'Rhythms of Dialogue', 1970.

12 Siegman and Felstein, *Of Speech and Time*, 1979.

13 McNeill, *Hand and Mind: What Gestures Reveal about Thought*, 1992.

14 DeCasper and. Fifer, 'Of Human Bonding … ', 1980.

15 Fifer and Moon, 'The Effects of Fetal Experience with Sound', 1995.

16 Hepper, 'The Behaviour of the Fetus as an Indicator of Neural Functioning', 1995.

17 Lecanuet, 'Prenatal Auditory Experience', 1996.

18 Nazzi and Ramus, 'Perception and Acquisition of Linguistic Rhythm by Infants', 2003.

19 Trevarthen, 'The Concept and Foundations of Infant Intersubjectivity', 1998.

20 Murray and Trevarthen, 'Emotional Regulation of Interactions between Two-month-olds and their Mothers', 1985.

21 Nadel, Carchon, Kervella, Marcelli, Reserbat-Plantey, 'Expectancies for Social Contingency in Two-month-olds', 1999.

22 Selby and Bradley, 'Infants in Groups … ', 2003.

23 Murray and Cooper, 'The impact of Psychological Treatment of Postpartum Depression on Maternal Mood and Infant Development', 1997.

24 Schore**,** *Affect Regulation and the Origin of the Self* … , 1994.

25 Nakano, 'Incidents make Communication … , 1996.

[26] Papousek, 'Musicality in Infancy Research … '; 'Intuitive Parenting … ', 1996.

[27] Trevarthen and Malloch, 'The Dance of Wellbeing … ', 2000.

[28] Stern, Hofer, Haft, Dore, 'Affect Attunement … ', 1985.

[29] Malloch, 'Musicality: The art of human gesture', 1999/2000.

[30] Stevens, Malloch, McKechnie, 'Moving Mind: The cognitive psychology of contemporary dance', 2001.

[31] Moll, *Vygotsky and education …* , 1990.

[32] Rogoff, *Apprenticeship in Thinking*, 1990.

[33] Vygotsky, *Mind in Society: The development of higher psychological processes*, 1978

[34] Wertsch, *Culture, Communication and Cognition: Vygotskian perspectives, 1985*

[35] Erickson, 'Going for the Zone … ', 1996.

[36] Robb, 'Emotional Musicality in Mother-infant Vocal Affect, and an Acoustic Study of Postnatal Depression', 1999/2000.

[37] Malloch, Scott, Črnčec 'The Importance of Timing in Teacher-talk …'.

[38] Watt and Ash, 'A Psychological Investigation of Meaning in Music', 1998.

[39] Di Pellegrino, Fadiga, Fogassi, Gallese, Rizzolatti, 'Understanding Motor Events: A neurophysiological study', 1992.

[40] Fadiga, Fogassi, Pavesi, Rizzolatti, 'Motor Facilitation During Action Observation … , 1995.

[41] Clynes, 'The Communication of Emotion … , 1980.

[42] Kohler, Keysers, Umiltà , Fogassi, Gallese, Rizzolatti, *Science*, 1970.

[43] Wolf, Gales, Shane, and Shane, 'The Developmental Trajectory from Amodal Perception to Empathy and Communication … , 2001.

[44] Rizzolatti and Arbib, 'Language within our Grasp', 1998.

[45] Tomasello and Camaioni, 'A Comparison of the Gestural Communication of Apes and Human Infants', 1997.

[46] Reed and Farah, 'The Psychological Reality of the Body Schema … , 1995.

[47] Panksepp and Bernatzky, 'Emotional Sounds and the Brain … 2002.

[48] Donald, *Origins of the Modern Mind …* ,1991.

[49] Merker, 'Synchronous Chorusing and the Origins of Music', 1999/2000.

[50] Trevarthen and Malloch, 'Musicality and Music Before Three … , 2002.

2

Light and Shade in Communicative Musicality: A commentary on Stephen Malloch's 'Why do we like to dance and sing?'

Agnes Petocz

Challenge to Insularity

Stephen Malloch poses the question: why do we like to dance and sing?, and replies that we are human and are born that way. In one sense, this answer represents a significant contribution. In another, it merely raises a more fundamental question. Either way, it is a challenge to the insularity and complacency of much of contemporary mainstream psychology. In my commentary, I would like to sketch briefly the lines I would follow to support these claims, while also offering, in the spirit of the present book, some tentative suggestions for further exploration.

To begin with, we do well to bear in mind that in psychology—as in science generally—yesterday's fantasy can become today's discovery, and tomorrow's given. Yesterday, Trevarthen's observations on mother–infant interactions were dismissed as unscientific speculation, and the concept of 'mirror neurones' was met with similar scepticism. Today, the material which Malloch discusses is considered to be at the 'cutting edge'. Tomorrow, it may cause not even a ripple. So there are surprises here for anyone who believes that dancing and

singing, as learned or socially constructed cultural accretions, have little or nothing to do with the innate equipment and behaviour of the infant.

New Revolutions

More significantly, this field of work manages to steer a course between the two perils that I have elsewhere described as the Scylla of mainstream scientism and the Charybdis of postmodernist anti-science.[1] After nearly a century of 'scientistic' self-misunderstanding (to borrow a phrase from Habermas)—that is, mind-less behaviourism followed by emotion-less 'cognitivism', and then disembodied neuroscience—which has left the disenchanted with nowhere to go but straight into the intellectual whirlpool of relativist and irrationalist postmodernist metatheory—sanity is finally returning in the form of a set of so-called 'new revolutions' that are currently sweeping through psychology and the social sciences.

In many respects, these movements are simply rediscovering and extending the traditions of the two great contributors to 20th-century psychology, Freud and Piaget, who took Darwin seriously in a discipline which tried hard to proceed, in Damasio's words, 'as if Darwin never existed'.[2] They developed synthetic, holistic, cross-disciplinary systems, in which the mind's embodiment was rescued from its radically dualistic Cartesian formulation, and rooted firmly in the naturalistic conception of Aristotelean science.

The work of Malloch and others on early infant intersubjectivity and communicative musicality fits comfortably into these new movements, sharing their integrative features, and is thereby enabled to trace connections and open up avenues which have long been obscured.

Breaking Images

As a result, in offering an account of the source and origin of various interrelated aspects of our nature as humans, this work also succeeds in effecting a long-overdue conceptual iconoclasm, by undermining a number of entrenched dichotomies: nature/nurture, mind/body, cognition/emotion, universal/particular, etc. Let me give just three examples.

First, much of the research which Malloch discusses serves as a methodological model for mainstream psychology, in so far as it

undermines paradigmatic versions of the qualitative/quantitative dichotomy by combining both approaches—not from an ideologically driven apriorism, but as a matter empirically determined by sensitive attunement of method to the particular combination of research question and relevant aspects of the subject-matter. That is to say, it refuses to be duped by the credo which has enslaved armies of 'scientific' psychologists, that 'an approach which stresses *meaning* is the exact opposite of the natural science approach which stresses the study of *behaviour*'.[3]

Second, in epistemology an updated version of Piagetian commonsense is brought to the old debate between rationalism and empiricism. Mind is neither passive receptacle, awaiting impressions on the tabula rasa that Leibniz incorrectly attributed to Locke, nor is it constructive shaper of an amorphous, unstructured reality, as in Kantian objective idealism. Instead, the embodied mind/brain, located between S-R behaviourism and phenomenological constructivism, anticipates, elicits, reflects and shapes..

Third, in aesthetics our notions of the attractiveness of the gestalt qualities (wholeness, completeness, harmony, etc.), which underpin the various 'formalist' theories of aesthetics, no longer need to compete with the 'content' or 'symbolic' approaches, according to which the subject matter of art is human emotion. Stern's theory of 'affect attunement' accords with Ehrenzweig [4] and Gombrich's [5] suggestion that the pleasure derived from metaphors and symbols comes not from the way in which they establish new linkages, but from the way in which they indicate linkages never broken, reminding us of what are simply 'very wide pigeon-holes' (Gombrich, op. cit., p. 44).

This is supported by the work on conceptual metaphor by Johnston and Lakoff [6] and Hopkins [7], and by recent discussion of synaesthesia and its relation to perception, thought and language [8]. Also, Cox and Theilgaard [9] explore the emotionally transformative efficacy of what they call 'mutative metaphors' in psychotherapy. Here, with form and content appropriately reunited, aesthetics and creativity meet psychotherapy through the concept of metaphor. The implications are clear: when pseudo-dichotomies are exposed and challenged, explanatory benefits accrue from the rediscovery of those 'very wide pigeon-holes'.

More Fundamental Question

All the same, the fact that we like to dance and sing because we are human and are born that way simply raises a more fundamental question. *Why* are we born that way? What is it about humans that makes it so important that they be born already equipped with the need for interpersonal, sympathetic communication?

Like others in the present book (for example, McKechnie, Hagendoorn, Grove), Malloch braves, albeit tentatively, the waters of evolutionary theory, but rightly so. In his discussion of the evolutionary literature, he suggests that the mirror neurone system, being the possible mechanism underlying our innate communicative musicality, may be the evolutionary basis for the coordination of gesture, mimesis, metaphor, symbolism and language. He alludes to Schore's (1994) work on infant brain development. Without elaborating or connecting, he also mentions Merker's sexuality-based evolutionary theory for the origin of our ability to act rhythmically together, and he comments that this theory 'stands as a male balance to Ellen Dissanayake's suggestion that music and dance come out of mother–infant interaction.

It is not clear what is intended by 'stands as a male balance'. Is Merker's an *alternative*, but male-based, theory? Or is it a *complementary* theory? If the former, why are they in competition? If the latter, how are they related? What if we were to venture a little further into evolutionary waters, taking with us extra supplies from infant research and beyond? Might there not perhaps be connections between all of these seemingly disparate themes which would allow a coherent picture to emerge? I think the answer is yes.

The first thing needed is a sound theory of human motivation. Malloch talks of a 'drive to reach out to others in contingent interaction through time', and I agree that motivational theory requires appeal to drives. However, drive-theory fell into disrepute because it became all too easy to engage in so-called 'drive naming', that is, explaining a particular observed behaviour by appealing to a 'drive to do' that behaviour. Critics of this practice (Freud included) correctly impugned it as empty and non-explanatory, as opening the door to the postulation *ad libitum* (at whim) of *ad hoc* drives. The drives that have survived are those which have been able to be defined deterministically, located in physiological sources, and themselves explained in terms of evolutionary principles.[10]

We can say that we are born with a hunger drive, and we can identify the physiological and neurophysiological mechanisms that underpin our food-seeking and food-consuming activities, and, further, we can offer an evolutionary account of *why* such a drive should have been selected. Of course, as a result of our great mental plasticity and our capacity for learning, not to mention our long period of infantile dependence, drive-derived activity in humans becomes enormously complex and elaborated, and 'drive-anaclisis' and overdetermination via drive-confluence becomes the standard account for much, if not all, of human behaviour.[11]

Light and Shade

Granting, then, that our 'drive to reach out to others in contingent interaction through time' is the basis of the development of our artistic activities and sensibilities, including our capacity to create and appreciate music and dance, how might we obviate the charge of mere 'drive naming'?

We might, initially, point to the well-established sexual drive, whose formulation (at least in psychoanalysis) considers sociality, love, companionship, friendship and intersubjectivity to be part of the total package, alongside what Freud labelled mere 'genitality'. Also included in this package are some 'darker' aspects: competition, rivalry and aggression.

For example, in the frenzied, rhythmical music and dancing of today's teenage rave party, the various elements of sexuality, sociality, competition, mate-selection, aggression, and communicative musicality converge. It is clearly a case of both Merker's male synchronized chorusing activity and Dissanayake's mother–infant interaction. There is light and shade here, in the single package.

However, the elements of intersubjectivity, much as they are part of the package of sexuality, are clearly not restricted to sexuality. They seem, in fact, to be part of the package of *any* established drive. If that is the case, then perhaps, rather than being a separate drive, the reaching for contingent interaction has evolved in the service of all drives, as part of their general *modus operandi*—and for good reason.

Consider the point that contingent interaction is more important than benign indifference or positive disengagement; the infant is

distressed by a mother's happy facial interaction if that happiness is not *contingent*. In his work on the role of affect regulation and 'dysregulation' in attachment, Schore [12] points to evidence which suggests that the aim is not to avoid distress or disharmony but to be able to regulate it. What is important is that the infant experiences and comes to feel confident that tension will be resolved, and distress managed and contained. These data may help explain why it is that we are not aesthetically satisfied with a pure state of harmony (music is boring if it contains only concord, drama is boring without conflict)—or why we seek thrills in order to experience the satisfaction of relief.

The inevitability of tension and competition, which are aspects of the 'darker side', arises from the evolutionary fact that parental investment is never as full and immediate as the infant desires—and so survival is a matter of constantly negotiating the best possible deal. This negotiation (by way of expressing and eliciting emotion) involves cooperative and coercive strategies—the latter involving expressions of rage, pain and fear.

It would not be surprising, then, to find that the mirror neurone system has evolved not only to foster the light of (positive) identification but also to accommodate the shade of (negative) projection.[13]

Zoltan Torey, blinded in an accident at the age of 21, tells in his autobiography of his unusual success in counteracting his blindness by systematically and painstakingly 'visualising' everything before him, including people with whom he is interacting.[14] In response, people actually forget that he is blind, because his facial muscle movements show a contingent interactive awareness of the kind that is typically absent in a blind person. Thus, it seems, by constantly and continuously visualising the other, Torey is able to achieve the remarkable feat of activating his mirror neurones by imaginatively reconstructing the scene before him, and providing the visual input not available through his eyes. In this way, he can 'read', feel and communicate the other's emotional state. This suggests that it might be quite possible for the mirror neurone system to be involved in 'mirroring' the other as endowed with the self's (negative) projections, in the way Hopkins describes.

If our sophisticated 'companionship needs' have evolved as a *modus operandi* in the service of *all* of the drives, and are, in that

sense, an evolutionary elaboration of more basic needs, then music, dancing, and other aesthetic, expressive and communicative forms may nevertheless derive from instinctual and primitive, sub-cortically based, evolutionary endowments.

But here we might challenge yet another pseudo-dichotomy, involving a different light–dark dimension, already present in the *scala naturae* or 'order of ascent' of the ancients—according to which the human occupies a place which extends from the beasts 'below' to the angels 'above'. As the material suggests, it is not that the lightness of art and music evolve from the shade of instinctual conditions; clearly, both light and shade are there at birth. Both are part of mother–infant communication. Both must be accommodated in any therapeutic intervention, and they are simultaneously elaborated in the creation of artistic and cultural phenomena. To neglect the shade is to tell only half of the story.

It would be a considerable challenge today to devise ways of testing these speculations, some of which may appear far-fetched, and take us way beyond our scientific comfort zone—even perhaps our artistic one, which is considerably wider. But what of tomorrow? For some reason, I think of the words of the poet W. H. Auden: 'Time will say nothing but I told you so'.

Endnotes

1 Petocz 'Psychology in the 21st Century … '; also, 'Science, meaning and the Scientist-Practitioner Model of Treatment', 2001.

2 Damasio, *The Feeling of What Happens … '*, 2000.

3 Eysenck, *Decline and Fall of the Freudian Empire*, 1985, p.194

4 Ehrenzweig, A., *The Psychoanalysis of Artistic Vision and Hearing*, 1953.

5 Gombrich, *Meditations on a Hobby Horse: and Other Essays on the Theory of Art*, 1963.

6 Johnston and Lakoff, *Metaphors We Live By*, 1980.

7 Hopkins, 'Psychoanalysis, metaphor and the concept of mind', 2000.

8 Ramachandran and. Hubbard, 'Synesthesis—A window into perception, thought and language', 2001.

9 Cox and Theilgaard, *Mutative Metaphors in Psychotherapy: The Aeolian mode*, 1987.

10 Panksepp, *Affective Neuroscience*, 1998.

11 Petocz, 1999 (op. cit.), 1999.

[12] Schore, *Affect Dysregulation & Disorders of the Self*; *Affect Regulation & the Repair of the Self*, 2003.

[13] Hopkins, 'Conscience and Conflict: Darwin, Freud, and the origins of human aggression', 2004.

[14] Torey, *Out of Darkness: A Memoir*, 2003.

3

Show Me What You Just Did

Robin Grove

Preserving the Moment

Choreographers have many ways of making movement, but in rehearsal anything that does not 'work' will almost invariably vanish without trace. The dancers, after all, have enough to remember as it is, and in any case dance is hardly fixable, since even as it is taken in, the performance is passing away: each gesture replaced by another.

Unspoken Knowledges, however, had a use for discarded passages—those ideas that go nowhere, those preliminary versions that change drastically as their material is developed. In our project, all such happenings, though they failed to make it into the finished dance, were not lost, but recorded on digital camera, bringing to light the equivalent of a composer's first sketches of a string quartet, or a writer's drafts.

Scholars in other areas have long known how valuable such evidence can be. With luck, literary drafts give us unexpected glimpses of the individual author's mind, but more even than that, they may show something about the processes of creation. For example, when Keats in his famous 'Ode: To Autumn' urges the season to ' … bend with apples the moss'd cottage-trees, And fill all fruit with ripeness to the core' … it is a fine moment, keenly felt. The phrasing registers the

solidity of the imaginary apples as they weigh down branches and trunk. We feel how fruit warmed through can become not simply ripe but *filled* with ripeness 'to the core'. The homeliness of the scene is noted too: not an orchard, but some half-neglected cottage-trees; so there is a touch of class awareness here, as nature, unlike society, is seen bestowing her wealth without discrimination. All this is suggested in two simple lines. But in fact these published words of Keats tame what he originally wrote.

Composing the poem on an afternoon in September 1819, he got to this point and what he excitedly dashed onto the paper was 'fill all furuits with sweeness**'.** See Figures 1 & 2.

Strange though it looks, that eager, hasty, misspelt phrase makes even more sense than the final version: more sense, because it contains more of the senses. Instead of 'fruit', that hard little knob of a noun, 'furuits' is squashable. With its three vowels so closely packed, it's as awkwardly sensuous as trying to speak with one's mouth full. Meanwhile, instead of 'ripeness', 'sweeness' gets onto the page, so syrupy, it has dissolved even the *t*, that letter that usually controls the middle of the word. The fruit in Keats's mind has grown so ripely soft, there is nothing hard inside.

A dozen such manuscript details show the poet thinking through his tongue, thinking and knowing through vocal chords, muscles of mouth and throat—in short, through the physical intelligence, eyes, ears, pulse, skin, that internally re-presents the experience of Autumn. To the extent that he writes like this, Keats is thinking like a choreographer, not with mental representations only, but through a co-operation of faculties we can (in useful shorthand) call 'bodymind'. Later, in printed books, his thinking will be straightened into more orthodox spelling and grammar, and he will be seen to have written a proper ode. It is both a come-down, and a necessary advance, like adult life itself, but here for a moment we have glimpsed something of the dissolving and reconstituting polymorphic energies of thought.

Consciousness in Forms

Keats is traditionally considered to be rather bad at Thought. Literary critics more often praise the 'sensuousness' of his verse, and quite a few of them suggest that sensuousness, even of Keats's sort, is inferior to the big topics and noble sentiments you find in, say, *Paradise Lost*.

But any such hierarchy, by putting thought above sensation, ideas above tastes and smells, is a piece of ideological simplification. Step outside the belief that Mind is higher than Body, and it is clear that the two are interdependent, each relying on the other. Not for nothing do we say we've 'grasped' an idea when we've understood it.

Research seems to show that the ability to get a handle on the world is closely allied to the ability to handle it physically, with palm and thumb and fingers.[1] Similarly, in the studio, our research-project saw dance makers thinking not in words but through a language of movement and mass, of pauses in space and time, advances, realignments. As a work of 'bodymind', choreography creates consciousness in forms that can hardly be translated into words.

But such forms are part of everyone's experience: for example, do any sentences adequately convey what it feels like to hold an insect in your hand? Not just the particulars of brittle wings, delicate legs, powdery feel of the thorax, but the difference in scale between *its* tiny body and one's own: the knowledge of how easily it might be crushed, the awareness of how vividly alive it is … and all these knowledges of the insect coalescing in the one instant it is being held. Sentences can speak *about* the facts, but that preposition, 'about', already admits that words go *round* the experience, leaving its reality more or less untouched. To hold an insect, or to feel in oneself the unfolding of a piece of movement while watching some dance-work are experiences that language through its symbolic marks and sounds may point towards, but cannot in the end convey.

So, while we invited dancers and choreographers to discuss their experiences, to keep logbooks and to talk, the most revealing evidence was always going to be the movement-material itself. From day to day, therefore, we tracked their dance works as they were created. One of them, a 20-minute solo called *Not Entirely Human* began from experimenting with what the lower limbs might do if isolated from the upper ('higher', more 'intellectual') parts of the body.

In this early rehearsal, the choreographer—Sue Healey (in blue)—dances alongside performer Michelle Heaven.


http://www.mup.unimelb.edu.au/ebooks/0-522-85144-4/videos.html#NEHRehearsal

As yet, the arms and head are hardly involved; instead, the choreography focuses on the delicate endings of the limbs, the way feet can grip the floor, inch across it, search to find what's *there* on the ground level that thickly shod citizens take for granted. These feet by contrast are remarkably bare. So are the legs, stalking this way and that, to bring the weight to rest occasionally in a precarious-looking stance, turned-in, crossed-over, with right foot hooked behind left. Normally, we would read this position as 'fumble-footed'—the equivalent of being tongue-tied. As the solo developed, however, these first experiments began to issue in images of wary animal energy, almost dangerously on the prowl.

Instead of the confident stride and straddle of feet that need not worry what the ground beneath them is like, we watch something just as alert and quite as skilled as human mastery, only more instinctual. Other sources of strength, other relationships to the world were being explored. At one point, the slender human figure capped itself with a grotesque yet poignant animal head; from underneath, limbs trembled, eyes peered this way and that. The dance intensified; it began to embody the conceptual challenge of its title, *Not Entirely Human*: for what does that last word *mean*? By degrees, we saw 'humanness' in this solo not as a status attained once and for all, but as one more performance, always having to manage other powers emerging from deep within—hence the clown's pantaloons that the dancer wore like an emblem of self-mockery.


http://www.mup.unimelb.edu.au/ebooks/0-522-85144-4/videos.html#NEHPerformance

The dancer gave a virtuoso rendition of 'herself' in many forms. At one moment, a snake-like pulsing through stomach and spine seemed to disgorge the beautiful serenity of a creature poised for flight, like the swan-queen Odette, whose image, with one sweep of a stiff wing-arm, then folds into a zany courtier's bow, which in turn jack-knifes forward, only to collapse so bonelessly that the body can hardly drag itself into motion again, and achieves just an impotent swimming flutter.

Not through words, not through disembodied concepts, but in its own extraordinary forms, the dance came to display the ambivalence

of that category, 'human', we employ to distinguish ourselves from our animal cousins on the one hand, and from our damaged or too brilliant brothers and sisters on the other: superhuman, subhuman, non-human, all such images appear and re-appear, only to be dismantled and remade in this remarkable work, ludicrous as a cartoon at moments, yet so powerful it leaves the viewer shaken.

Slow Birth of Art

For thousands of years, our species has been creating visible images, often in the most secret and inaccessible places. For whom did we make these almost unvisitable and unseeable creations? Not for curators, anyway. Rather, these pieces of magic, paying homage to animal and spirit together, suggest that the shaping of physicality and the production of thought are co-active and intertwined. That is no new idea, but it is an idea habitually dislodged by stronger and cruder assumptions.

For example, give or take some millennia, textbooks like to claim that 'art appeared about 35,000 years ago'[2]—as if the activity were reducible to pictures and other objects. But not even the earliest artefacts simply 'appeared' in a Nature previously untouched by our shaping powers.

The urge to make patterns and drawings, to abstract and symbolize, shows that this is a world already cultivated, tilled by the mind. In turn, though, this long imagining is only another stage—not the 'beginning'of art, but part of a process as old as humanness itself: for to paint the bison of Lascaux not only took the workforce and the will to put everything in place—scaffolding, torches, pigments, and all the rest of that astonishing collaborative endeavour—even more importantly, it needed the musculature of the hand and the co-operation of hand and eye. And to call those faculties into existence was a work that extended not just over centuries, like the building of a cathedral, but through untold thousands of years of gripping, digging, singing, as we slowly brought ourselves into being.

View images of the bison of Lascaux online at
http://www.culture.gouv.fr/culture/arcnat/lascaux/en/nef6.htm
Website of the Minister of Culture and Communication France

Our own 'bodyminds', I mean, are our first and greatest work of art, and their endlessly repeated and varied self-creating is the pre-

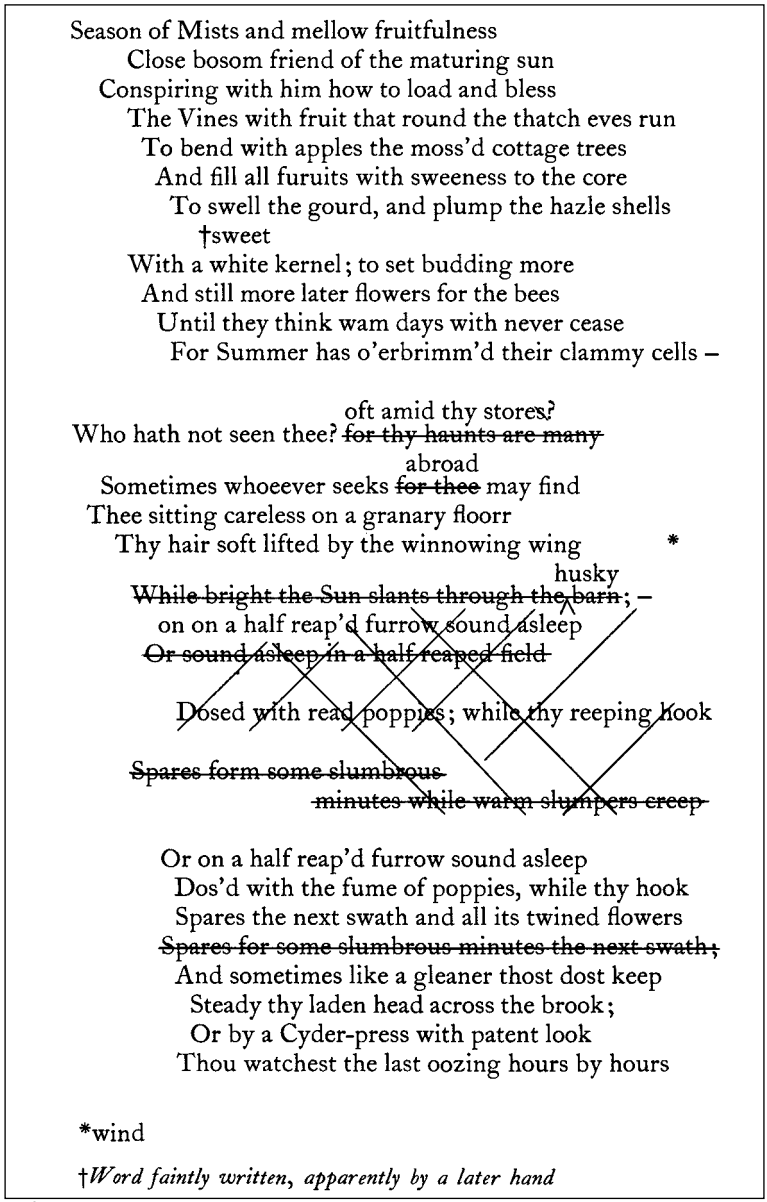


Figure 1: *Keats, Ode: To Autumn*

Source: Gittings, R, *The Odes of Keats and Their Manuscripts*, Heinemann, 1970, p. 56

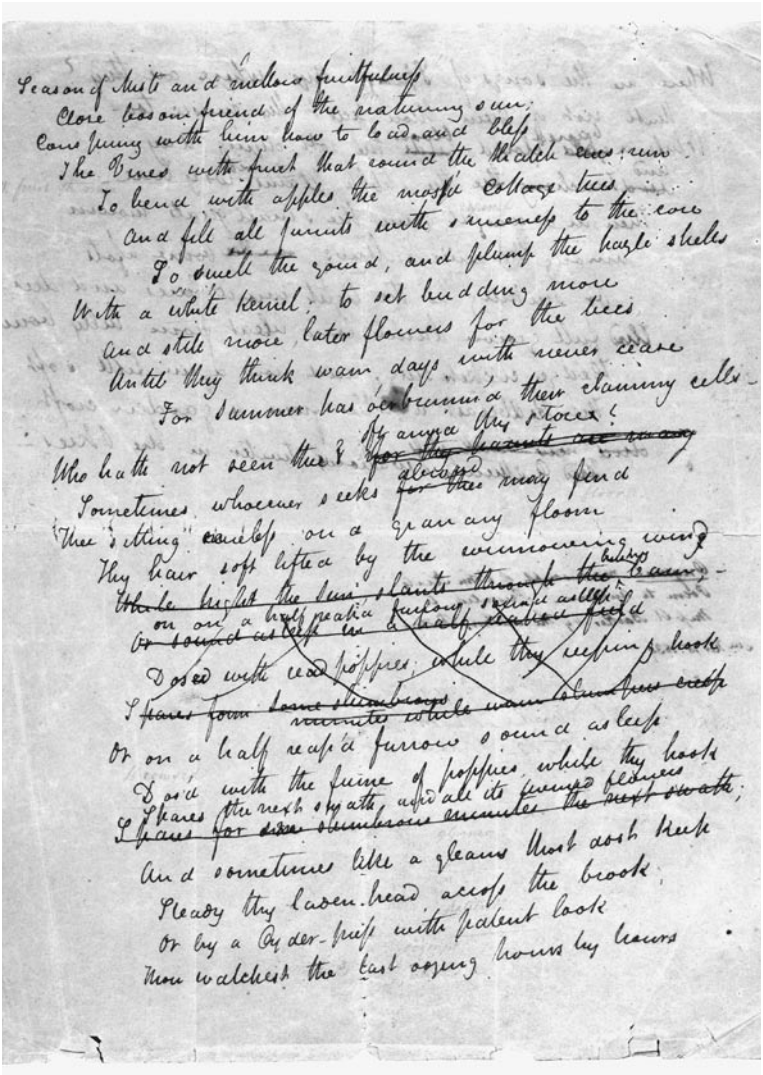


Figure 2: *Keats, Ode: To Autumn*

Source: Gittings, R, *The Odes of Keats and Their Manuscripts*, Heinemann, 1970, p. 57

condition for any artefact. Mozart is made possible only by millennia of inventive stamping and barking. For Shakespeare to have had a language in which to speak, tongues had to learn to negotiate the little world of palate, lips and teeth, as our noises took on increasingly distinct meaning and slowly became a vehicle for thought. Rembrandt's brush, likewise, could create the thinking nakedness of Bathsheba only because we human creatures gradually learnt to juxtapose thumb to fingertip with the finest subtlety—and thereby gained a new inwardness with ourselves. For there is no acquired bodily skill which is not also a new potentiality for thought, intuition, imagination: in short, an increase in 'feeling' as we significantly call it, looking simultaneously to the tactile and psychological.

Dancers, more than most of us, know this in their bones, because unlike the canvas or the violin, they are the phenomenon of self-creation twice over, being both the artist and the work of art. They are performers on and of themselves. But all of us are that, at least when it comes to thinking. For as the philosopher Collingwood observes, a thought is not something we know *about*. It is not an object. To be known, it must be had, experienced subjectively, which is something no one else can do for us. 'To know what someone has thought, involves thinking it for oneself'.[3] Or, to put that in terms of our enquiry, the danced 'work' of art does not become art until it is working inside the viewer, setting in motion its particular activity of 'bodymind'.

Engaging the Senses

What art produces, therefore, is not primarily an artefact, but consciousness, so that seeing or hearing, reading or walking through these things that artists have made, we *know differently*, experiencing both ourselves and our world in unexpected ways. Not just through the intellect, either: the senses are engaged, whether directly by sights and sounds, or indirectly, as when touch is invited to re-imagine itself through the seen textures of a painting.

The visual, the kinaesthetic, the auditory, spatial, temporal, 'motoric' and affective faculties may be involved; memory also, and judgment of various kinds. These and other cognitive operations are at play in the imaginary sphere of art, where we act not as divided beings but as 'bodyminds' in which (or in whom) the senses are fun-

damentally constitutive of consciousness.

Evolution has made it possible for us to be such creatures, and traces of the process may be glimpsed in the miniature evolution of baby into self. Here, consciousness learns to extend itself by internal means—not the same as applying a program or triggering a pre-set system. It is not even much like being taught—for do parent dolphins *instruct* their offspring in dolphin-speak? Do gorillas teach behavioural grammar? They do nothing so limited. Rather, I suspect their processes resemble our own; for when it comes to language, we don't start from instruction either: we surround a child with humanity and wait for him or her to catch on. To begin with, it's a humanity of touching and sheltering, feeding, cleaning, of facial gestures and baby-talk, of gazing, humming, singing, cuddling (see Chapters 1 and 2).

These features seem just about invariable world-wide, and even while they nurture the baby they take place inside the larger humanity of adult speech, music and social custom, so that not just the parent but the world is there for the child to grow into. The child's human growth, however, happens through what might indeed be called 'self-creation', since no one else can do it for him or her. Slowly achieving a self, the child plays with tongue and toes and fingers, gurgling, sucking, sicking, to find her own body in a world of other bodies who are already selves.

'Play' is central to this process and helps explain why, relative to other species, humans spend longer achieving maturity than any creature, even the apes. The benefits of taking time to grow up evidently outweigh the disadvantages and dangers—for once conditions exempted us from having to be adults as soon as possible, we played ourselves into humanity by improvising on 'an ever-novel configuration of shifting conditions',[4] thus continuing the self-creation of infancy.

In particular, what developed were the large frontal lobes of the brain that enable actions to be thought of which are not just happening now, and need not have happened in the recent past, but which are *possible*.

The humanities deal with this realm of the possible. So too of course do the sciences: asking 'Can we suppose …?' 'What if … ? and so on. Both approaches to the world involve speculation, experiment, postponement of gratification; and both involve long-term strategies.

All these faculties are managed by the frontal lobes, the site of mental possibility, and art, presents us with this make-believe acted out in singularly vivid, engaging forms. To 'know' these imaginary occurrences is to experience them for ourselves. Yet there is a further layer of awareness to take into account. Thanks to the reflective capacity of the mind, we not only know the music or the dance within ourselves but also know that we know it. The serious play of art is a means of extending experience, while acknowledging that this experience is not 'for real'.

Inhabiting Different Worlds

That awareness is important, because it enables us to distinguish between imagined events and hallucinations, for reading a novel is not the same as suffering a delusion or succumbing to fantasy. Instead, it offers the chance to inhabit worlds to which we bear a conscious and critical relationship, since even as we construct them in our reading mind we are aware that they are fictions. They are (yet are not) 'ourselves'. So the world that Tolstoy can enable me to enter, or Stravinsky can let me hear, is not one I could have experienced without them, and while it depends on my consciousness for its present existence, its power does not allow me to believe that this alternative reality is inferior to my own. Quite the contrary: works of art are often more alive than I am; they embody and release modes of consciousness exceeding many times over anything I can manage for myself. They pose an ethical challenge, therefore: the challenge of the other, for the self finds it hard to learn that the world is larger than 'I' and other people are equally real—'equivalent centres of self' as George Eliot called them.[5] Hard as it is, however, that realisation is crucial, so it is just as well that art enables us to practise it. What we are practising —imaginative sympathy, the capacity to feel for others—is the very stuff of novels, drama, film. Through it, we encounter unforgettable persons, even though they are made out of nothing but words, or gestures, songs, projections of light. How real an Anna Karenina is, how intimate we become with her feelings. We don't live long enough to achieve this kind of closeness to many people except through the pages of books; but while books can guarantee nothing, the offers they make are always open.

The kind of thinking we practise in art has another advantage

too: it is inescapably personal, often hesitant or doubtful, a matter of guesswork, of frequently being surprised. In other words, it is very unlike the problem-solving computers do—which is why we need it more than ever. Art-experience, which does not allow precise and verifiable answers to complex matters, is closer to reality and inherently sceptical, by virtue of its own art-nature, its visibly fictional, constructed presence that demands we recognize its 'irreality' at the same time as experiencing its power.

For thousands of years our species has worked with the images of thought and language, to rehearse in the mind what we have done or might do in the world of action. Through the play of consciousness and the play of art, human creatures prepared for unpredictable actuality by immersing themselves in the possible. Only by deploying this front-lobe thinking could our physical selves—pitiably ill-equipped with claws and teeth, short on thick fur, and without armour-plating—become flexible enough to adapt and survive. But we did better than that: we grew, inwardly.

The evidence is to be found in the traces our inward lives have left, including the maps of consciousness made visible in handiwork of every kind.

View Claude Monet's Haystacks, Midday *online at:*
http://www.nga.gov.au/International/Catalogue/Detail.cfm?IRN=29073&ViewID=2&GalID=ALL
National Gallery of Australia

Perceiving Art

When we enter the imaginary world that shimmers out of Monet's canvas, the everyday scene is changed, and so are our everyday selves. If we permit it, both self and world can be heightened by the encounter with an otherness of such beauty and power. Music, architecture, literature, science, all offer their own realignment of experience; and when we speak of being *moved* by them, *gripped* by what we hear or read, we testify to the almost physiological alteration it seems to bring about.

It may be, indeed, that these words are particularly apt. Many choreographers and dancers report that they experience a dance performance so intimately that they feel the movement somatically,

or have the sensation that they are performing it themselves. Is it possible that there is a physiological basis for this sympathetic kinaesthesia? Research into perceptual mechanisms has identified neurons that fire not only when we activate our own muscles, but even when similar actions are seen being performed by another.[6] If such a mirror-system *re-presents* actions in the observer, 'it is possible that as we observe a dance performance particular neurons are firing that represent that particular dance action in us.'[7] Drawing on a range of theoretical and experimental work, Unspoken Knowledges reached the following conclusion:

> We suggest that what we know as dance and music are particular cultivated instances of an intrinsic aspect of being human. But, as suggested by research on mirror neurons and body schema, this very perception blurs the distinction between self and other. When we watch a sequence of dance, we are, to some extent, dancing the dance as well. Thus, part of the reward of watching a dance is not only to receive communication of affect and meaning from the dancers, but also to experience that affect and meaning as expressed by our own bodies.[8]

It would follow, therefore, that the audience as well as the performers and choreographer will 'sense dances in the mind's body, in its bones and nerves and muscles, just as painters see with the mind's eye, composers hear with the mind's ear'.[9] Readers will also be familiar, anecdotally at least, with the experience of 'seeing' a scene in a novel, or 'hearing' a character speak, although scene and voice and character are nothing but print on a page. In all these instances, we are enabled to enter imaginary experiences with an immediacy so intense that it alters the 'bodymind'.

The question then arises: Does habitual exposure to such experiences make it more likely that the propensity for change is heightened? If we practise, might we become better at being moved by these arrangements of possibility? That is, become fuller, more flexible, more self-aware, more delicate in judgment, more alert to the reality of other selves. Maybe; but to look to art to make us finer people is as instrumentalist a view as that of the entrepreneurs who praise

museums on the grounds that they contribute to the economy. It is enough that we register as keenly as we can the imaginary realm that art provides: as when we set the opening moment of Anna Smith's *Red Rain*, where water is heard trickling, washing, passing from hand to hand in a gentle fluency, against the final moment when the dark falls on a downpour spattering onto the stage.

Such contrasts do not go easily into words, but we are not thereby condemned to silence. As with many of the deep things in experience, we do not always need to verbalise, but can say to ourselves as we gather in our own responses and recollections, 'Show me what we just did'.

Endnotes

1 Rizzolatti and Arbib, *Language within our Grasp*, 1998, pp.188-194.

2 Ruspoli *The Cave of Lascaux: The final photographic record*, 1987.

3 Collingwood, *The Idea of History, 1961,* p.288.

4 Torey, *The Crucible of Consciousness*, 1999, p.83.

5 George Eliot, *Middlemarch*, Book 1, chapter 21, final paragraph, ,1957.

6 Stevens, Malloch, McKechnie, 'Moving Mind …', 1999, p.61.

7 Ibid., p.63.

8 Ibid., p.61.

9 McKechnie and Grove, 'Thinking Bodies: A Dialogue', 2000, p.12.

4

Moving and Thinking Together in Dance

John Sutton

The collaborative projects described in this e-book have already produced thrilling new danceworks, new technologies, and innovative experimental methods. As the papers collected here show, a further happy outcome is the emergence of intriguing and hybrid kinds of writing. Aesthetic theory, cognitive psychology, and dance criticism merge, as authors are appropriately driven more by the heterogeneous nature of their topics than by any fixed disciplinary affiliation. We can spy here the beginnings of a mixed phenomenology and ethnography of dance practice and choreographic cognition, which is deeply informed and empirically inspired by the best current theory in the sciences of the embodied mind.[1] These sciences must themselves increasingly deal with culture and cognition all at once: questions about pleasure in movement, habit and skill, and kinaesthetic memory, for example, *require* neuroscientific, physiological, psychological, sociological, and anthropological investigation simultaneously. These then are essentially collaborative enterprises, and the active interpenetration of the concerns of dance practitioners and academic researchers is one remarkable success of Unspoken Knowledges and Conceiving Connections.

Mapping the uniqueness of dance (and of its differing traditions and styles) requires cognitive scientific enquiry into similarities with

and differences from other temporal and performing arts, and other embodied activities such as sport; and this in turn requires close access to the kind of thick description available to participants and experts in each domain. If experimental intervention in this context involves the collaboration of dancers, choreographers, and dance audiences in the creation, development, performance, and analysis of new funded works such as *Red Rain, Not Entirely Human, Fine Line Terrain,* and *Quiescence,* enthusiasts are likely to embrace this empiricism most willingly. In reflecting on these discussions of 'bodymind' and of the choreographic process by Robin Grove and Sue Healey, my remarks focus first on some questions the papers raise about the interplay of cognitive and motor systems – of, roughly, knowing or thinking and doing or moving – in choreographic cognition. Then I'll briefly sketch one natural extension to the dynamical orientation of this research in the shape of recent ideas about the 'extended mind' and 'distributed cognition'.

Dance practitioners and experts are intensely attuned to the non-referential features of movement: as Shirley McKechnie writes, 'subtle dynamic shadings, tensions and releases, rhythmic patterns and counterpoints are the stuff of which dance phrases, motifs, themes and variations are constructed'.[2] Of course, as Robin Grove's discussion of Keats reminds us, the verbal arts too rely on all kinds of hints, pulses, and rhythms, and we don't favour novelists just for telling good stories; but he rightly goes on to argue that the intrinsically embodied nature of dance-making renders especially salient forms of experience 'that can hardly be translated into words'.

Writers on both practice and theory in dance, then, emphasise the independence of the embodied, procedural systems involved in movement from more obviously representational systems such as autobiographical memory and semantic knowledge. Symptoms of this independence include the frequent inarticulability and the conscious inaccessibility of many processes underlying complex movement (in its conception, its execution, and its appreciation). Of course some verbal descriptions offered by dance teachers and by critics can be more effective or satisfying than others; but this ability to *tell* is an entirely different skill from the more mysterious battery of coordinated perceptual-motor-memory capacities which underlie dance production and performance.[3]

Such enactive skills and habits are also learned differently from explicit thought, for they need repetition, practice, and grooving; those on which we rely in ordinary life are thus often 'traceless practices', to the extent that we often don't see them as forms of memory at all.[4] But these danceworks are extraordinary, and far from traceless. The various records of their development document visually as well as verbally the development of these specifically regulated forms of improvisation, offering rich resources for the study of realistically complex procedural memory. They reveal, for example, in convincing detail how the deliberate, explicit disrupting in rehearsal of such 'habitual, flowing awareness' can be difficult and occasionally frustrating.[5] In dance as in sport and in ordinary routinized activities, thinking *can* cause trouble. The initial development of a skill may require hard, effortful, conscious control, but when a set of embodied movements is inhabited fully, wholly and easily remembered in the muscles, it can often be *explicitly* forgotten.[6] This 'expertise-induced amnesia'[7], which often accompanies higher levels of spontaneous skilled performance or flow, is prized in much sports psychology: its absence or breakdown, when explicit memory and conscious control of movements return, is a sign of difficulty or failure. In the extreme, 'choking' under pressure, or other forms of performance breakdown or 'yips', can be partly caused and then entrenched by excessive attention to, or reflection on, skills which had been successfully routinized.[8] It would be intriguing to investigate any comparable kinds of difficulty or blocks experienced by dancers, both within ordinary rehearsal processes, and in any longer-term disruptions in the individual body-mind.

But in dance, and especially in the highly collaborative projects described in this book, there is not such direct competition between conceptual and explicit knowledge, on the one hand, and the enduring, fluid wisdom of the 'bodymind' on the other.[9] Sue Healey's account of the pleasurably cumulative evolution of the *Niche Series*, and of how complex theoretical concerns about space informed the designs, movement phrases, and performances of a sequence of performances, demonstrates that explicit, conscious and procedural embodied forms of thinking and feeling can and often need to interpenetrate. Philosophical or political ideas, wishes, hints and half-remembered dreams, idiosyncratic individual memories, cognitively-loaded emotional states and

moods, perceptually-driven assessments of complex cultural situations, and other cognitive processes which are (to varying degrees) more articulable and accessible than is movement itself, can all influence the creation, performance, and enjoyment of dance. The extent and nature of these intricate interactions depend on the kind of artwork and the context of performance.[10] The impenetrability of the motor system is far from complete: unless thinking could work *with* moving, and doing *with* knowing, the richness and flexibility with which kinaesthetic memory is honed and accessed for particular purposes in dance would be sharply limited. These investigations offer a unique opportunity to track the literal incorporation over time of idea-patterns as they are embodied into movement-patterns and gradually inhabited and then actively lived out to the full in performance.

The documented uses of notebooks and video in the evolution of these danceworks demonstrate that this process of transmitting, playing with, and selecting elements across an ensemble of dancers did not occur solely within each individual choreographer's mind. Particular movements and sequences could loop out into the world, jump across bodies, get tried out briefly and discarded or remoulded, and then be accessed again and again later through the enduring technological record. This is just the most obvious of a number of respects in which the creative processes in question are literally distributed, or extended across many brains, bodies, and artefacts.

Researchers on these projects have already convincingly applied recent dynamical hypotheses in cognitive science to the case of choreographic cognition, and Shirley McKechnie has pointed to the relevance of dynamical systems concepts to understanding creative processes in small groups of dance practitioners.[11] One concrete way in which these thoughts might develop in future is by making contact with compatible ideas about the extended mind and distributed cognition. As Andy Clark puts it, 'our brains make the world smart so that we can be dumb in peace'.[12] This includes our collective and individual utilization and mastery of external symbol systems and artefacts like videos, notebooks, and notations. But cognition is interpersonally as well as technologically distributed: we work together with each other in many ways to form temporarily integrated larger systems with cognitive characteristics and abilities which are often quite different from the mere sum of individual capacities.

In the choreographic process, existing movement repertoires are often reconstructed in the spread of embodied ideas and movement patterns across individuals. Rebuilding the old familiar ways under particular new circumstances or demands, the shared memory evolved by particular ensembles need not be held in any single person or in any single or canonical notation. Choreographers and dancers alike continually lean on, manipulate, recirculate, and transform materials held in and spread across a range of media, including idiosyncratic but repeatable movements, shared kinaesthetic memories, verbal or other labels and compressed or shorthand cues, and external recordings of various kinds. Each such form of scaffolding has its own distinct properties. So choreographic cognition, as the contributors to this book realize, is an intricate natural artistic domain in which to study the peculiar interfaces that emerge in intelligent action which is extended in space as well as time across the diverse components within such groups of practitioners and their cognitive technologies. I fervently hope that the collaborations reported here in practice and research can be continued and further developed.

Endnotes

1 One model, at the phenomenological end of this spectrum, from writing about music might be David Sudnow's brilliant, often agonizingly precise account of learning to play improvisational jazz piano, now republished as *Ways of the Hand: a rewritten account*, 2001.

2 Shirley McKechnie, 'Movement as Metaphor: the construction of meaning in the choreographic art', in *Proceedings of the 7th International Conference on Music Perception and Cognition, Sydney 2002,* C. Stevens, D. Burnham, G. McPherson, E. Schubert, J. Renwick (eds.) (Adelaide: Causal Productions), pp.157-160, at p.158.

3 Probing the extent of this independence is one inspiration for the new work on the effects of expertise on dance perception and reception reported by Stevens in this e-book ('Trans-Disciplinary Approaches to Dance Research'). In the extreme, it might be possible to match dissociations at aesthetic, psychological, and neurophysiological levels. The aim would be to contrast four groups: professional choreographers, and some dancers, who are both highly skilled and deeply knowledgeable about the movement they are watching; experts who are not practitioners (such as some critics), who may have a rich and relevant semantic and associative network as they watch movement, but lack the history of embodied performance; other dancers who may be highly skilled performers but lack the relevant explicit or theoretical understanding; and

naïve novice subjects. This may work more neatly for certain traditions of classical dance than for the projects reported here, in which all dancers were actively involved in the conception as well as the execution of their performances.

[4] Paul Connerton, *How Societies Remember*, 1989, p.102.

[5] Catherine (Kate) Stevens, Stephen Malloch, Shirley McKechnie, and Nicole Steven, 'Choreographic Cognition: the time-course and phenomenology of creating a dance', *Pragmatics and Cognition 11* (2003), 299-329, quoting from Nicole Steven's *Red Rain* rehearsal log-book.

[6] Hubert Dreyfus, 'The Current Relevance of Merleau-Ponty's Phenomenology of Embodiment', *Electronic Journal of Analytic Philosophy* (1996), http://ejap.louisiana.edu/EJAP/1996.spring/dreyfus.1996.spring.html; Edward Casey, 'The Ghost of Embodiment: on bodily habitudes and schemata', in D. Welton (ed.), *Body and Flesh* (Blackwell, 1998), 207-225.

[7] Sian L. Beilock and Thomas H. Carr, 'On the Fragility of Skilled Performance: what governs choking under pressure?', *Journal of Experimental Psychology: General 130* (2001), 701-725.

[8] One suggestive study is Mark Bawden and Ian Maynard, 'Towards an Understanding of the Personal Experience of the "Yips" in Cricketers', *Journal of Sports Sciences 19* (2001), 937-953.

[9] In many sports too, of course, it's vital for conscious and verbally-mediated current factors to influence skilled performance; embodied action can be sculpted, not just disrupted, by deliberate thinking. A more integrated picture in which motor skill expertise lies in the *links* between knowing and doing, which has influenced my remarks here, is developed in Fran Allard and Janet L. Starkes, 'Motor-skill Expertise in Sports, Dance, and Other Domains', in K.A. Ericsson and J. Smith (eds.), *Toward a General Theory of Expertise*, 1991, 126-152.

[10] Whereas the uses of explicit intervention in these dance projects were mainly confined to the rehearsal process, choreographic practices specifically aimed at improvisation as an end in itself may 'merge cognitive and motor faculties' in a more deliberate and ongoing way: see for example Ivar Hagendoorn, 'Cognitive Dance Improvisation: how study of the motor system can inspire dance (and vice versa)', *Leonardo 36* (2003), 221-7. Sue Healey in the *Niche Series,* and Anna Smith in *Red Rain,* in contrast, were less interested in deliberately putting 'the implicit properties of the motor system… under conscious control' (Hagendoorn, 'Cognitive Dance Improvisation', p.222), and keener instead to let the works evolve or self-organize: Anna Smith wrote of feeling that she was 'over-anxious to know the work; what it is' (quoted in McKechnie and Grove, 'Thinking Bodies', *Brolga 12* (2000), 7-14).

[11] Stevens *et al*, 'Choreographic Cognition' [note 5 above]; McKechnie, 'Movement as Metaphor' [note 2 above], p.160.

[12] Andy Clark, *Being There: putting brain, body, and world together again,* 1997, p.180. As well as the work in developmental psychology cited by Stevens and McKechnie, other key sources for these movements are Edwin Hutchins, *Cognition in the Wild*, 1995, a remarkable study of the

spread of cognitive processes involved in navigation across many brains, bodies, and machines; Andy Clark and David Chalmers, 'The Extended Mind' *Analysis 58 (1998),* 7-19; John Haugeland, 'Mind Embodied and Embedded', in Haugeland, *Having Thought*, 1998, pp. 207-237; Susan Hurley, *Consciousness in Action*, 1998; and Mark Rowlands, *The Body in Mind: understanding cognitive processes*, 1999.

5

Navigating Fine Lines

Sue Healey

Performers: Shona Erskine,Victor Bramich

Photo: Kate Callas

Introduction


http://www.mup.unimelb.edu.au/ebooks/0-522-85144-4/videos.html#FineLineIntro

The *Niche Series* is a six-part collection of works devoted to the choreographed body and its intricate occupation of space: a navigation of fine lines and precarious terrain, in both live performance and digital media. The series, dedicated to Shirley McKechnie, was created over two years during 2002/03. This paper details the evolution of the series and discusses the role of video/film in the creation and performance of these dance works.

The *Niche Series* is set within a theatrical world of potent spaces. Through video to installation to live performance, it endeavours to question, unsettle and expose basic assumptions of how we occupy space—for space, after all, is critical in our lives: it affects the way we live, move and interact with each other. On an intimate scale, the space of our bodies is our physical reality. On a global scale, the competition for space is the source of much conflict. On a universal scale, space is a conundrum. How do we deal with the relative scales of immensity and the microscopic to the atomic?

This series of works has been devoted to understanding the precarious relationship we have with space and the fine lines we traverse for survival. The research for *Niche*, therefore, pivots upon the idea of space, the articulation of the body and imagination through various performing terrains. Both the series and the research take dance as the primary mode of communication and reveal the subtle intricacies inherent in a non-verbal language.

Two key spatial concepts underpin the series.

Firstly, the idea of a *niche*. In a biological sense, a niche is an environment that provides the appropriate conditions for a species to survive and thrive. It also implies a small enclosed and intimate space.

Secondly, the image and metaphor of a *fine line,* an abstract divider of extremes, upon which our lives often balance, is also a recurring theme: fine lines between connection and isolation, order and chaos, fragility and strength.

Process

The word *navigation* is a critical one for me as a choreographer. I not only navigate the external geography of space and the human form within it, but also the internal spaces of the imagination. I am interested in the word because it implies a degree of not knowing, of trusting in the process of getting somewhere, but doing so in a somewhat blinded fashion. Very similar things occur during the choreographic process.

The links between the separate works are palpable, but each investigation resulted in a unique spatial and contextual manifestation. I entered each new project with the underpinning philosophical 'world' already established, rather than the usual method of creating this anew with each succeeding work. The series, therefore, has a cumulative effect; each work adds another layer, dimension and perspective.

This method of working has had many benefits. Firstly, it eased my frustration at never having enough research time in a one-off project. Whether on a commission or an independent production of my own, I have often entered into the choreographic process anxious about the lack of conceptual preparation. This is a classic scenario for most freelance choreographers who are usually employed on a project basis. Being supported by a framework of knowledge from the series gave me the confidence to take more creative risks, and instead of being bound by the 'world' already established in the prior work tangential ideas flowed easily. It provided the dancers and other collaborators with ongoing exposure to my ideas, which meant that we were able to work quickly and efficiently as soon as I had funding to proceed with a new project. Again, the cumulative nature of this process has been the novel result for me and has enriched the investigation at every stage.

Another positive outcome of this model has been the relative ease of disseminating and promoting the work—something that is almost impossible for an independent artist to tackle successfully in Australia because of limited touring networks and sporadic funding. While these matters are pragmatic and relate to the business end of making dance visible in the community, the accumulation of images, video and written documentation of this series has been of great benefit to the dancers. By making the work visible over a longer period of time— beyond one season, for example—this process has given me a

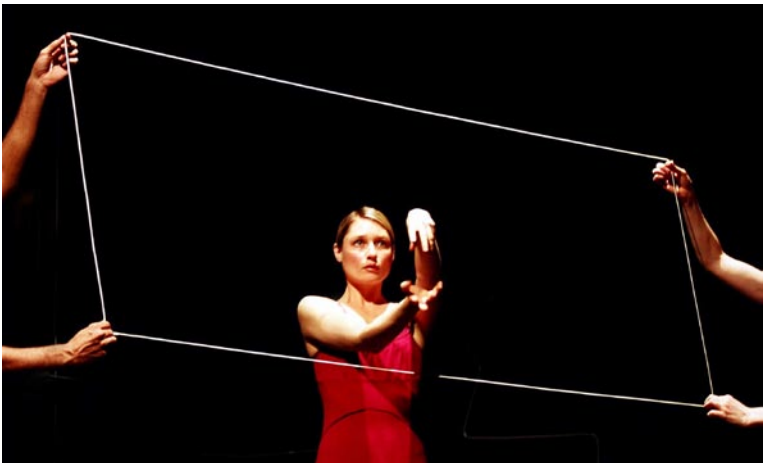
greater capacity to talk about, illustrate and share the ideas of the work with a diverse audience. The choreography and ultimately the whole theatrical experience has become more 'available' as the dancers and the spectators increasingly understand it.

Influences

The philosopher Gaston Bachelard and his seminal book *The Poetics of Space* (Beacon Press, Boston 1994) have been a constant resource. His ideas on inhabiting space and perceiving the immense in the intimate have been crucial to opening up the imaginative world we have explored. Both physically and theatrically, the possibility of space defining our dreams, thoughts, memories and actions gave us much to translate into dance.

Also the design influences of the installation artists James Turrell and Bruce Nauman, have informed this investigation. Through light, video and design, these extraordinary contemporary artists continue to push the boundaries of our perception of space, reinforcing its enigmatic and multi-dimensional nature. This series attempts to address these same issues by placing the human body, in all its choreographic complexity, purposefully in space.

Design



Performer: Lisa Griffiths

Photo: Kate Callas

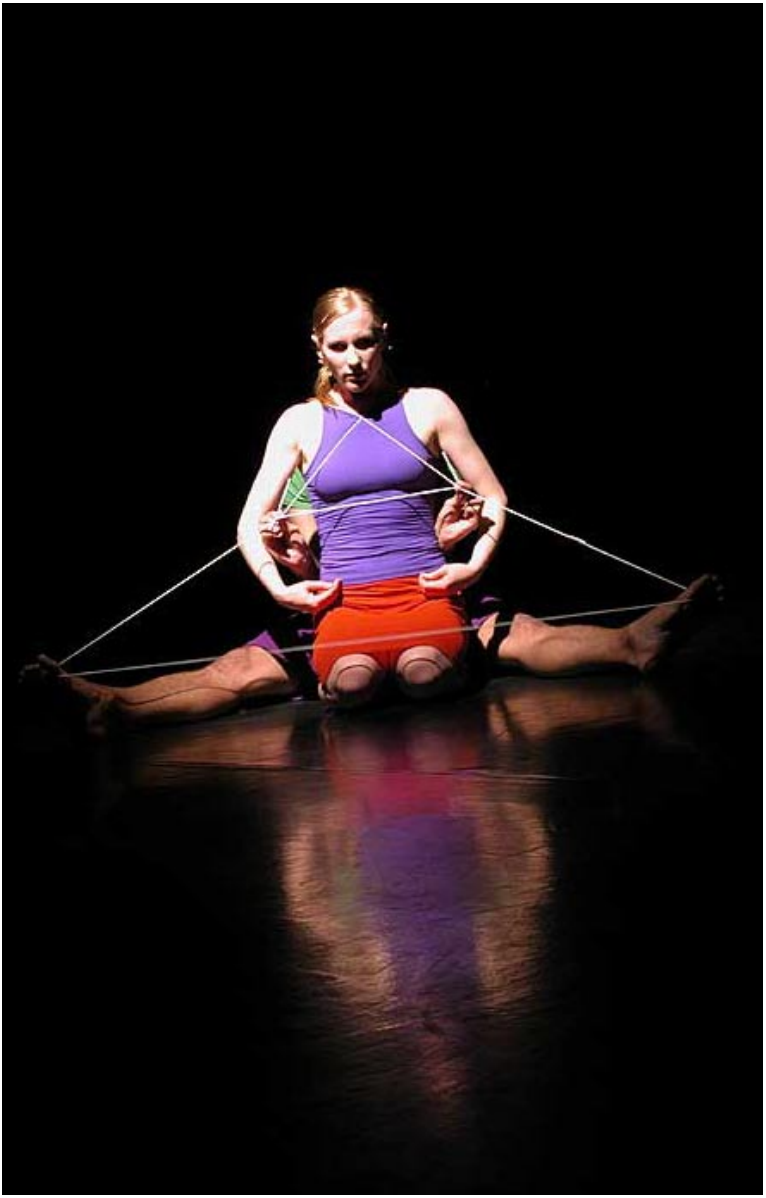
This process began with an utterly simple architectural idea: a vertical and a horizontal line, which together form a corner. Every corner in a house, every angle in a room is a … 'symbol of solitude for the imagination' (Bachelard, op.cit.).

Bachelard's haunting remark gradually translated into movement that explored corners and angles of the body and a distilled design of white lines in space. A vocabulary of angular, intricate movement was created. It extended into duets, trios and groups of complex contact, which then moved out into wider space, the dancers inhabiting geometrical 'houses' made of suspended string, corners and specific volumes of light.

Performers: Shona Erskine (foreground), Lisa Griffiths
PHOTO: KATE CALLAS

This simple idea evolved into an array of works traversing the space of film and video, the cultural spaces of Australia and Japan, the immersive space of installation performance, and various styles of theatre.

The design elements evolved to generate specific metaphoric spaces of their own; the fine white lines of string became three-dimensional maps, a 'psycho-geography', of the territory explored by the dancers. The design was fully realised in *Fine Line Terrain* where, at times, the white lines frame the action in the black space (see p. 60) or connect and entangle the dancers in 'cat's cradle-like' structures (see p. 62).



Performer: Shona Erskine
Photo: Alejandro Rolandi

Performers: Lisa Griffiths/Victor Bramich (foreground), Shona Erskine/ Nalina Wait

Photo: Alejandro Rolandi

Performers: Shona Erskine, Lisa Griffiths, Nelson Reguera Perez, Nalina Wait

Photo: Kate Callas

The white string design further developed into a large scale 'drawing' in the space, which is created as the dancer moves.

Collaborators

Shona Erskine was an important collaborator during this work, an integral participator in all six stages. This ongoing thread, this through-line of knowledge that she has given to the *Niche Series*, has been crucial to its evolution. To use an architectural metaphor, her journey through the *Niche Series* began in a small, dark corner and travelled through habitats of increasing complexity. The other dancers, eleven from Japan and five Australians, have also contributed to the process with great skill as the series unfolded.

The creative team included composer Darrin Verhagen, film artist Louise Curham, designer Michael Pearce, cinematographer Mark Pugh, editor Sam James and lighting designer Joseph Mercurio. Each of these artists has had a long history of involvement with dance and the particular processes involved in dance making. Significantly for the themes of the series, each collaborator contributed a unique angle on the *idea* of space. This constantly challenged my own spatial notions and, at times, gave me new hierarchical relationships to consider. The light, sound and design are integral partners in this work, as are the camera and the technology of the computer during the editing process.

Screendance

I have been making dance for the screen in conjunction with live work for over ten years, and the *Niche Series* began and concluded in this medium.

My desire to work this way comes primarily from my fascination with space. The camera is another site to explore, as is the screen and the context in which screenings take place. Choreography and film/video technologies are closely related; they fundamentally deal with moving images, action and perception, and for me the links are exciting. However, the rules governing time, energy, gravity, architecture, scale, light, and physical limitation are utterly different when working in film/video compared to live performance. Movement vocabulary, syntax and structure also require a different logic when working within the camera space and during post-production. The

more experience I gain as a dance filmmaker, the more I am captivated by these differences, and the more I realise that dance on film is not about dance in another medium, rather, it has the potential to *be* a new medium.

My personal filmmaking objective is to question how dance can be translated to the screen with integrity and with new choreographic insights. I have undertaken study in filmmaking and editing techniques, but I try not to be subject to the traditional methodologies of established film genres, especially in dealing with narrative. As with my work in live performance, I am always seeking novel ways to describe, question, unravel and expose meaning.

The initial catalyst for creating 'screendance' was my frustration at dance documentation.

This is how it usually went: a single unmanned VHS video camera at the back of the theatre, bodies the size of ants in the frame, and lenses unable to cope with theatrical light. It became my aim to capture more successfully on tape or film the elusive nature of dance, to make the intangible slightly more tangible. My initial forays into this world were with collaborator film artist Louise Curham and cinematographer Mark Pugh. We made three films together during the 1990s, and have spent many years since playing in a studio with camera and action. This was a necessary apprenticeship to enable my move into a directing role.

A positive outcome of working in a digital medium is that it makes the work of an independent choreographer more viable. It extends the lifespan of a work, broadens the audience, and can be used as a pragmatic choreographic tool. After so many years I feel that I unconsciously begin to employ the things learnt from this medium in a live context. I am not sure of results yet, but feel my experience of creating in a digital medium is changing how I negotiate live transitions, the framing of space, even the sort of movement I create: for I tend now to make shorter phrases with greater focus on detail and dynamic. This has been a catalyst for a significant shift in my spatial and choreographic thinking.

Art comes from experimentation. The nature of the camera, with its capacity for close-up and tracking, invites an investigation akin to choreographic manipulation. The language of cinema offers a fluid and extraordinary play with space and time. It was from these thoughts that this series of works began.

The Niche Series

1 Niche: the video
Director/Choreographer: Sue Healey.
Performer: Shona Erskine.
Cinematographer: Mark Pugh.
Music: Darrin Verhagen.
Design: Van Jones.
Editor: Sam James.
Created: March 2002.
Funded by NSW Ministry for the Arts.

Performer: Shona Erskine
Photo: Sue Healey

I began by creating a solo specifically for the camera space. With Shona Erskine, we spent several periods choreographing and filming with a digital camera in The Figtree Theatre, a black-box venue at the

University of New South Wales. Then with cinematographer Mark Pugh and a team of volunteers we shot the film itself over three days.

Niche exists in a narrow corridor defined by two walls. This design employs an existing wall and a moveable frame covered in opaque paper with apertures cut into it. The framed wall gave us the possibilities of filtering light through it and enabled a vantage point for the camera to 'spy' through the apertures. It was also able to shift in space creating greater or lesser angles on the 'niche-like' space; at times enclosing the action and at times exposing the performer.

In *Nich**e***, a woman navigates through several rarefied spaces; a sharp edge, a blank but haunted surface and the volume between the solid and the limitless. Her space of solitude is suddenly occupied; the small corridor is filled with many people, perhaps past inhabitants. They are then replaced by moving lines of colour and light, she becomes a shadow, translucent and then disappears.

2 Niche Solo
Performer: Shona Erskine.
Lighting design: Joseph Mercurio.
Music: Darrin Verhagen.
Created: April 2002.

Performer: Shona Erskine
Aichi Arts Centre
Photo: Tatsuo Nambu

A solo live study for Shona Erskine was created and performed at The Figtree Theatre. This was an opportunity to create phrases of movement, find relationships with Verhagen's sound, and create the 'string house' that was further developed in *Niche/Japan* and *Fine Line Terrain*, later pieces in the series. This stage enabled us to focus on the physical, creating a 'library' of movement ideas. Throughout the series we constantly drew upon this, augmenting and manipulating the original material.

This was also the first opportunity to begin an integral collaboration with lighting designer Joseph Mercurio. We began to discuss ways in which to highlight the design of the string and to sculpt the space, creating intimate zones contrasting with immense space.

3 Niche/Salon

Film artist: Louise Curham
Performer: Shona Erskine
Created: August 2002
Commissioned by The Performance Space, Sydney.

Performer: Shona Erskine
Photo: Sue Healey

This was an installation performance work. The piece lasted ten minutes and was repeated several times a night to audiences of 20 people. The audience sat in a small white room, looking into a similar adjoining space. A version of the 'string house' was constructed in the performing area; white vertical and horizontal lines dissecting the space. (Many members of the audiences said that they thought the structure was solid until the performer fell 'through' the walls).

The 8mm film projections were the main source of illumination for the performer (some of these film loops were also used in the film *Niche*). Louise Curham created these films by hand-processing, drawing and incising directly onto the film surface. The projected result is a dynamic, kaleidoscopic terrain of lines and colours that the dancer inhabits.

Ten projectors were placed in front of the audience, looking like an orchestra of odd little machines, projected at different angles around the room, and at times across the audience. This was an experiment to create an intimate salon-connection to the audience; giving a sense of immersion in dynamic light and close proximity to the dance. Added to this, Louise and I were also part of the design, as 'minders' of the whirring projectors.

This was an experience where you could not escape the tangible presence of the breathing, moving performer. The audience were involved at close range as Shona navigated through many lines of thought, action, projection and design.

The shift from the black space of the solo *Niche* to the white gallery space of *Niche/Salon* was a dramatic contrast for those who had seen both works. The remainder of the series was realised in black spaces, but the drama and colour made possible in the small white space gave *Niche/Salon* a unique resonance.

4 Niche/Japan

Dancers: Ono Shina, Okayama Mutsumi, Kawamura Sachiyo, Kuroda Yuri, Kobaysahi Yuka, Takagi Rie, Takise Mai, Fujimora Ryuichi, Bokui Akiko, Miyao Akino, Yaku Yukari and Shona Erskine.
Composer: Mizuno Mikako
Musicians: Ohta Kazuya and Tange Satoko
Filmmaker: Ichio Naoki

Photographer: Tatsuo Nambu
Producer: Karatsu Eri, Aichi Arts Centre
Created: December 2002
Funded by Aichi Arts Centre, Nagoya, Japan, The Myer Foundation and The Australia Council.

Performers: Bokui Akiko (foreground), Kobaysahi Yuka, Kuroda Yuri
Aishi Arts Centre
Photo: Tatsuo Nambu

Performers: (l to r) Takagi Rie, Ono Shina, Shona Erskine, Bokui Akiko
Aishi Arts Centre
Photo: Tatsuo Nambu

The next stage was created in Japan, where I have a long and successful relationship with Aichi Arts Centre in Nagoya. I was commissioned to create a full-length work extending the ideas I had been working with, and to provide a choreographic development opportunity for twelve Japanese artists. Most importantly, this shift from one to twelve bodies, allowed a choreographic exploration from the space of solitude to the space of interaction.

Performers: Okayama Mutsumi, Kobaysahi Yuka, Shona Erskine, Yaku, Yukari, Taksie Mai, Fujimora Ryuichi, Kawamura Sachiyo (left to right) Aishi Arts Centre

Photo: Tatsuo Nambu

Shona Erskine and another Australian dancer Ryuichi Fujimora accompanied me. We spent over a month working in Nagoya with the Japanese dancers and also making a documentary of the process with filmmaker Ichio Naoki. During this time I was also able to extend the set-design ideas begun in the solo work and to collaborate with live music and a composer. Most significantly, the chance to investigate the different cultural perceptions of space between the Australian and Japanese dancers asserted itself and introduced a further layer of intrigue to this project. An entirely new physicality and use of space came from the Japanese dancers as they tackled the same choreographic questions as the Australians. The differences between the two were dramatic and gave me a wealth of choreographic contrasts to formalise within the work.

A simple example of this was illustrated when a dancer was asked to create a solo inside a very small floor space and then accommodate another moving body within this tight zone. Australian dancers given this task would immediately break the personal space of the 'intruder' and accept the necessary contact that occurs. The Japanese dancers on the other hand, went to extraordinary lengths to maintain their own sense of intimate space, negotiating the other person's body with incredible dexterity without touching. While this may seem like a clichéd example, it was nonetheless fascinating to observe in many aspects of Japanese society—from negotiating thousands of close bodies during train travel to the organisation of private spaces in homes—the protection and awareness of intimate space. In contrast to the imprint of wide open spaces upon an Australian's psyche, the Japanese are adept at according space its rare and precious status. We were able to incorporate this delicious mix of spatial awareness into *Niche/Japan*.

Performers: Aichi cast
Aishi Arts Centre
Photo: Tatsuo Nambu

Audience Reaction

The work was performed in a large, open black theatre space within the Aichi Arts Centre, which is itself an awe-inspiring modern

construction of white marble. The lighting and projection facilities in the theatre were state-of-the-art, enabling a large-scale investigation of the themes.

Two lecture-demonstrations/work-in-progress performances were given in Toyohashi and Togo-town (two cities within the Aichi prefecture) and a short sell-out season was performed at the Aichi Arts Centre in December 2002.

The response from a Japanese audience is always intense. From my experience in Japan since 1997, audiences seem to observe with a different focus compared to those in Australia. Perhaps this is due to the fact that contemporary dance in Japan is seldom seen. The audiences there seem genuinely interested in its relationships to other art forms and even though its language might puzzle them, they are more than willing to 'go along for the ride'. From my experience of creating three large-scale performances in Japan with audiences of many thousands (always in tandem with audience feedback sessions) I can say that the desire to understand contemporary dance is high on the agenda of the audiences in Nagoya.

5 Fine Line Terrain

Performers: Victor Bramich, Shona Erskine, Lisa Griffiths, Nelson Reguera Perez, Nalina Wait
Lighting design: Joseph Mercurio
Music: Darrin Verhagen
Film/video projection: Louise Curham
Set design: Michael Pearce
Created: February 2003
Funded by The Australia Council

I returned to Sydney to create *Fine Line Terrain*—a full length work of 60 minutes, with a company of five Australian dancers I had long admired. This work came together very quickly, supported by the wealth of material and research from the entire *Niche Series* and was created with a development grant from The Australia Council. It premiered in Sydney at the Bangarra Theatre, an unusual space of 30 metres in depth. This first version of *Fine Line Terrain* used this depth of perspective to great advantage, at times placing dancers in the foreground zone against action in the distance.

Performers: Miyao Akino, Takagi Rie (left to right)
Aishi Arts Centre
Photo: Tatsuo Nambu

Performers: Australian cast
Photo: Alejandro Rolandi

Performer: Nelson Reguera Perez

Photo: Alejandro Rolandi

A duet from this work for Shona Erskine and Victor Bramich was then performed at Dancehouse, Melbourne in March 2003. *Fine Line Terrain* was subsequently performed in Canberra, (October 2003), Auckland (November 2003) and at the Sydney Opera House (June 2004).

The *Niche Series* themes are most fully realised in this work. Five characters, in a fragile and ever-shifting environment, explore a 'poetics of space'. This work is about the subtle and the intricate; the fine lines that map the precariousness of our relationship to the world and to each other.

The dancers navigate through a design of many white lines dissecting black, infinite space. 'House-like' structures frame the choreography, solid corners confine and expose the performers, volumes of light encase and sculpt the space and projected film adds further dynamic dimension of lines and colours. The emotional landscape is extremely diverse; at times humorous, formal, sensuous, intimate and elegiac. The music is similarly eclectic ranging from abstract electronica to intense rhythmic grooves, even hints of trance and Middle Eastern vocals are woven into the mix. Darrin Verhagen's score creates a cinematic soundscape for this work; imaginative worlds are conjured through the dance/ music interaction.

The architectural and choreographic elements have a precarious edge to them, what seems stable is not; throughout the course of the work the straight lines begin to bend and disintegrate, to break and entangle. The space builds to a climax of disorder and frenetic dissolving of spaces, finally resolving to an image of tenuous stability—the fine line.

6 Fine Line: the video

Director/Choreographer: Sue Healey.
Performers: Shona Erskine, Victor Bramich, Lisa Griffiths, Nelson Reguera Perez, Nalina Wait.
Cinematographer: Mark Pugh.
Music: Darrin Verhagen.
Design: Sue Healey.
Editor: Sam James.
Created: June 2003.
Funded by Conceiving Connections Research Project, Australian Research Council.

Performers: Australian cast

Photo: Alejandro Rolandi

This is the culminating work of the *Niche Series*, a video lasting nine minutes. Set entirely within one of the 'string houses', the action is seen by a camera that circumnavigates the structure. The choreography is distilled from the live work *Fine Line Terrain*, and the structure is an accumulation; from solo, to duet, to trio, to quartet, to quintet. The music is adapted from *Fine Line Terrain*.

The editing style that occurs in parts of *Fine Line* is quite different to that of *Niche,* which has a fluid organic flow. Slight adjustments forward and back in time in *Fine Line* give the action a sense of glitch and of having been felt or seen before. For me, this technique assists the observer in experiencing and translating the movement from the screen.

Fine Line brings a sense of conclusion for me. The series has come full circle; from a video medium through a variety of spaces and contexts, back to video. The relationships between the performers and the space that they occupy are seen with intimate closeness; the *fine lines* frame, connect, then entangle the dancers, the space disintegrates, the lines collapse; the dancers disappear, but the space hums with what has gone before.

Performers: Victor Bramich, Lisa Griffiths
PHOTO: SUE HEALEY

Postscript

Internationally, there has been a recent proliferation of choreographers making dance for the screen, and the genre is now widely accepted. There are also an extraordinary number of festivals devoted to 'screendance'. This creates a viable international audience for Australian artists who are constrained by the extreme cost of touring live performance. It also raises the possibility of generating discourse with international peers through these festivals. In recent years Australian films have been frequently represented at these international festivals.

The films *Niche* and *Fine Line* have had wide international exposure and have won several awards. *Niche* was Highly Commended at the 2002 Reeldance Awards, Australia, and a finalist in the Dance Screen 2002 Monaco, and Cinedans, Holland 2003. It has been screened in festivals in Italy, Holland, Spain, Japan, New Zealand and Britain.

Fine Line was screened at the Dance on Camera Festival New York, 2004 and was awarded Best Dance Film, Ausdance Awards 2003

and Winner Il Coreografo Elettronico (Independent section) 2004, Naples, Italy.

In Australia, the advent of Reeldance, curated by Erin Brannigan under the umbrella of One Extra Company, is significantly raising the profile of this genre and of choreographers dedicated to it. The workshops organised as part of this event have also been successful in giving quality experience to dance filmmakers and stimulating a necessary discourse about the genre.

My work has been inspired by many of the experimental filmmakers of the 20th century; artists such as the New Zealander Len Lye and Americans Maya Deren and Merce Cunningham. These artists were/are pioneers in the moving image and are the heroes of early dance on film. Their aspiration to aesthetic research is exactly what the *Niche Series* has attempted to embody.

We live in a precarious age. The *Niche Series*, on one level, makes a statement about the fragility of our species and the space we inhabit and alter so powerfully.

An art form, like a belief system or a species, must evolve or feel the pressure of extinction if and when the environment changes—whether this is due to cultural, geographic or technological influences. Ancient languages, literature and music can be kept alive by scholarship, and sculptures and paintings have been preserved over centuries. In contrast, most dance has a short life and little prospect of immortality. As a practising choreographer I have been keenly aware of changes in my own environment, even over the relatively short period of 20 years. Importantly, digital technology has significantly changed the face of dance practice, providing choreographers with an invaluable tool to record, manipulate and show dance to new audiences.

The evolution of the *Niche Series* has been instructive, teaching me much about how to adapt to a changing environment and, in the process, to discover new works through the use of technologies now easily accessible to dance artists.

Acknowledgments

As Research Associate with the Unspoken Knowledges and Conceiving Connections projects, it has been an enormous privilege to be involved with the research team over a lengthy period. To witness the

unfolding of their ideas about dance—its processes as well as the perception and experience of this art form—has inspired and illuminated much of the journey of the *Niche Series*.

Many thanks to the extraordinary dancers, collaborators, producers and financiers of this work.


http://www.mup.unimelb.edu.au/ebooks/0-522-85144-4/videos.html#FineLineConclusion

6

Dancing Memes, Minds and Designs

Shirley McKechnie

Many years ago I was given a book with an intriguing and irresistible title. *The Dancing Wu Li Masters* was not, however, about dancing. Its subject was the mind-stretching mysteries of the new physics of the 20th century. I was entranced by the idea that the world of matter is a relative and illusory one: what appears solid and permanent is actually all dancing energy and transient, impermanent forms.[1] This curious and compelling idea, connecting ancient Buddhist wisdom with quantum physics and Einstein's theory of relativity, illuminated a train of thought that has occupied my mind for over three decades.

A major catalyst was my experience at the summer schools of dance held at the University of New England in Armidale, northern New South Wales, between 1967 and 1976.[2] The experience of those summer schools in Armidale was enhanced by the beginnings of my friendship with Peggy van Praagh, then artistic director of the Australian Ballet. In 1991 on the first anniversary of her death I gave the inaugural Dame Peggy van Praagh Memorial Address in Perth. This event in other cities in ensuing years has now produced a collection of addresses honouring Dame Peggy's contribution to dance in Australia.[3] But in 1991 I spoke about the excitement of the gatherings in New England, the influence of Dame Peggy, and how my current thinking was linked through these events to my earlier perceptions.

As a modern choreographer in the 60s, I know that my sense of aloneness was acute. Those of us working in Australia at that time depended on the occasional visit of an American company to see what the dances we were reading about actually looked like. Classical dancers and choreographers were better off. A much longer tradition, which included Adeline Genée and Anna Pavlova, brought the Ballets Russes to Australian cities in the 1930s. Within a decade, Helene Kirsova in Sydney and Edouard Borovansky in Melbourne had established companies. At the same time, the expressionist dance of central Europe came to Australia. By 1939 Gertrud Bodenweiser had established her school in Sydney, and Hanny Kolm (now Exiner), a member of her company, had joined her friend Daisy Pirnitzer in Melbourne to teach and perform. It was this school in Melbourne which introduced me, still a schoolgirl, to the new modern dance in 1940.

Creative climates

Few of us in the 1940s and 1950s had the resources to travel overseas. The ballet world provided more scope for an exceptional talent. Most of our early choreographers had their first experiences in London: Robert Helpmann, for instance, and Laurel Martyn and Dorothy Stevenson, who both created works for the Borovansky Ballet. But Martyn's Ballet Guild, established in 1946, was a major contributor to the growth of choreographic awareness, at least in Melbourne. Laurel herself created many significant works that used Australian dancers, designers and musicians in ways not previously open to them, and the convergence of these various artists resulted in a kind of 'creative broth', producing an innovative company with high standards of performance and a considerable degree of public support.[4] Diaghilev's Ballets Russes and Marie Rambert's company in the United Kingdom are similar examples. Indeed, van Praagh's artistic growth and her lasting interest in the development of Australian choreographers stemmed from the varied group of dance artists who made up the Rambert company. All these influences shaped my own thinking and finally had a bearing on the 'Legacy of New England'.[5]

Our research over the past few years has provided insights into the way in which these creative periods became breeding grounds for significant discovery and innovation. From artists like Merce Cunningham, William Forsythe, Lloyd Newson and Pina Bausch, who

have been central to the creation of similar systems, it seems that the talent for making dances goes hand-in-hand with another more elusive talent: that of inviting and harnessing the creativity of other like-minded individuals. These, then, are the matters that have been in my mind since the Ausdance Biennial Conference in Perth in 1991.

New frameworks of thought

Like many other dance artists and scholars who write about dance, I have constantly sought words adequate to the task of conveying something of the dance experience and why so many of us are passionately committed to the art form. How to describe that fleeting moment when the intractable body is heedless of one's will and limitations and seems impelled by some transcendent force? How to find the right metaphor to illuminate the creative process in dance? Where do choreographic ideas—which are often unannounced and frequently surprising even to the artists involved—come from?

Many similar questions are explored in contemporary theories of mind and body, creativity and consciousness, and in the writings of a new breed of philosopher-scientists, 'the new humanists', who seek to understand our world in ways not known or understood in earlier times. 'They are not reducing the humanities to biological and physical principles', says author John Brockman, 'but they do believe that art, literature, history, politics—a whole panoply of humanist concerns—need to take the sciences into account.'[6] I find this idea enormously appealing and I can finally place my perception of a 'creative broth' in the context of this line of contemporary thought.

The image of a 'first human' watching with awe the mystery and wonder of the night sky is not different in kind to that time in all human adolescence when an awakening consciousness blends childhood curiosity and imagination with adult questioning and doubt. Neither proof-oriented reasoning nor mythic explanations are likely to satisfy a questing modern mind, but the work of 20th-century physicists and evolutionary biologists does offer us a new framework for thinking about many matters that once seemed beyond understanding. In a language surprisingly fitted to describe choreographic processes, it has revealed a universe that endlessly generates novelty. The key concepts are time and emergence. An infinite kind of 'becoming' has replaced former views of our world as static, a kind of

giant clock in danger of running down.7 This different view of the world is a 'world of dancing energy and transient impermanent forms'.

These very things are the materials with which dance artists work; the stuff of which dances are made. Time and emergence are unifying concepts, and degrees of scale allow us to see patterns and structures as universal manifestations our brains have evolved to notice. For our remote ancestors, birth and death, the mysterious phases of the moon, seasons and cycles, storms and earthquakes were powerful manifestations of forces that needed to be cajoled or placated. Ritual and magic were part of the storytelling, music, paintings, poems and dances in which tribal beliefs and understandings were passed through the generations.

Led by thinkers such as Francis Bacon, Isaac Newton and Gottfried Leibniz, the 17th century set our species on a new journey of the mind. We should not be surprised that contemporary theories arising from the natural sciences and other great branches of learning are ever more open-ended and constantly evolving, and that in many ways the 'consilience' or unity of knowledge proposed by biologist Edward O. Wilson has implications for all branches of human endeavour, including the arts, ethics and religion.[8] Indeed, the words 'evolve' and 'emerge' are now common parlance in the dance studio, or whenever artists gather to discuss processes and consider where a current investigation might lead. I think these ideas can provide us with a new framework for thinking about how dances are made, especially within a collaborative ensemble, as is now common in contemporary dance wherever or whenever time allows it.

Two bodies of investigation have provided the language and imagery to make this possible. First, the powerful ideas embodied in the processes of (biological) evolution as conceived by Charles Darwin, and traced over immense periods of time. Second, the related theme of the emergence of order or structure from complex adaptive systems. Taken together, these concepts point us far beyond any simplistic 'survival of the fittest'. It is, rather, a question of how *ideas* evolve, and why certain ones succeed in seeding new and useful ideas where others do not.

Charles Darwin's 'dangerous idea'[9] about the evolution of species can also illuminate the evolution of ideas in creative processes. Richard Dawkins, a distinguished evolutionary thinker of our own

time, coined the word 'meme' for the cultural analogy to the biological concept of the gene. He proposed that our ideas, beliefs, values, actions and patterns of doing things are conceived in mind-processes, just as genes are conceived in biological processes. The meme in this theory, however, is replicated not in biologically defined cells but in the minds of individuals and groups. Memes, Dawkins said, are also subject to variation, and to selection and replication, according to adaptive pressures.[10] Adaptivity can be thought of as a system's capacity to adjust to changes in the environment without endangering essential elements, and to evolve from local interactions into a coherent whole. 'In this theory complex wholes and forms emerge from simple elements and in self-organising dynamical systems structures emerge from chaos'.[11]

Dawkins' idea of the meme can encompass many things: a unit of culture, a pattern, a poem, a way of building a canoe, spinning a thread or a yarn, making a dance, or embellishing a particular style. An idea nurtured in minds and bodies is passed from one to another by a process of variation (embellishment or modification), selection (chosen or remembered), adaptation (editing, or elimination). The ongoing evolution of dance ideas, or memes, is central to the choreographic process. Processes involving both thought and action unfold in time. Substantial achievement is the result of the blossoming of ideas, the selective success and further evolution of some of these, and the dying away or editing out of others. At some point, perhaps determined by lack of time or economic pressures, the choreographer or director will be obliged to pronounce the work 'finished', even though he or she and all the performers may know that the potential has only just been glimpsed, and now will never be realised.

Emergence is the name we give to the ongoing results of such processes. The words 'evolve' and 'emerge' are part of a language we already use to describe what we see in the studio on a daily basis. Arising naturally from consideration of these is the second powerful idea provided by these new philosopher-scientists, that of complex adaptive systems. Its basic premise is that the world as a whole might be understood as interrelated and relational, rather than predetermined by fixed laws of nature. This, for a scientist, does not mean that atomism and reductionism are not useful, but it means that they must be understood in a more subtle and complex way than before.

We cannot understand the delicate balances in nature by examining one fox or one rabbit; all of nature is dependent on the delicate balances existing in the huge complexity of factors that decide which population is in ascendance at any one time. It is not necessary for me to explain this to an ecologist; the relationships and interactions between living organisms and their natural or developed environment are a given.

By viewing the community of creative minds present in a dance ensemble as an adaptive dynamical system, we can see how we might advocate a more realistic framework for the creation or evolution of new work—perhaps over a longer period of time to allow the choreographer and the dancers to find the balance they need for new movement-ideas and innovative structures to emerge. The wider implications of this are immense. In her book *Dynamics in Action*, philosopher Alicia Juarrero reminds us that 'A universe in which certainty is possible must exclude novelty and individuation. Complex dynamical systems, in contrast, teach us that change, novelty, creativity and spontaneity are the real laws of nature'.[12]

The productive nurturing of such a system has become a luxury unavailable to almost every dance company and small group in Australia. The waste and frustration it brings is a tragedy for the art form and its practitioners and audiences. The idea of the dance ensemble with its various skills and talents, personal histories and ongoing processes as a complex dynamical system, allows us to see that it is indeed an ecological one, dependent for its artistic outcomes on a balance of interacting relationships in all their variety and complexity.

Such a system is sustained by its ability to adapt, to cooperate, to deal with ideas that are generated by group processes. There are two central questions relating to complex creative systems such as a dance ensemble, a theatre group or a jazz quartet. First, what kind of complex systems can evolve by accumulation of successive and useful variations? Secondly, how do we understand emergent novelty or emergent order in any evolutionary process?' An answer proposed by biologist Stuart Kauffman of the Santa Fe Institute is 'that complex systems constructed so that they are on the boundary between order and chaos' are those best able to adapt by mutation or variation and selection.[13] Writers and thinkers who see the connections between evolutionary theory and dynamical systems also propose that these

questions apply to such entities as galaxies, solar systems, populations, societies, groups and human brains.[14]

Reflections on the case studies

In our research it has become evident that complexity, order and disorder, and—eventually—structured design, can evolve in dance making where the relationship between the choreographer and dancers is one of mutual respect based on skills and experience, and is fluid, open and cooperative. This also makes it an interesting model for investigation in other disciplines where such relationships are both desirable and possible. The technology that allowed us to record high-quality moving images of the day-to-day activities in the studio shows clearly how this process works. In the past, movement vocabularies, structures and forms with vast quantities of related information have been lost because dance had no simple means of notation such as has existed in music for centuries.

As a choreographer in the 1960s and early 1970s, I saw how greatly dancers were influenced by observing one another, especially in processes that involved improvisation as a tool for investigation. In an era when few means existed for recording the development of processes over time, this was a major factor. Movement ideas and subtle rhythms and textures were progressively enhanced as dancers contributed some aspect of their own unique qualities of physicality and expression. During our recent research these potent combinations of imagination and skill, the inextricable connections between mind and body, were again observed in the studio, but this time the video camera captured and held the evidence for our reflection. 'Enchantment, absorption, modification, re-creation; and yes, a kind of evolution—a movement subtlety seen in one dancer appeared in the body of another, changed, often extended or transformed by the individual length of an arm or leg, a subtle shift of focus, a sudden stillness, an inclination of the head, perhaps a radical recasting of the rhythmic tensions'. [15] This process was duplicated on a daily basis in the Unspoken Knowledges research.

What emerged under our eyes was something we can now recognise as a complex dynamic system, one in which many levels of thought, action and interaction grow or evolve over time. These interactions sometimes resembled those of social exchanges, as dancers

and choreographer discussed the associations and implications of a particular idea or image. We can trace in the video and other documentation how tentative beginnings became complex explorations, and how these influenced the imaginations of each dancer. Throughout the research the choreographers and dancers kept notebooks, journals and records in a variety of media. These have all been available to the researchers in addition to their own observations. Under the guidance of the choreographer, individuals transposed sensations, feelings and images into patterns of dance movement—patterns composed of the tensions, releases, stresses and shadings that constitute physical action. These processes seem to draw on the instinctive connections between perception, imagination and action described by a developmental psychologist working with young children. She offers an insight into their complexities:

> There is no separation of mind from body because there is no sense in which the mental is abstracted from the material. All is process, all is emergent. Consciousness, imagination, beliefs and desires are co-equal with reasoning and language, and all are as much a part of human neural activity as is movement or perception. [16]

If this is true of a single individual how much more complex is the system which constitutes a small community of dance artists, musicians or scientists? The exchange of ideas in any medium between small groups of humans, of whatever age, can be seen as both dynamic and evolutionary. The crucial element in such a system is time. Information about such a process is relayed as much through facial expression and bodily gesture as it is through sound or language, written or spoken. Dance is blessed: it has all of these available for creation.

Keeping these ideas in mind, let's look again at the notion of adaptive behaviour. One of the dancers working with choreographer Anna Smith on *Red Rain* commented on the amount of movement information the dancers had had to absorb. When the choreographer began to structure the material into complex layers and sections she felt it was an overload of information. She struggled to internalise both the semantics and the syntax or structures of the new 'language'—to locate in her own body a new kinaesthetic sensibility

Anna Smith (back to camera), from L to R: Kathleen Skipp, Hannah Panelli, Deirdre Stewart, Nicole Steven, Tamara Steele.
PHOTO: ANNA SMITH

in the movement-pathways and relationships. The choreographer, with a different perspective and a different responsibility, now conceived this material partly as extended sequences of movement, which needed to be brought into a coherent whole, and partly as material which found its own form. She wrote in her journal,

> On Friday I had a great rehearsal; I think I passed through a difficult stage. I always feel as though I am over-anxious to know the work, what it is. But it is not alive yet so how can I possibly expect to know what it is? It has to breathe its own existence, and I have to be patient, to allow it to evolve itself. The work is an organism, which creates its own body, so to speak. Does this make sense? Perhaps I understand the dilemma much better now. [17]

This statement suggests that the choreographer is waiting for the dance ideas to appear and to find their own form—to 'self-organise'. It is a familiar phenomenon to artists and scientists, and in theories of

creativity, where concepts of preparation, incubation and illumination characterise creative processes. In dance, the formal structuring of the overall design may also be 'discovered' in this way and shaped or enhanced by aesthetic considerations. It is this view of the whole that plays a significant role in the communication of meaning.

It is in the relationships between the parts, the parts and the whole, and the ways in which these are constructed over several timescales, that dance shares with music the non-literal ideas that inform compositions in time. Subtle dynamic shadings, tensions and releases, rhythmic patterns and counterpoints are the stuff of which dance phrases, motifs, themes and variations are constructed. The stillness that makes us notice the slow turn of a head is similar to the silent pause that emphasises the delicate musical passage that follows. These simplicities and complexities seem to carry meaning because our experience tells us that they carry meaning, and often an intention to communicate. Susanne Langer wrote, ' … whether a gesture has linguistic meaning or not, it is always spontaneously expressive by virtue of its form: It is free and big, or nervous and tight, quick or leisurely,'[18]. Langer called these contrasts 'an image of dynamic life'; elite composers or choreographers are masters of just such forms and images. The search for meaning is often resolved when the right form is found.

What can dances communicate?

Many sequences from the dance works *Quiescence*, *Red Rain* and *Not Entirely Human* [19] are examples of the concepts discussed. Without music or an explanatory text, the movements reveal a range of qualities and images inviting interpretation. Whatever our personal responses, it is hard to deny the 'expressiveness' of the images. In *Not Entirely Human*, the choreographer has used an extraordinary costume to enhance aspects of animal and human life. [20] These themes dominate a dance that is tantalising in its subtle exploration of animal and human behaviour.


http://www.mup.unimelb.edu.au/ebooks/0-522-85144-4/videos.html#NEHRhino

It can be said of *Quiescence* that the movement material is mostly in a 'minor key'; that the repetitions of reaching, falling, slowness, turning away and shutting out—mostly manifested in the upper

Michelle Heaven
PHOTO: JEFF BUSBY

torso—suggest a palette of feeling which is consistent in the sections in which it occurs and recurs. In striking contrast is a sequence with elastic 'wires' stretched in silvery strands across the stage space. Here the choreographic invention is in passages of extreme busyness, of agitation, scurryings and flutterings and a certain chaotic urgency. It is noticeable that feet and legs are used with clarity and precision, and often in unison passages against a solo dancer. Whatever an individual observer might make of these qualities, it is clear that there is an intention on the part of the artist to communicate something of significance.

http://www.mup.unimelb.edu.au/ebooks/0-522-85144-4/videos.html#Quiescence

The projection of a moving image of a solitary eucalyptus tree at the beginning of the work has revealed in brief close-up the teeming insect life nurtured by its branches. And perhaps this is enough for those who like to imagine their own scenarios or simply take pleasure in the skill of the dancers. Others may want to know more about the choreographer's intention; a matter addressed in the second research project *Conceiving Connections.* [21]

Performers: Deidre Stewart and Jade Duffy
Photo: David Price

In the making of a dance, it is the relationship between bodies in space and events in time that is central to the artist's thinking. It is not the parts but the relationship between them, and the relationship between parts and whole, that enables the emergence of meaning. The search for form is also a search for meaning. Connections with the experiential worlds of both maker and audience are most often found in the universal patterns and structures common to all cultures and all times.

Conclusion

In my readings of the more accessible literature on new evolutionary theories I am struck by the ways in which structure and the seeking of order out of chaos have become pervasive concepts. Structures and patterns in both space and time frame and order our world, and we have evolved complex neural systems that notice them. It appears that our propensity for noting or searching for patterns is also part of our innate humanness. We are a structure-seeking species, creatures who seek to understand the world by identifying its features. We look for patterns that our minds are able to grasp. In order to understand the

world we recast it in simpler, more recognisable forms. In his book, *The Philosophy of Modern Art,* written half a century ago, Herbert Read wrote,

> I believe that among the agents of human evolution, art is supremely important. I believe that the aesthetic faculty has been the means of man first acquiring, and then refining, consciousness. Form, the progressive organisation of elements otherwise chaotic, is given in perception.[22]

The elucidation of order out of chaos is a major theme of this chapter. Read's conception of form as the progressive organisation of elements otherwise chaotic has been with us for decades, a given in human consciousness. The dynamical system, which I have suggested is at the heart of richly evolved dance making, can be seen as an example of such a process in action. It is also a constant in human affairs; perhaps an innate adaptive mechanism for the survival of the species. Ritual, ceremony and magic were early human responses to the mysteries of existence. All were embodied ideas or knowledges enacted to influence potent powers and forces beyond human understanding or control. They also served as a means of passing life-sustaining values and beliefs to future generations. In many ways the evolutionary and dynamical systems on which these processes depended can be perceived as self-organising activities.

In this kind of scenario, the choreographer can be seen as a modern descendant of the shaman. In the examples we have studied in this research she is many things—conceiver, creative thinker, teacher and learner. In her role of initiator and arbiter of structures, this choreographer is sometimes at the head of a centralised system; sometimes part of a more distributed system in which the thoughts and actions of individual artists contribute to a coherent and potent whole. Human cooperation harnessed in this way requires all parts of the system to contribute to the ongoing creation in whatever capacity is productive of positive outcomes.

The social and cultural forces that shaped human evolution have been reliant on similar processes. I suggest that education and learning in any field, and especially in the performing arts, are equally so. The potency of a community of creative minds may well be an impetus for

further research in our tentatively connecting disciplines. I believe it has shown how it can connect many lines of thought and action, and advance the emergence of new directions for exploration and research.

Endnotes

1 Zukav, *The Dancing Wu Li Masters*, p.177.

2 The National Library of Australia holds records of these events which have also been reported in Brysha, 'The Legacy of New England', pp.25–27; Potter, 'The Armidale Summer Schools', pp.15–18; McKechnie, 'Voices from Australia: A tribute to Peter Brinson', pp.31–48.

3 The Ausdance Dame Peggy van Praagh Memorial Address http://www.ausdance.org.au/outside/resources/pvpaddress.html

4 McKechnie, 'Australians Making Dances: The spatial imperative', 1991.

5 Brysha, 'The Legacy of New England', 1984, pp.25–27.

6 Brockman, *The New Humanists: Science at the edge*, 2003, p.7.

7 Heylighen 'The Science of Self-organization and Adaptivity', p.3.

8 Wilson, *Consilience: The unity of knowledge*, 1998.

9 Dennett, *Darwin's Dangerous Idea*, 1995.

10 Dawkins, *The Selfish Gene*, 1989.

11 Stevens, McKechnie, Malloch, Petocz, 'Choreographic Cognition: Composing time and space'.

12 Juarrero, *Dynamics in Action*, 1999, p.258.

13 Kauffman, 'Order for Free', 1995, pp.334–335.

14 Smolin, *Life of the Cosmos*, 1998.

15 McKechnie, 'Movement as Metaphor: The construction of meaning in the choreographic art', 2002.

16 Thelen, 'Time-scale Dynamics and the Development of an Embodied Cognition', 1995, p.74.

17 Anna Smith's daily journal for the creation of *Red Rain*, 1999.

18 Langer,, *Feeling and Form*, 1953, p.175.

19 All three works were commissioned by the Unspoken Knowledges research project.
Red Rain (1999), Choreographer: Anna Smith in collaboration with the dancers.
Not Entirely Human, (1999) Choreographer: Sue Healey in collaboration with dancer Michelle Heaven. *Quiescence* (2001) Choreographer: Anna Smith in collaboration with the dancers.

20 http://www.ausdance.org.au/unspoken

21 http://www.ausdance.org.au/connections

22 Read, *The Philosophy of Modern Art*.

7

In the Air: Extracts from an Interview with Chrissie Parrott [1]

Interviewer: Shirley McKechnie
Edited and introduced by Michelle Potter

Introduction

In 1993, commenting on the relationship between the development of artistic ideas and the development of technological ideas, American dancer and choreographer Merce Cunningham said … :

> [T]he work of James Joyce, for example, goes from paragraphs, to sentences, down to words—and now to words themselves separated, so you don't have even a whole word, you just have part of a word. And that is quite apparent—and seems to me quite reflected—in our technology. That doesn't mean that they [Joyce, Eliot, etc.] did it because of technology. It just happens that those ideas are in the air. Technology is full of this … the electronic system where they cut things so fine … . [2]

Placing Cunningham's associations between technology and literary endeavour in a choreographic context, technology may suggest to the dance artist how movement might be broken down and

re-patterned. Cunningham himself has spent his lifetime investigating new ways in which movement can be generated and pieced together, in particular so that the choreographer's 'psychological preferences' are removed.[3]

One of the recurrent themes emerging in interviews with Australian choreographers and dancers, especially those interviews conducted over recent years for the National Library of Australia's oral history program, has been just that feature of technology recognised by Cunningham: its inherent capacity to slice, cut, separate larger components into smaller ones, and the consequences of then re-ordering the parts.

This impact of new technology on the conceptual and practical activities of Australian choreographers turned out to be the single most important focus of a series of interviews conducted by Shirley McKechnie in 2003 as part of the Conceiving Connections project. In collaboration with the National Library, McKechnie interviewed seven Australian artists, Sue Healey, Michelle Heaven, Margie Medlin, Chrissie Parrott, Anna Smith and, in a joint interview, John McCormick and Hellen Sky.[4] Each of these artists has been recognised by his or her peers as leading the way in the creation and development of connections between dance practice and new technological procedures. These procedures have included the use of film and video technology, and the use of computer software to generate movement.

This article focuses on just one of those interviews, that with Chrissie Parrott. The chance occurrence of the phrase 'in the air' in both Cunningham's comment and in the Parrott interview gives the article its title. That the occurrence is unintended would please Cunningham, much of whose choreographic output has been generated by chance procedures. Its appearance in the Parrott interview draws the reader into one of the most thought-provoking ideas to emerge from her interview: the potential for technologically-driven dance outcomes to influence choreographers and audiences by putting a particular movement aesthetic 'in the air'.

The verbatim transcript of the audio interview has been edited to fit the guidelines of this e-book. It has been shortened considerably and many of the questions posed and remarks made by the interviewer, McKechnie, have been removed. In the interests of readability, some of the text has been formalised slightly from the conversational

style, and there has been some minor rearrangement of the conversation. For research purposes the full interview, TRC 4959, is available both as an audio item and as a transcript of interview through the National Library in Canberra, or through institutions with which the National Library has an inter-library loan agreement.

Chrissie Parrott's professional dance career began in the 1970s when, aged 19, she joined West Australian Ballet. She made her first choreographic work, *Like Hiroshima: Just Another Fallout*, in 1976. Her first commissioned work, *Catherine's Wedding*, was created in 1978 for West Australian Ballet. Chrissie Parrott left Australia in the late 1970s and spent the next years in Europe, developing her interest in and knowledge of contemporary dance. She danced with Tanz Forum in Cologne and was commissioned by the company. She also created experimental works in London and France.

Chrissie Parrott returned to Australia in 1986 and formed the Chrissie Parrott Dance Collective, later renamed the Chrissie Parrott Dance Company. For this ensemble, Parrott created more than 30 works. Other commissions in this period came from West Australian Ballet, Australian Dance Theatre, and several companies located outside Australia.

Her interest in technology as a tool for choreographic investigation began in the 1990s. Since then her work has been informed by a variety of technological developments including magnetic motion-capture technology and the software program Life Forms, developed at Simon Fraser University. Chrissie Parrott's involvement with these procedures is the focus of this interview extract.

The Interview

Growth of Interest in Technology

CP: Back in 1996 when I still had Chrissie Parrott Dance Company I started to get interested in film. That came about just after the ABC had done one of their first pilot projects, *Seven Deadly Sins*, which I'd been involved in.[5] I got a lot of pleasure out of that whole process and decided that it was about time that I started to get involved in filming my work at a creative level rather than just an archival level. However, because of the company winding down at that stage there wasn't support from the board or money to do those sorts of things. So what was

happening for me was that I was starting to look at my own future as a choreographer beyond the life of the Chrissie Parrott Dance Company.

I had suggested at that stage to my board that we have a look at moving into technology and nobody was ready for it. It was kind of an interesting time but I was not able to convince them, for some reason, that it was the way to go. I really believed at that stage—and it's quite interesting that we go back to this now because I'd almost forgotten it—that, because the government wasn't supporting the company as a live performance company, I was looking at ways of saving us. It was getting impossible for the government to conceive why we should exist and why we should travel.

One of the ways I thought we could save ourselves, and keep our audiences, was to put things either into film or onto television and send [them] to the northwest of Western Australia—rather than having to take my company, with crew *et cetera* (twenty people) all the way to the northwest to perform to a handful of people. So I thought, 'Well, if we can put this into an electronic sensibility I can send that film up there, get the people interested, and then follow up by bringing the company on tour the following year'. So it was a way of me addressing audience development in my own particular way. But also trying to deal with the fact that the funding wasn't going to be there for touring. That was one of the things that prompted me to go in that direction.

Often during that time of the company—and I still hear it ringing in my ears— people would say, 'When you're touring to the country we need to make the work really accessible'. Now, I have a problem with that, in that those people in Broome or in Geraldton or right up in Karratha watch the same movies that we watch that come out of Hollywood. We don't make special films for that audience, so why should we make special dance or special theatre for that audience?

The company did fold down, and I was offered this situation at the Western Academy of Performing Arts as a research fellow. Even though I was funded by Arts WA they placed me at the Academy of Performing Arts. The first six months I spent researching. During the process of research I found a number of websites and one of them was MEDIALAB in Paris.[6] I started to realise that there were some other beautiful technologies that were just emerging and I got very

excited about magnetic motion-capture technology, which at that stage was really incredibly cutting-edge stuff and very, very expensive. And I went looking for some sort of support to see whether there were any opportunities for us to set up a motion-tracking studio in Western Australia.

Motion-capture Technology

CP: There are a number of different types of motion-tracking, but magnetic motion-tracking utilises a 'data suit' that a performer wears, which has up to sixteen sensors embedded into it. They then send signals into a small backpack on the performer's body. That in turn sends signals into a magnetic box, which picks up the coordinates of where that person is in space. They're three-dimensional coordinates of every single joint of the body. So that in real time what happens is that, as soon as those coordinates are picked up, they are sent through another series of sensors into the computer interface. The computer actually reads it in real time.

Those coordinates are visually represented on a skeleton that's been built or on a 3D model. But in its most basic form it's just a skeleton that has been sitting literally motionless in the computer. When the right buttons are pressed that information then activates the skeleton in real time and *it* moves as the dancer moves. For me that was absolutely fascinating, because what it meant and what it does mean is that you have a digital 'puppeteering' situation where the dancer becomes the puppeteer for a 3D model.

The implications are huge: say, enhancing dance for film and taking that aesthetic towards a younger audience who are now used to that aesthetic which they see in their arcade games. So again that's where my sense of audience development came in. It's a real consciousness about that. It's not just about playing with the tools for my own needs. It's actually about approaching the younger audience, or even the middle-aged audience who are now used to that aesthetic, and bringing them back into the poetic side of the imagery.

Initial use of motion-tracking

CP: Then, in 1998 I was approached by the Adelaide Festival, by Robyn Archer, to see whether I'd like to propose any kind of event for them. I'd worked with Robyn in the past. We had a professional relationship

developing there. I said to her that I would like to have [an attempt] at creating a dance film made with 3D models and using motion-capture. So they gave me some seed funding, which, as well as the grant that I had, allowed me then to actually travel to MEDIALAB. I went to Paris and had a look at their motion-capture studios.

When I got to Paris they were already way ahead of our thinking. They'd already developed a real-time 3D character who was presenting on television every night at 6pm doing live interviews with sports people and politicians. Her name was Cleo, and she had a big fan club. At six o'clock every night, people would turn the news off and have a look at Cleo interviewing. Anyway, they allowed me into their studios. They actually allowed me onto the floor with them, and I wore the suit and I did some digital 'puppeteering' with them as part of my research.

Then I returned to Perth and approached Robyn and said, 'I would like to now take this to the next stage and make a film'. They agreed to that, with the proposal [involving a] second stage twelve months later to develop it further into the real product. But interestingly, although there was a successful presentation at the Adelaide Festival, between then and now there hasn't been anybody who's really jumped on the concept of magnetic motion-capture and how it can enhance dance.

S. McK: I wonder if this is a point at which I might just read something from the website from the Adelaide Festival of 1998:

> Chrissie Parrott, one of Australia's most visionary and widely recognised choreographers, will present a series of lectures in which she demonstrates her findings on the implications of Magnetic Motion-Capture Technology within the realms of performing arts. Chrissie has collected raw data of her own choreographic phrasing, utilising the magnetic body-suit. This data has been caught on video and simultaneously rendered by technicians at the headquarters of MEDIALAB, Paris, the most advanced users of this technology. Each one-hour, audio-visual presentation gives a rare insight into the world of cutting-edge research that ultimately will lead to a grand spectacle of

> fully rendered, real-time dance performance. Still only on the drawing boards of major exponents of media and entertainment industry in other major cities of the world, Chrissie Parrott is at the leading edge of this 21st-century frontier.[7]

CP: What happened after that was we then did our second pitch, which was to create a dance film with eight dancers. Because the technology is very expensive, we would have hired the suit and brought it out—you can actually pack those suits up into a small box and fly them. The magnetic box is heavy but you can fly it around. It's called Flock of Birds in fact. We could have done it quite easily. For [the presenters] it was a very expensive piece of entertainment. It would have cost hundreds of thousands of dollars to make this short, 20-minute film. But it would've been great. I'm the ultimate optimist when it comes to this opportunity. I'm still working through it, because I really have a belief that the technology can bring that aesthetic, that performance aesthetic, to the young audiences.

Use of Life Forms

CP: Then I was approached through the Australia Council to attend a workshop in Sydney, which was to teach us Life Forms, the Life Forms technology.[8] Although Life Forms has nothing directly to do with magnetic motion-capture it was still a tool to enhance performance and choreographic development. So I thought, 'Well, look, okay, I'll go towards Life Forms, which is really what I've been involved in since then. I went to Sydney and Iris Garland from Simon Fraser University came over to teach six choreographers and I was one of them—a four-day workshop that would give us the skills to then further develop our consciousness of that work. I haven't really looked back. I've been teaching Life Forms and I'm still teaching it and I sell the product.

I've made eight major works through Life Forms. But they've not necessarily come from me sort of with this great urge to make the work. I've used it sometimes only as a starting point. The latest piece, which I found the most satisfying, was to try and make an immersive work by using three lots of scrims and four, or five—we started with five—projectors that projected onto the bodies of the dancers, but also projected the 3D characters onto scrims. So I made an interactive

dance company on stage. Okay, now that for me is really interesting because I find that when you're using high tech and low tech together to create the sort of visual arena, it's totally immersive and it's beautiful. It's not just a two-dimensional image of a 3D idea. So that's probably the closest I've gotten to being really satisfied with using Life Forms[9]

It does have a lot of restrictions, Life Forms. It's not a pure sense of enjoyment when you use it, because it actually has some restrictions within the program. I could go into detail. It could take a lot of time, though. But, for example, the pelvic area of these little bipeds—if you click on that pelvis by mistake the little figure will just fly around the screen. It's very hard to control it, because the pelvis is the centre of gravity, which means that when you're developing movement on that little character you can't move the pelvis independently. So you don't get any kind of hip swing or pelvic movement, so it becomes quite a static character. The arms and legs move around the pelvis. I know that some of the choreographers, for example, who worked on that workshop with me won't use it because they find that too restrictive. So it's not the most amazing tool in the world. The interesting thing is that through Life Forms I've now been steered by other forces back into magnetic motion-capture.

S. McK: I was going to ask you just specifically, was it your growing interest in the technology for its own sake, or did you see Life Forms as enabling you to do something you wouldn't otherwise be able to do?

CP: One came from the other. What it's done, just going back again, is that the aesthetic that those bipeds create is becoming more and more familiar [to] people now —almost surreptitiously. I can see in other people's work an aesthetic change that has been informed by this technology, even though they haven't been directly involved in that technology themselves, because subtly our aesthetic eye is changing. It's almost like we're evolving into this new aesthetic.

S. McK: It's a very interesting point you're making because in Melbourne, as you know, through Chunky Move and the work of people like Phillip Adams and even Lucy Guerin, but particularly Phillip Adams and Chunky Move, there has been evolving the kind of

thing I think you are referring to. The explanation of it has always been that this is derived from the ballet lexicon, fragmented and differently changed, and you could accept that too. But what you're saying also has resonance and I think it's probably an influence.

CP: They've all informed each other. That's why it's a very exciting time, because we are subtly getting used to this other aesthetic and starting to really enjoy it. It's about that sort of disembodiment too, and the detachment from the narrative. I mean, I think there's a point where we explored movement at a particular level through the 60s, 70s and early 80s through improvisation, for example. We kind of got used to that and almost got over it.

Now this is a new sort of development, in the sense that some of those choreographers that you've mentioned, whom I've had a little bit to do with here, there and everywhere through workshops and things, use the body in a kind of detached format. They might choreograph something and then cut and paste the arms onto the legs or the lower part of the left leg onto the upper part of the right arm, which is exactly what you can do with this technology. They may not have directly used the technology, but they use the concept of what you can do. Whereas with somebody like Billy Forsythe, he started to develop the deconstruction of the ballet technique himself from whatever direction he came from. So those two things have collided, I suppose, and started to form this new sensibility, which is quite beautiful. I really enjoy developing work that way as well, just by cutting and pasting different parts of different phrases onto the body. I've noticed in process that even Anna Smith, for example, people like that, are starting to do that almost unconsciously. I see it as coming from them.

S. McK: Well, it is certainly in the air and it's certainly very much the case in Melbourne.

CP: It's an aesthetic. I mean, our young, our five, six, seven, eight year olds are watching programs on television that are created with motion-capture technology or through key-frame animation. So the characters seemingly move in an organic fashion. But if you really analyse and have a look at them, they're not moving organically at all.

So the aesthetic is changing. Again that's where I get excited about the potential of bringing that back into the schools and towards the younger audience.

Future Directions

CP: Then the most wonderful thing happened, really. Only just over a month ago I got a phone call from the Film and Television Institute in Western Australia, who are now affiliated with the Australian Film and Television Institute, saying that Ramon Rivero was coming. Now, Ramon Rivero is an amazing person. He's actually an architect, but he ended up being the digital puppeteer for all the *Lord of the Rings* film work. He did Gandalf, he did Gollum, he did the big troll in the first piece, *The Fellowship of the Ring*. In the second piece, *The Two Towers*, he was puppeteer for three or four characters. Now, Tom Lubin, who is the director over there of FTI, as we call it, said, you know, 'I know you're interested in motion-capture. I'm really interested in motion-capture. Let's get this person here. Let's get an audience'. So we worked on developing a situation for him to come and he came. He's really excited about doing projects with me and wants things to happen. He's got the right accent and the right kind of charm, you know, to get the money, I'm sure, to set up a studio somewhere in Australia. So there's something in the air for sure.

S. McK: Chrissie, in all this period you've been describing, although it's a relatively brief period—like 1996 we started, and we're only three or four years down the track—but it seems to me that the network that you've established, the network of people who are interested in similar technologies and similar aesthetic outcomes, if you like, has been enormously important.

CP: You know, for me that's really fascinating as well, because often in the dance world you can get caught up in the dance world and tend to stay within those boundaries. But because of this technology I found myself meeting people in television, film and other areas of entertainment who are really excited about bringing that technology back into the creative realms rather than just the commercially viable top-end stuff.

What I'm thinking while you're talking to me also is that the work that I really enjoyed doing when I had those opportunities then was

theatrical work. So, in a sense, the choreography was always embedded in the greater picture. So in a way that hasn't really changed, because I really enjoy the setting that the dance is in, rather than just the dance for the sake of the dance—as opposed to other choreographers who might be interested just in the formulation of movement. So I'm just a theatrical girl.

I think really what we've been discussing today on this tape is just the potential that the new technology has to enhance a particular type of work; that dance can very happily become a part of that new digital vision. It doesn't have to feel that it's either too expensive or too far away from us. The technology redefines the principles of space and time that we've always looked at as choreographers, and we will continue to look at that, but it helps us redefine them and it helps us redevelop those ideas.

Endnotes

1 Conducted March 2003, National Library of Australia, Canberra.

2 Quoted in Thecla Schiphorst, "Merce Cunningham: Cyber Dances with Life Forms", http://www-personal.umich.edu/~marchant/XPoseDance/Thecla%20Folder/thecla.html

3 Cunningham used the phrase 'psychological preferences' in a forum discussion, 'Music and Dance and Chance Operations', recorded by radio WFCR, Amherst, Mass., on 16 February 1970. Sound recording, MGZTC 3-934, Dance Division, New York Public Library for the Performing Arts.

4 All interviews were conducted between March and April 2003 and have been preserved and transcribed by the National Library of Australia. They have the following National Library call numbers:
John McCormick and Hellen Sky, TRC 4954;
Anna Smith, TRC 4955;
Sue Healey, TRC 4956;
Margie Medlin, TRC 4957;
Michelle Heaven, TRC 4958;
Chrissie Parrott, TRC 4959.
The interviews are available for research use through the National Library in Canberra, or through institutions with which the National Library has an inter-library loan agreement. Further information about the interviews and the artists involved is also available at the Australia Dancing website: http://www.australiadancing.org.

5 *Seven Deadly Sins*, produced and directed by Stephen Burstow and screened by ABC Television in 1993, consisted of seven short dance works made with seven contemporary dance companies. They were:

Lust choreographed by Graeme Watson with One Extra Company;
Avarice choreographed by Leigh Warren with Australian Dance Theatre;
Sloth choreographed by Meryl Tankard with Meryl Tankard Company;
Envy choreographed by Paul Mercurio with Australian Choreographic Ensemble;
Wrath choreographed by Chrissie Parrott with Chrissie Parrott Dance Company;
Gluttony choreographed by Kai Tai Chan for Sydney Dance Company;
Pride choreographed by Stephen Page for Bangarra Dance Theatre.
For brief notes by Burstow see 'Dance on Screen' in *Brolga*, 11 (December 1999), pp. 58–59.

[6] The MEDIALAB, Paris website appears no longer to exist. A directory of motion-capture companies published online in 1999 describes the organisation as follows:
Medialab is the world leader in real-time performance animation and offers a full range of creative solutions, technological innovations and production expertise to enable clients to create high quality 3D animated content for live or prerecorded TV programs. In 1989, Medialab pioneered the production of feature films and television series using its proprietary real-time performance animation system, CLOVIS PA. This led to the creation of Mat the Ghost, the first real-time cartoon character to run successfully for 3 years on France's Canal+. In 1996, Medialab produced the first ever 26-episode cartoon series using a mix of real-time and keyframe. The series, entitled "Donkey Kong Country," launched in the U.S. in 1998 and is Fox Family Channel's number-one-rated kids' animated show. Divided into four synergistic divisions, Medialab is a real-time animation studio, a visual effects house and a TV and feature film production and R&D house, jointly owned by Canal+, the European pay-TV giant, and NOB, a leading Dutch supplier of film and video services throughout Europe. Medialab's real-time virtual characters appear on networks in the U.S., U.K., France, Spain, Germany, Canada, Italy, Russia and Japan.'
Source: http://www.awn.com/mag/issue3.11/3.11pages/mocaproster2.php3

[7] http://www.adelaidefestival.org.au/red/timeline/1998/www.adfest98.telstra.com.au/misc/to79.htm [no longer active as at 09/02/2005]

[8] Life Forms is a software system originally designed for choreographers and animators. Its development began in 1985 under the direction of Thomas Calvert of Simon Fraser University, British Columbia. It is now used globally and by practitioners in a variety of disciplines. They include athletic coaches, robotic animators, aviation engineers, prosthetic designers, architects, gymnasts, skaters, avatar creators, and game developers.
Source: http://www.telusplanet.net/public/brthomp/technology.html

8

Observer Response to Contemporary Dance

Renee Glass

Introduction

Anecdotal accounts within dance literature have identified various responses to contemporary dance that include cognitive reactions such as interpretation and affective responses. However, there is little empirical research informed by contemporary psychological theory that has explored these responses. The present research empirically examined the qualitative nature of cognitive reactions and affective responses. Furthermore, the impact of dance experience and pre-performance information on such responses was assessed.

The experiments involved 306 participants who observed a 40-minute live contemporary dance work, *Red Rain,* choreographed by Anna Smith. Responses were assessed using the Audience Response Tool (ART), which consists of five sections and includes a series of counterbalanced open-ended questions and a series of closed questions measured on a seven-point Likert-type rating scale. Results confirmed anecdotal accounts that observers typically respond both cognitively and affectively. However, the impact of dance experience and pre-performance information was not considerable. It was suggested that perhaps people, when given the opportunity to reflect on their own experience with the work, enjoy being asked their opinion, and the freedom to interpret the work in any way they want. Perhaps

what is important is not being given pre-performance information, but the opportunity to reflect on one's own interpretation, understanding and connection with the piece.

Contemporary dance is defined in this research as a 'work in which the major medium is movement, deliberately and systematically cultivated for its own sake, with the aim of achieving a work of art' (Stevens, McKechnie, Malloch & Petocz, 2000, p.1).

The dance event, which has previously been described as a communication process (Hanna, 1979; Hanna, 1983; Stevens *et al.*, 2000), includes the creation of a particular work, its performance and observation. As such, three 'participants' are involved: the choreographer; the performer(s); and the observer(s) or audience (Hanna, 1979). This 'communication process' has received little attention within the literature, particularly the relationship between the performance of a work and the observer's response to the performance.

Contemporary dance is a multimodal sensory and perceptual experience, and an observer of contemporary dance is likely to experience visual, aural and kinaesthetic stimulation (Hanna, 1979; Mitchell & Gallaher, 2001; Stevens, Malloch & McKechnie, 2001). The extent to which an observer experiences the stimulation of these various physiological systems is in part established through the choreographer's deliberate and systematic implementation of various sensory elements. Such elements described by Adshead, Briginshaw, Hodgens and Huxley (1988) include individual movement-patterns, such as posture, gesture and locomotor movement; spatial elements, including the relationship among dancers; and dynamic elements such as rhythm, tempo, tension and force. Furthermore, a choreographer may deliberately accentuate various visual and aural elements, such as set design, costuming, props and lighting, sound effects, the spoken word, and music.

An observer of contemporary dance is immersed in a variety of complex sensory stimuli. Surprisingly, one of the least researched areas, and one that is ripe for psychological investigation, is how an observer perceives a dance performance, how an individual organises such complex incoming information, and how an individual subsequently responds or reacts to these sensory cues. The present research represents an attempt at partially answering these questions by exploring some of the ways an individual may respond to contemporary dance.

Anecdotally, various dance writers have acknowledged the presence of cognitive and affective reactions in observers. However, little empirical psychological work with ecological validity has assessed and examined the qualitative nature of such responses. Such responses include, albeit not exclusively, cognitive reactions, such as interpretation (Adshead *et al.*, 1998), and affective reactions (Hanna, 1979; Hanna, 1987).

Cognitive Interpretation

Cognitive interpretation involves recognising, ascribing and understanding character, qualities and meanings in a particular contemporary dance work (Adshead, *et al.*, 1998). While it is possible that an observer may deliberately choose not to 'make sense of' a contemporary dance work (viewing the art as non-representational), there are certainly observers who do seek to attribute meaning to the dance (viewing the art work as representational).

Furthermore, a particular contemporary dance work can stimulate a whole host of interpretations. Many theorists have acknowledged that art works can be interpreted in many ways. For example, Solso (1994) adopts an information-processing view of visual art cognition, and suggests that knowledge about a particular art work is based on two factors: the neural activity instigated by the observer's sensory experience; and the observer's cognitive background. According to Solso (ibid., pp.2–3):

> [O]ur knowledge about a particular art work is based on a stream of neural activity initiated by our sensory experience. However, art impressions are not limited to sensory experiences that excite receptor neurons of the peripheral nervous system. They also involve the observer's cognitive background, which gives such experiences meaning. Thus, the emotional/intellectual reactions you might experience when seeing a particular art work might be far different from someone else's experience of that particular art work.

Similarly, Kurtz and Schober (2001) suggest that thematic inferences in literature are generated by the reader's activity. They theorise that readers of a particular text 'go beyond the explicit information

provided, and use background knowledge to infer a theme … Meaning is [thus] produced by the reader's activity and is not the sole property of the text' (ibid. p.141).

Strategically, there are a variety of ways an individual may attribute meaning to a contemporary dance work (Adshead *et al.*, 1998). Interpretation may take the form of a narrative, whereby an observer perceives the work in terms of a storyline, or an observer may identify certain themes. According to literary theorists, a thematic inference differs from a narrative account because the interpretation is generally stated with no reference to specific story-elements (Kurtz and Schober, 2001). Furthermore, an observer may perceive the work as symbolic, or alternatively interpret it as depictive of 'pure' movement (Adshead *et al.*, 1998).

Little empirical research has been conducted to assess whether observers of contemporary dance interpret or attribute meaning to a particular work, or the extent to which interpretation varies among observers of the same contemporary dance work. The present paper represents a first attempt at mapping the kinds of sensory cues observers attend to and report as aiding interpretation.

Affective Reactions

It has been well established within the literature, and it is our common experience, that there is a strong relationship between emotion and the arts (Cupchik, 1994). According to Kleinginna and Kleinginna (1988; p.355):

> emotion is a complex set of interactions among subjective and objective factors, mediated by neural/hormonal systems, which can (a) give rise to affective experiences, such as feelings of arousal, pleasure/displeasure; (b) generate cognitive processes, such as perceptually relevant effects, appraisals, labelling processes; (c) activate widespread physiological adjustments to the arousing conditions; and (d) lead to behaviour that is often, but not always, expressive, goal-directed, and adaptive.

Within dance, few studies have examined links between emotion and dance, particularly contemporary dance. The basis of dance,

and therefore the principal sensory cue that observers are exposed to, is body movement. One theoretical explanation for affective response to body movement is sympathetic kinaesthesia (Stevens *et al.*, 2000). When an observer witnesses a dance, it is possible that he or she translates the visual stimulation from the dancer(s) into kinaesthetic and visual images of himself or herself performing the movements (Cadopi, Chatillon, Baldy, 1995; Mitchell, 2001; Smyth & Pendleton, 1994). The stimulation of both visual and kinaesthetic response means that the observer can experience and 'feel' the dancer's actions, and can empathetically experience affect. Furthermore, non-verbal communication studies have found that others' body postures also provide information about their emotions, which can be empathically experienced in one's own body posture (Hoffman, 1981).

Whilst there is empirical evidence to suggest that body movement does elicit emotion within an observer (for example, Mitchell, 2001), this kind of research is limited in that studies have typically used 30-second dance-video clips that are designed specifically with an emotional purpose.

The present paper seeks to expand the literature on emotional response and dance. While numerous anecdotal and theoretical arguments have put forward sound explanations as to why and how observers respond emotionally to dance, no research to date has empirically explored such processes in an environment where dance works are normally observed. Furthermore, while body movement is largely the predominant factor in contemporary dance, observers of contemporary dance are often exposed to other sensory cues. Such cues, including music, are also capable of eliciting an emotional response in the observer (Sloboda, 1991). It is therefore one aim of the present research to investigate the extent to which body movement contributes to emotional response when the observer is immersed in other potentially emotional sensory cues.

Individual Differences

Impact of Experience

It is well established that experience affects perception and cognition (see, for example, Walk and Pick, 1978). Theoretically, experience impacts on how observers perceive and process aesthetic stimuli. For

example, Cupchik (1994) asserts that aesthetic stimuli possess greater qualitative diversity than everyday stimuli, incorporating both syntactic (or stylistic qualities) as well as semantic information (or subject-matter). Semantic information is easily discerned because of everyday experience. However, an appreciation of *stylistic* qualities requires attention to patterns of physical/sensory qualities that can be more difficult to discern. For this reason, 'naïve viewers generally focus on subject matter, because it is easier to discern than style' (ibid., p.178).

Within dance, no empirical work has investigated the impact that experience has on observer-response. The present paper, therefore, represents a first attempt at a comparative charting of the relationship between experience and observer-response.

Impact of Information

Given that the audience for many contemporary dance performances is provided with 'program notes', it is an aim of the present research to assess what impact prior information has on an observer's response to contemporary dance. Schema theory (for example, Schank, 1982; Schank and Abelson, 1977) suggests that previously presented stimuli will influence later responses. According to this theory, incoming information, such as contemporary dance, can be processed in one of three ways:

1. The incoming information can match a schema exactly.
2. The incoming stimulus may partially match an existing schema.
3. No schemas match the incoming information.

The present paper explores how activating a particular schema impacts on cognitive and emotional response.

Summary

Currently, there is little discussion or data in psychology on the way individuals respond to contemporary dance. The present study empirically explores two kinds of responses that have been anecdotally noted within the literature—cognitive interpretation and affective response. Specifically, the following research questions will be addressed:

1. Do current audiences of contemporary dance choose to 'make sense of' a contemporary dance work?
2. To what extent do observers arrive at the same interpretation of a particular contemporary dance work?
3. What specific sensory cues do observers report as aiding interpretation?
4. Do observers typically respond emotionally to dance?
5. To what extent do observers experience the same emotions in response to a particular contemporary dance work?
6. To what cues do observers respond emotionally?
7. Are differences in responses mediated by experience and expertise in dance?
8. What impact does pre-performance information have on cognitive and affective responses?

Method

Participants

A total of 306 volunteer participants were involved in the study. 154 participants were city-based residents affiliated with the Victorian College of the Arts in Melbourne, Australia, 84 participants were regional-based residents affiliated with the Geelong Performing Arts Centre, and 68 participants were regional-based residents affiliated with the Earl Arts Centre in Launceston. Of those participants who indicated gender, 53 were male and 240 were female. The mean age for the sample was 37.99 years with a standard deviation of 18.53. 133 participants attended a specific-information session before viewing the dance performance; 63 participants attended a generic-information session; and 98 participants did not attend any pre-performance information session. Twelve respondents failed to indicate whether they had attended the information session. 152 participants had no form of dance training, 39 participants had between 1 and 4 years dance training, 45 had 5–9 years of dance training, whilst 65 participants had over 10 years of dance training. 5 respondents failed to indicate whether they had received dance training.

The Dance Piece

Red Rain, choreographed by Anna Smith, was the contemporary dance piece used in the research. It is 40 minutes in duration and has

a cast of seven female dancers. The piece incorporates three structural elements: movement (postures, gestures and locomotor movement-patterns, and spatial and dynamic elements); visual setting/environment (set-design, lighting, costuming, use of colour and props); and aural elements (music and sound effects).

Information Sessions

Two speakers presented a 30-minute information session. There were two types of information session. Information in the specific-information session included:

1. A detailed verbal description of the choreographic process.
2. Possible strategies for interpreting the piece.

Static photographs and video footage were presented to illustrate the choreographic process. Images included the interaction between the choreographer and dancers at different stages in the development of the piece. Possible strategies for interpretation were presented, and were used in association with dancers from the piece. Dancers illustrated various motifs within the dance work, while the speakers suggested possible ways to interpret such motifs.

Information in the generic-information session included:

1. General information about contemporary dance.
2. A comparison between contemporary dance and classical ballet.

Static photographs and video footage were used to illustrate content. Dancers did not participate in these generic sessions.

Measurement

The Audience Response Tool (ART) was used to assess observer-response. The ART consists of five sections, and includes a series of open-ended questions and closed questions measured on a seven-point Likert-type rating-scale. In this study, two counterbalanced open-ended questions pertaining to cognitive interpretation and emotional response were assessed. Cognitive interpretation was assessed by asking participants, 'how would you interpret *Red Rain*?',

and emotional response was assessed by asking participants, 'did you respond emotionally to *Red Rain*? Please explain'. Participants were also asked to specify basic demographic details including their experience in various art forms, as observer or participant.

Procedure

All participants were affiliated with either the Victorian College of the Arts, the Geelong Performing Arts Centre or the Earl Arts Centre, and were personally invited to attend the performance of *Red Rain*. Additionally, some participants were invited to attend the preceding information sessions. Those participants who decided to take part in the information session were presented with one of the information sessions 30 minutes before the performance of *Red Rain*. After the conclusion of the information session, participants were ushered into the performance space where participants who did not attend the information session were waiting. After viewing the performance, all participants were instructed to complete the ART.

Results and Discussion

A conceptual (or thematic) content analysis was performed on the data-set. Responses were examined for the presence of implicit and explicit concepts (words or phrases). Categories of response were set up, and response-categorisation was dependent on the presence of a particular concept.

Cognitive Interpretation

Do current audiences for contemporary dance choose to 'make sense' of a contemporary dance work, and to what extent do observers arrive at the same interpretation of it?

Consistent with anecdotal accounts, most observers actively interpret contemporary dance (88.7 per cent). However, the particular contemporary dance work does not necessitate a particular type of interpretation. The contemporary dance work used in the present research provoked a multitude of interpretations. Not only was the content of responses quite varied, the type of interpretation among observers differed. Predominantly, observers interpreted the work as representing certain themes (45.3 per cent); however observers also described elements of symbolism within the piece (33.3 per cent).

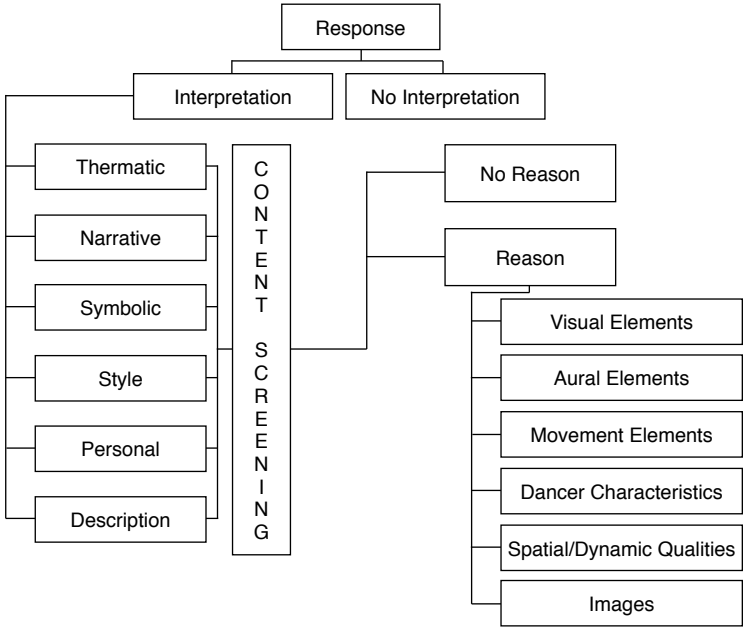


Figure 1 *The content-analysis extraction process*

Furthermore, another type of response was to draw out a narrative or a storyline from the piece (15.5 per cent). A smaller percentage of observers provided only a description of the dance (8.9 per cent). Other responses included a description of the style of dance (5.4 per cent), whilst other observers again found the dance reminiscent of a particular personal memory (3.9 per cent).

This diversity in responses is consistent with arguments that the attribution of meaning in aesthetic stimuli is not a specific property of the aesthetic stimulus but involves the observer's cognitive background (Kurtz & Schober, 2001; Solso, 1994).

What specific sensory cues do observers report as aiding interpretation?

Of those observers who interpreted the work, approximately half presented a reason or justification for their response. 40.5 per cent gave as their reason visual setting, such as costumes, lighting, props and

set design; 31.4 per cent nominated movement; aural elements (31.4 per cent); dynamic and spatial elements (15.7 per cent); dancer characteristics (14.9 per cent); and images (9.9 per cent). The most commonly cited reason for a particular interpretation was visual impact. This is partially consistent with Cupchik's (1994) view that everyday stimuli such as costumes and lighting are more easily discerned, and thus attended to, because of observers' exposure to such stimuli outside the performance space.

Given that a large number of observers did not articulate the particular sensory cues that led to interpretation, it is suggested that future research explore this finding. While a plausible explanation may be the lack of direction in the open-ended question, alternatively it may be the case that some observers are unable to articulate the sensory cues that lead to interpretation.

Affective Reactions

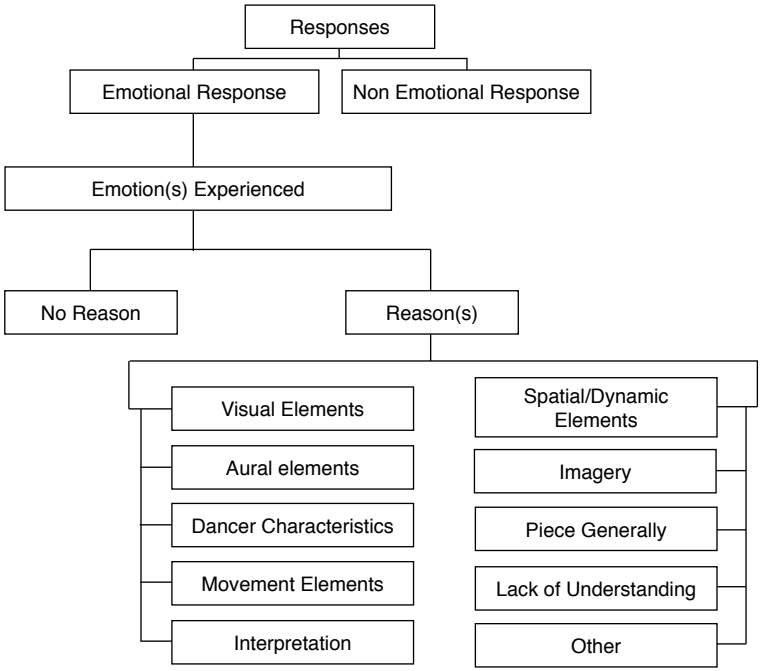


Figure 2 *Content-analysis extraction process.*

Do observers typically respond emotionally to dance, and to what extent do observers experience the same emotions in response to a particular contemporary dance work?

Results indicated that the majority of observers responded emotionally to the contemporary dance piece used in this research (82.3 per cent). However, emotional response to the work varied. Emotions typically ranged from low-intensity negative emotions such as sadness, to high-intensity positive emotions such as excitement and happiness. These results indicate that,although this particular performance elicited emotion in many observers, emotional response is not an inherent trait in the dance work, but a characteristic of the observer in relationship with the dance work.

To what cues do observers respond emotionally?

Approximately 80 per cent of participants indicated reasons for their emotional response. Body-movement in dance has been suggested as a possible cue that may elicit an emotional response in the observer. While there is evidence in this study to suggest that observers attend to and respond emotionally to body-movement (28.0 per cent), aural elements typically elicit an emotional response in a greater percentage of observers (43.4 per cent). Furthermore, observers attend to and respond emotionally to other cues within the dance. These cues include dancer characteristics such as the physicality of the dancers (10.3 per cent), visual elements (13.1 per cent), images (8.6 per cent), the piece generally (5.7 per cent), and spatial/dynamic elements (5.7 per cent). In some cases, emotional response is contingent on the observers' level of understanding (6.9 per cent), and their interpretation of the work (21.1 per cent).

Individual Differences

Are differences in responses mediated by experience and expertise in dance?

Differences emerged between those observers with dance experience and those observers with no dance experience. However, differences were slight, and the only significant difference that emerged was that a greater percentage of inexperienced observers relied on aural cues when formulating an interpretation. It would therefore seem that dance experience did not affect responses in this study,

though past literature suggests that it does. This finding, however, should be interpreted with caution. Observers with dance experience in the present study do not necessarily have expert knowledge in contemporary dance, nor does it indicate how often they view contemporary dance performances. It is suggested that future research assess what effect specific contemporary dance experience (knowledge and duration of exposure) has on responses.

What impact does pre-performance information have on cognitive and affective responses?

Results indicated that the information session did not affect the tendency to interpret the work, nor did it impact on the type of interpretation. However, several significant differences were found in relation to the content of interpretation. A greater percentage of observers who attended the specific information-session interpreted the work as representative of life and women, and a greater percentage of observers articulated bipolar adjectives in their responses. This is consistent with the content provided in the information-session. Furthermore, a greater percentage of observers who did not receive any information-session interpreted the work as representative of oriental themes and as depictive of a ritual dance. These ideas were not mentioned in the information sessions. It seems that information sessions served to activate a particular schema that subsequently affected observers' interpreted responses. However, this conclusion cannot be drawn for all observers exposed to information. In some cases, observers constructed completely novel interpretations. Future research should follow up the finding that only some observers accommodate various sensory cues within the dance to their pre-existing schemas.

Differences also exist between the responses of those who attended the specific- information session and other groups when emotional response was assessed. A greater percentage of observers who attended the specific-information session described their interpretation as responsible for their emotional response. Furthermore, a greater percentage of observers who did not receive information responded emotionally to aural elements.

Conclusion

The results of this study confirmed anecdotal accounts that observers typically respond cognitively and affectively to a contemporary dance work. Whilst dance experience and the pre-performance information sessions did not impact considerably on response, a large majority of respondents interpreted, felt they understood, and connected with the dance piece. It is suggested that future research follow up this finding by investigating these same responses using other contemporary dance works. It may be that the work used in this research was particularly accessible to current audiences.

However, another possible explanation for the current results is that people, when given the opportunity to reflect on their own experience with the work, enjoy being asked their opinion, and the freedom to interpret the work in any way they want. Perhaps it is not pre-performance information that is important, but the observers' opportunity to reflect on their interpretation, understanding and connection with the piece. Future research could investigate this hypothesis by conducting follow-up studies to examine whether the use of a questionnaire affects long-term memory for the dance work. Additionally, future research could explore other methodologies to measure audience response. For example, focus groups could be used to investigate how groups of people reflect upon their experience of the work.

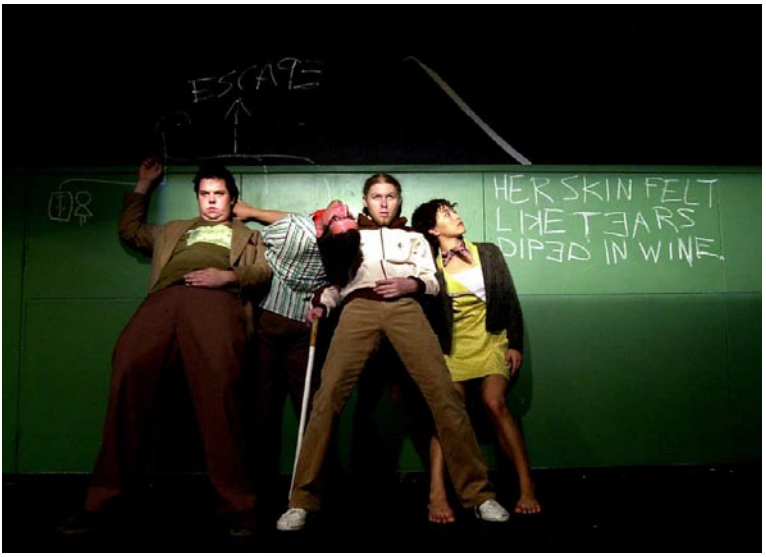
The present research used the newly developed Audience Response Tool (ART) to investigate cognitive and affective responses to contemporary dance. Whilst the impact of two variables—pre-performance information and dance experience—were examined in relation to these responses, there are many other ways the ART can be used to gain greater insight into observer response. The particular contemporary dance work used in this research elicited a wide and diverse range of responses. This suggests that response to a particular contemporary dance work is not the sole property of the aesthetic stimuli, but is an interaction between the stimuli and the observer's cognitive background. Future research could further investigate this conclusion by investigating the interaction between variables such as age, gender and education and how they impact on observer response. Further, the ART can be used to assess differences in observer-response between different works, different choreographers, and different viewing media – for example, live versus recorded viewing.

Furthermore, various structural cues within a particular work, such as music, props and digital media, can be manipulated to examine what impact that has on the type and intensity of observer response. For more information on the ART, refer to the MARCS Auditory Laboratories website (http://www.marcs.uws.edu.au).

9

Growing Choreography

Mark Gordon



Fellowship 1, '12 Floor' by Tanja Leidkte 2004. Performers: (left to right) Joshua Tyler, Anton,Sasha Budinki and Kristina Chan.

Introduction

It is in the context of the two projects, Unspoken Knowledges and Conceiving Connections, that I find myself wearing the slightly unusual hat of an industry-partner. Such is the relationship The Australian Choreographic Centre (ACC) has entered into with the three universities involved. The traditional gulf between industry and the academy is less pronounced in the dance profession. This has been brought about in part by necessity, but significantly through the work of Ausdance. The Australian dance profession has maintained mostly good communications within itself, and set up career pathways that wind through schools, community, tertiary education and professional companies.

For the moment, then, I wear an industry hat, but the underlying interconnectedness of the dance profession in Australia underpins the mission of the ACC, and is the reason why as an organisation we want to engage in and support research beyond our own programs. I will outline the formation and objectives of the Centre to explain how it all fits together in 'growing' a choreographically literate dance culture, and I will provide some examples of how this works in practice.

History of Centre

The Australian Choreographic Centre came out of a history of 24 years of professional activity in the ACT. Its first artistic director was Don Asker, its second Meryl Tankard, its third Sue Healey. I am the fourth artistic director of our organisation. The first three directed their own dance companies. My role is different, but as The Australian Choreographic Centre, we are the same incorporated non-profit association. Our Commonwealth Bank account remains the same, and we have the same phone number as in 1980. Several board members served various incarnations of our organisation: some who served through the 80s retired from the board for several years but have now rejoined, while others have continued their service for up to 14 years.

Despite all this support, however, there was a crisis for the organisation in 1995 as funding shrank and money was unavailable to support its programs and the audiences attending its activities. This in many ways was part of a global crisis in contemporary dance, and its Australian manifestation led to the disappearance of a number of small dance companies. This has had devastating effects. The

small-to-medium dance sector has traditionally been the proving ground for young choreographers emerging from the ranks of a company to produce small works, assist a choreographer/artistic director, and ultimately to create new theatre. The absence of former structures, the decline in audiences and funding, and a sense that the future was being destroyed, led the board of the Centre, and the dance and arts community of the ACT more widely, to engage in a local and national process of consultation.

The organisation and the community here were seeking a niche in which to continue professional dance practice in the ACT—one that would be of importance for the national dance practice, and that could be well sustained and nurtured within the scale, size and resources of the ACT.

Part of the transition process of buying, accepting and defining the new future of our organisation was a very healthy partnership with funding agencies. I think this is not an insignificant reason for the organisation's success. Both local and federal funding agencies were engaged in a dialogue: asking where the motivation was coming from, what the models were, and what kinds of steps were reasonable to take, given expectations of financial support. There was also the issue of acknowledging and fulfilling a niche or boutique role within Australian dance practice. As the new centre began to take shape, media and community opinion was greatly divided. There were many voices damning it before it commenced operations, and there was, and probably remains in the ACT, a blank refusal to accept that there is no funding in this country for yet another dance company. But our experience has been that what must be done is to find one's expertise and address a particular strategic need within a sector, and deliver excellently against those strategic aspirations. And this, in many ways, is the fundamental success of the ACC as an infrastructure for dance.

Our doors were finally opened at the end of 1996. The Centre has progressed in its complexity and its layering since that time. It is by no means a perfect model, and it is by no means the only model of choreographic development. It is the one that we have evolved, based upon the success of similar infrastructures in France—for at about the same time that we were asking these questions in Australia, the arts communities in France were asking similar ones, and they based their choreographic centres upon the success of a previous generation of

actors' centres. In Canberra, we based our response in part upon the absolute demonstrated need within the local community and the profession across Australia, and in part on the successful way forward those French choreographic centres had shown.

Three Categories

Since we opened, in 1996, we have had more than 30 choreographic fellows, over 80 artists-in-residence, several hundred individual artists, and many hundreds of young people participating in our programs. The ACC has been important as a place of professional development, of industry-networking, and of course choreographic research. Throughout this time, we have asked ourselves the following questions: What is it that we do and for whom? Why do we do it? How do we go about it? In relation to our constituency, the Centre has identified three layers or orbits of choreographic practice that we attempt to serve.

The first are choreographers with an emerging practice. We found that categorising an individual as an 'emerging artist' became relatively meaningless through overuse of the term in the arts community. Consequently, we have shifted our focus towards the 'practice' of an individual artist, and our choreographic fellowships are primarily targeted towards dance makers who are probably in the first five, maybe up to eight years, after formal training.

The second orbit of choreographers we attempt to assist are those with a continuing or evolving practice. It is the stage beyond 'emerging', and our support of artists working at this point in their career, this career stepping-stone, is possible through our commissions and research activities.

The third category embraces what we call 'specific' choreographic practices, and includes new-media arts, dance on film, youth dance practice, performance improvisation, and other contemporary arts practice where movement is a central concern.

Core Business

The core business of the Centre is to support choreographic fellowships, residencies and commissions. It is important to note that some of the youngest participants in our programs are about 10 years old, while our most senior participants are older than 70, so we take a

Fellowship 2, 'In outside' by Jodie Farrugia 2003. Performers: Dylan Hodda and Jodie Farrugia

'whole of life' view of our activities. Our aim through our fellowships, residencies and commissions is to encourage and assist choreographers in making transitions in their skills, particularly transitions in depth of practice. This ranges from the use of basic principles of composition, to the practice of intricate choreographic craft, and ultimately to a viable integrated practice as a professional choreographer.

Choreographic fellowships are the centrepiece of the Centre's program. A fellowship provides an individual choreographer with a significant paid opportunity to create new dance material, and offers the time and resources to develop the recipient's choreographic craft. The fellowship program for 2004 is entirely committed, and we are currently reviewing proposals for 2005 and 2006. All the proposals in the fellowship category are reviewed by the Centre's artistic advisory panel: a group of educators, researchers and practitioners who are spread across the country, and come from diverse backgrounds and practices. This artistic advisory committee shortlists the applications against our selection criteria.

The choreographic residencies are similar to fellowships in many ways, but the core difference is that a residency is a grant of resources and support without a salary or fee component. Residencies are awarded at relatively short notice by myself as artistic director, and can be made in quick response to needs in an artist's practice, or in response to quieter times in the ongoing programs of the Centre. Sometimes, this is in the context of a special project for which separate funds have been sought; at other times, where an artist is seconded from a professional dance company or tertiary institution. Residencies, then, can be negotiated in a very intimate way between the Centre and the artist in question.

Our commissions program is where we are aiming to shift an artist's practice. We do this in terms of a move from creative development, or the development of work pursuing personal interest, towards an application of craft for the use of a company, a festival or an event. The key objective of a commission is to enable recipients to deliver their craft in a timely and appropriate way, perhaps to serve the vision of another artist or artistic director. Part of our commissions program involves a young performance group. This ensemble, called Quantum Leap Youth Choreographic Ensemble, provides a remarkable resource for choreographers—a resource well beyond the scope of artists

working in the funded environment. We may have up to 50 performers on stage in any given project. This is a great challenge for a choreographer, and it is also a progression in the use of bodies in space and one's understanding of space. It is a significant move, and for most choreographers it is a transition in terms of scale, from studio practice to main-stage experience. It represents a transition in focus from an open-ended creative development to working to a 'brief'.

It also represents an opportunity to deepen one's practice, when, from using basic compositional principles, one shifts to being a more fully integrated, high-skill practitioner or professional choreographer. Quantum Leap consists of talented young people, aged between 15 and 25, with dance and movement skills, who are auditioned from our local community and adjoining regional areas. The participants often come from a non-dance background, bringing talents in martial arts, gymnastics, ballroom dancing, circus, and other physical disciplines into a contemporary dance milieu.

Elastic 'Out of Bounds' by Ruth Osborne 2003. Quantum leap Choreographic Ensemble.

Other Developmental Strands

The Centre offers a number of other developmental strands out of these core programs. One is about professional secondments, men-

torships and research projects, where we seek out specific proposals from staff at professional dance companies and tertiary institutions for projects involving our resources and activities. These take many different forms, from a staff member being seconded into a performance project, to an ongoing relationship with the Centre —perhaps using it as a site for research.

In addition to this, we have a program of tertiary student secondments and work placements, where a student will come from an institution and spend from two weeks to three months at the Centre. This also intersects with some work that we do in the local community and adjoining regions of the ACT, under which students come on what is called a 'field placement' and spend one term working at the Centre.

There are a number of pre-tertiary activities undertaken that intersect with these professional activities, and the field placement is the cross-over point. We have a work-experience program, in which young people work as a dance company under the supervision of an artistic director and a team of local professionals. Those on these programs develop training skills, choreographic skills, learn repertoire and perform—all in a single week. We do this at a number of levels—a 'generalist' one, or sometimes with a specific group, for example, a 'boys only' work-experience. We have a more elite work-experience activity for those students who intend to take on dance study in a tertiary institution. We offer one other work-experience program called 'circuit-breaker work-experience'. If a young person in our programs runs into a crisis at school or at home, and they need support and time out, we take them on-board as a member of staff. We give them a training position for periods of up to 10 weeks, until the school or home crisis has been resolved.

For choreographic development in the pre-tertiary level, we also run a short-works program called 'Hot to Trot'. Students on this program make work with a maximum duration of six minutes. There is a common pool of dancers, and choreographers who are shared across the program.

In the tertiary and immediate post-tertiary field, we have a number of projects. These are partly our own initiatives, and partly a response to the needs of the field. One initiative, 'First Wave', was a response to the first wave of Quantum-Leap participants, who had been to university and were returning to Canberra. This was a project

driven and managed by that group as a way of supporting them in their return into a community, where there was not going to be a full-time dance job waiting for them. Through this, we brought together our programs for commissions and for residencies. We were able to weave together a project where young graduates worked with a professional choreographer to produce a season of professional dance. Through this experience, they learned performance skills, had their technique maintained and explored a choreographic process together.

We are currently developing an ongoing version of this program, which we call 'Soft Landing'. It has the intention of softening return to the home community. The Centre also supports a loose structure called 'Direct Current Dance Collective', which, again, grew out of the field, and enabled independent dance makers to produce short works. The Centre provides a theatre, a technician, publicity and box-office support for this group. The artists are in charge of the programming and selection of choreographers.

Direct Current comes and goes in waves of interest. What is interesting at the moment is that the concept sits dormant. This is because many of the original participants from the first few years of performances have now progressed to making evening-length works themselves. The short-works format is no longer of interest to them,

Multi media 'Ada' by Sarah Neville 2002. Performers: (left to right) Elise May and Wendy McPhee.

but there is a next wave of artists who are now seeking the short-works program.

In the specific residencies area, we have worked in partnership with the New Media Arts Fund of the Australia Council. Through this, we have created a best-practice environment for a new-media artist, in which to research part of their practice, or to produce a work. We were able to pilot this with: 'Company in Space' in 1997, and with Cazarine Barry and Megan Rowland (in 2000 and 2003 respectively) as new-media artists in residence in their own right.

Other Activities

Other activities for each of the last eight years include an improvisation or spontaneous choreography festival, workshops and masterclass series. Spontaneous choreography is about performance that is not predetermined, and is a spontaneous act where the performance is the goal. Very often, improvisation is a compositional activity, a choreographic tool, but in this particular practice the performers and participants are absolutely focused on the performance potential and outcome.

Another strand is the maintenance of dance heritage. We have been able to mount two programs of reconstructed works, the earliest of which came from the 1930s. It is through the act of re-creation that choreographers pass on legacies of information and choreographic practice to the participating artistic teams. At the same time, this inspires new generations of performers and makers—crossing boundaries and generations, sharing lineages and producing programs of dance which inspire us. The difference in form and structure between works created in the early and latter parts of the 20th century acts as a counterpoint to contemporary work. It is also an act of acknowledgment and respect for the traditions that empower the Australian dance community.

Documentation is an ongoing part of who we are and what we do. We are very diligent in archiving each project that comes through the centre with its accompanying video and photographic documentation. From time to time, we have been able to have an oral history made of an artist-in-residence, sometimes in association with the National Library, so that there is an enduring record, a snapshot of a particular time in a particular artist's work.

Mentorship is a key to the way the Centre operates, and an important part of any proposal for research or choreographic development. This means that we not only offer physical infrastructure—the time, the space and the bodies in the studio—but also ensure that choreographers are supported and challenged through the process of choreographic development. Mentorship gives the choreographer the involvement of one or more senior artists on their project. A mentor is not just an outside eye on the work, but also a challenging observer of the process. Our expectation is that mentors will provide a sounding-board for the choreographer and offer objective comment. Support and encouragement are essential, but mentorship also provides challenges to think about processes that are being used by the choreographer, and perhaps provides some provocative questioning of the creative team.

Education is a significant part of our mode of operation as a centre. We provide an introduction—one or two minutes of verbal introduction to each public performance—in an attempt to provide a context for what audiences are about to see. We follow every performance with a meet-the-artist forum. This is an opportunity for audiences to hear about the making of the work, and for the choreographer to seek feedback. These forums also provide platforms to respond to questions, to understand what worked and what didn't. We place importance upon providing program-notes that give a context for understanding the work.

The Centre is constantly involved in advocacy for dance at all levels of the community and government, highlighting the role of the choreographer in the dance profession and as educator. All programs and activities spin off this central hub of choreographic development, and the career pathway of a choreographer as contributor to the art form of dance.

Research weaves in and out of our projects, and it ranges from the formal to informal. Many participants are involved in Masters and higher-degree programs; their time at the centre provides a reflection-point, a publication-point or a point of discourse about their research. This also drives our interest in and commitment to the ARC-funded projects, in an endeavour to seek a balance through engaging in more formal research activities. Through this more formal activity we have been very happy to support a number of artists in their

individual research. These include Anna Smith, for whom we provided a residency in the development of *Red Rain*. Similarly, we were able to support Sue Healey during creative development activities in both Conceiving Connections and Unspoken Knowledges.

These activities fall broadly into three basic categories of experience: engaging in, through and about choreographic endeavour. We address this at as many levels as we possibly can offer from this dynamic system of multiple entry and exit points for artists, as touchstone moments to advance their practice. Participation in the Unspoken Knowledges and Conceiving Connections projects is a very significant investment of time and money for an organisation like ours, but we expect to acquire new knowledge about what it is that we do, and also gain new knowledge for the profession. We understand that the projects generate employment and develop new work. They also bring significant non-arts money into a dance practice which is currently in crisis. Accessing those resources for artists is clearly a priority, and I am delighted to think that through the two projects about $750,000 has been brought into advancing artists in their research and reflective processes. If we add the in-kind contributions made by a large range of organisations, we're probably talking about $1.5 million over six years.

As I look across the ACC's initiatives in recent years, something of Australian social history seems to emerge. Government has shifted its arts funding away from small-scale local practice to big public events, 'flagship' companies, and the like. Artists, however, have refused to accept this implicit recruitment of them as cultural advertisements. They have expanded their activities to show that art is a humanising and enriching force in any good society. And the Australian Choreographic Centre, whether through its education programs, its heritage transmission, or its directly 'social' interventions, such as Quantum Leap youth ensemble, First Wave, Soft Landing, Direct Current Dance Collective; and Circuit-Breaker work-experience, has been part of this re-working, this 'applied' creativity. It helps me to answer the question 'Why do we do what we do?' We expand Australia's imagination of itself.

Meeting Challenges

A number of instances in my professional experience drove me to this realisation. One was at the Dance Summit held in Canberra in 1991,

where the chairperson of the Australian Council challenged the dance community by saying that we were a bitchy, disorganised lot who didn't really know what we were doing. I have never quite understood the merit of his strategy, and I know that many people were affronted. The challenge I identified was how to address this low regard for dance.

Similarly, Robert Dessaix, the writer and ABC journalist, challenged many people at the Greenmill Dance Festival by suggesting that dance does not have a body of knowledge that is researchable. For those of us who work in this profession, this is absolutely wrong. We are acutely aware that there is a body of knowledge, and I am hoping that, through the life of the Centre and its involvement in research projects, we are able to make that knowledge both explicit and valued by the broader culture.

This is also about contributing to a viable and sustainable profession. The dance community is very vulnerable in Australia. The lack of resources impoverishes the many young people studying dance. If we can find the resources that grow our artists, there is great potential benefit for the nation's social capital.

The Australian Choreographic Centre is a three-dimensional whirlwind that is about growing energy and allowing things to find an up-draught, allowing people to enter and exit, to revisit, to come in many guises: as performer, maker and researcher. It enables people to research early or in the middle, to research at a specific time and with a specific purpose in mind. We are asking questions about the nature of choreography and the nature of art-making. We are testing ideas about processes and outcomes and performance modalities, and we are reflecting upon all this, partly to understand where we've been, and also where we're going.

There is a tension between research and practice, and we work in a 'pendulum swing' from one way to the other, allowing one side to inform and flow to the other, growing competencies and assisting people to move from 'composition' into 'craftspersonship'—into emergence as a choreographic artist. At each stage, we hope to raise the level of understanding and confidence, versatility and viability of practitioners, and of the art form itself.

Conclusion

Let me conclude with the stories of three people: Vivienne Rogis, Solon Ulbrich and Paul Zivkovich. These three examples demonstrate

artists coming from different places at different times, whose pathways occasionally cross, but whose needs and outcomes from the centre differ quite significantly. Each of these stories sets up a series of touchstones and interconnections with our mission as a centre.

Vivienne Rogis graduated from the Western Australian Academy of Performing Arts in 1994, and found her way back to Canberra in one of our early residency programs when a team from Western Australia came to work at the Centre for eight weeks. Vivienne remained in Canberra, partly to catch up with her family, but found through the Centre connections with artists and activities which are growing her practice. She is working with Quantum Leap as a choreographer and as an assistant director on various projects. Through our activities, Vivienne met 'living national treasure', Elizabeth Dalman, and continues to work with her in developing new choreographic material, recreating material, and working in a most intimate and remarkable collaborative way. Vivienne has also gone on to study sociology at ANU, where she is looking at 'perception of self', focusing particularly upon this concept in relation to the body and life of a dancer as performing artist.

The intersection of these practices came to fruition last year in a work called *The Looking Glass*. This was inspired by a psychological theory that suggests our sense of self is informed by the feedback and contribution of others. Vivienne has been weaving herself in and out of the Centre in a range of modalities, and to our delight is pursuing a research interest parallel with that role. Who knows what the future will bring? What I do know is that over eight years an emerging artist is growing into a richly layered and significantly informed practitioner who has great potential to become a leader in the field.

Sol Ulbrich was a performer who had spent a great deal of time with a number of elite dance companies, including Australian Dance Theatre, Western Australian Ballet, and One Extra Dance Company. He had worked with a range of choreographers in that context but also wanted to pursue work as an independent maker, in which context he first made contact with the Centre — as a choreographic fellow. Sol developed a body of work in the time that he was here, and also had an opportunity to see the work of Quantum Leap. He sought interaction with the group, and last year, for the second time, made a contribution to our season at the Playhouse, creating both filmic and

physical choreographies growing out of his personal understanding of the activities of Quantum Leap.

Sol is making a section for the 2004 Playhouse season, and has also worked with us in an administrative and managerial placement on Tanja Liedtke's project *Twelfth Floor*. We were delighted during one of his stays to be able to find an opportunity for him through a commission from the School of Music at the Australian National University. He made a 30-minute work to original music for a cross-disciplinary art festival.

Paul Zivkovich was born in Canberra, trained as a gymnast, took some dance studies at high school, and found his way to Quantum Leap. He became an important and powerful performer, but also a great contributor, taking responsibility for rehearsals in our Quantum Leap activities. Paul auditioned successfully for the Queensland University of Technology dance course, where he worked with a range of teachers and choreographers. He was offered a secondment with the Australian Dance Theatre while studying at QUT. He has a wonderful performance facility and impressive gymnastics background, and these attributes, in part, led to a contract with this internationally acclaimed dance company.

Paul has come back and created two works for Quantum Leap, and in them the varied strands of his experience richly intersect. He has participated in our work-experience program, was a contributor to the 'Hot-to-Trot' season, and we see him now come back as an emerging choreographer who no doubt in time will be applying for a choreographic fellowship to further advance his work.

To conclude, I have three questions about the future for us as a dance community. First, are we making—and at what time are we making—the dance that choreographers need and want to make? Secondly, at what time, and in what moments, are we making the dance that audiences want to watch? Lastly, at which other time—or can it be in some of the times mentioned—are we making the dance that theatres and festivals want to present? These, for me, are the challenges for dance in the 21st century, and this is why we need the research. I believe that if we can become clear in our understanding about these matters we will have more viable practice, less frustration, more funding and better art.

10

Dance Perception and the Brain

Ivar Hagendoorn

An Oblique Effect in Aesthetics?

Some years ago experimental psychologists showed that humans appear to have an aesthetic preference for horizontal and vertical over oblique lines (Latto *et al.*, 2000). It had already been known for over a century that the human visual system exhibits a greater sensitivity to horizontal and vertical than to oblique lines, a phenomenon referred to as the 'oblique effect'. The effect shows both in a quicker response to and a better ability at discriminating lines along the cardinal axes. Making clever use of the fact that some of Mondrian's paintings have oblique frames, the researchers were able to show that having to select one orientation from a set of four, the majority of people also *prefer* the one in which the lines are vertical and horizontal.

Outside the laboratory, a similar preference can be recognised in the common inclination to straighten slightly tilted frames. In a second experiment based on the catalogue of an exhibition of 20th-century painting, which aimed to 'fully reflect the art of the 20th century and its main trends comprehensively', Latto and Russell-Duff (2002) showed that artists have a preference for horizontal and vertical lines in the composition of their work, whether abstract or figurative art, or found artefacts. Both findings suggest what the authors call 'an oblique effect in aesthetics'.

Of course the predominance of horizontal and vertical lines in art may simply reflect the predominance of horizontal and visual contours in our visual environment in general, as a recent study by Coppola *et al.* (1998) demonstrated. In the experiment, which almost reads like an artistic project, two persons were asked to walk around the campus of Duke University, in outdoor, indoor, and natural environments, and to take a picture of the scene in front of them every time an electrical device gave off a sound.[1] The images that were thus collected were subsequently analysed for the direction of oriented contours. The results showed a prevalence of horizontal and vertical lines relative to oblique lines in all three environments, the 'fractal geometry of nature' notwithstanding, although the result was less pronounced in natural scenes. To correct for a possible geographical bias in the selection of natural scenes, images from two other geographic regions were also analysed, but the results did not differ from the ones obtained at Duke University.

The fact that horizontal and vertical lines prevail in both natural and man-made surroundings may be explained by the laws of gravity and mechanics. This, however, does not yet explain why the human brain would be better at detecting them. At present, the most likely hypothesis is that more orientation detectors in the primary visual cortex are selective for horizontal and vertical than for oblique lines (see Coppola *et al.*, 1998).

Horizontal and vertical lines are not the only visual features that have privileged access to the visual system. The perception of faces, the human body and what has been called 'biological motion'(the motion characteristics of humans and animals) also appears to be superior to that of other shapes.

A possible explanation for these findings may be found in human evolution. The visual system has evolved to represent the visual environment as efficiently as possible. It pays to see instantly whether it is just some grass and bushes waving in the wind or an animal moving; to recognise whether it is an animal or a human, and to tell from a distance whether he or she is a friend or a foe—or indeed a he or a she.

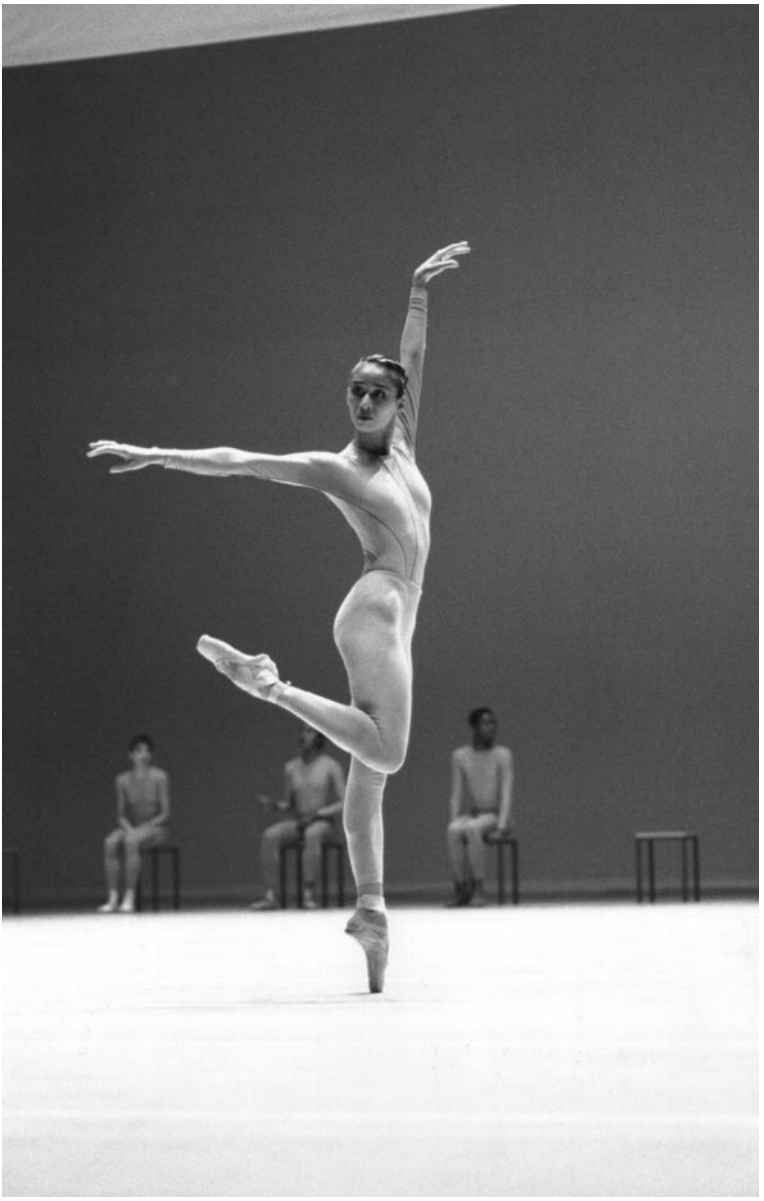
On the basis of these findings, Latto and Russell-Duff (2002) suggest that artists tend to favour those shapes, figures and orientations which the visual system is good at recognising, or perhaps we

should say *the artist's* visual system, to allow for individual differences, and to acknowledge the brain's plasticity. To understand why there is a case for this conjecture—sometimes referred to as the 'perceptual fluency' hypothesis—we must realise that artists also observe their work during the process of creation. Most painters do not randomly apply paint to a canvas, nor do choreographers randomly select and create movements and spatio-temporal configurations, although some may choose to do so.[2]

To write, paint or choreograph is a dynamic process whereby sentences, colours, lines, sounds or movements are composed, evaluated, changed, re-evaluated, deleted and inserted. This process is set against the backdrop of the brain mechanisms involved in analysing perceptual and emotional stimuli. In the somewhat caricatural case of a horizontal line on a canvas, we can imagine a painter stepping back to see whether the line is really straight. Indeed, Mondrian reportedly could spend weeks contemplating the precise positioning of lines and blocks of colour.

So far as vertical and horizontal lines are concerned, there is an obvious parallel between these findings and classical ballet. Much of ballet technique is based on alignment, from the five positions of the feet to the three basic arm positions, the four basic *arabesques* and of course the *arabesque penchée*, in which a dancer bends forward lifting one leg as high as possible. Every ballet dancer will instantly point out that there are good anatomical reasons for a proper alignment. In the case of ballet, practical and aesthetic considerations may go hand in hand. Of course, these are positions and not yet movements, but it is interesting to observe that within a ballet some positions are often not only the goal or end-point of a movement, but are also held briefly to provide a momentary still point. Not surprisingly, these positions are also clear favourites among photographers and the postcard-buying public.

Even though ballet—as well as the work of Merce Cunningham and Jiri Kylián, to name but two examples fom the sphere of modern dance—provides some evidence for an oblique effect in the art form, the more interesting question would be whether other, similar regularities can be identified in choreographed dance performances, and, if so, whether they correlate with known properties of the visual system. Again, we can find some inspiration in the analysis of visual art.



William Forsythe, Second Detail (1991). Ballet Frankfurt. Performer: Nora Kimball

Photo: Dominik Mentzos

Implicit Principles

Instead of looking at forms such as lines, faces or the human body, we can also try to find common abstract qualities in paintings, photos, sculptures and installations. In their much discussed paper *The Science of Art: A neurological theory of aesthetic experience*, Ramachandran and Hirstein (1999) propose eight such qualities, which they call 'laws of aesthetic experience'. These include: the enhancement of features that deviate from average, which Ramachandran and Hirstein refer to as a peak-shift effect; grouping of related features; isolation of a particular visual clue; contrasting of segregated features; and metaphor and symmetry.

Elsewhere I have shown how these principles may apply to dance (Hagendoorn 2003a, 2004). The perfect synchronisation of the movements of a group of dancers, for example, creates a peak-shift effect in the grouping of related features, while having another dancer perform different movements elsewhere on stage creates a contrast between group and individual. I have also proposed that, given the fact that part of the brain will automatically form a prediction of the next event in a series, the interplay between these implicit expectations and their rupture or resolution can be seen as a principle specific to dance, music and cinema. One of the simplest examples is that of someone playing scales and suddenly sliding into a different key. Another example is the global narrative structure of thrillers and detective stories. In dance, suddenly accelerating a limb, breaking off a movement, 'going against the logic of the movement', as a dancer once described one of my improvisation techniques (Hagendoorn 2003b), or introducing a new element in a sequence of recurring movements, will draw the observer's attention and raise overall awareness by differing from the anticipated continuation as built up by preceding movements.

I should add that the use of words such as 'law' or 'principle' in the present context is a bit misleading and has led to much misguided criticism. It suggests that artists follow, in the sense of adhering to, these laws when they create a work of art, the way a poet might adhere to the principles for writing a sonnet. Properly speaking, there are no principles in the brain either. What are referred to here as 'laws' or 'principles' are regularities deduced from how the brain operates in certain tasks. They are *implicit* in the manifold ways by which the

brain constructs a percept from sensory input and in the reverse process by which a percept is materialised in the form of a work of art.[3]

Destabilising Perception

The fact that the human visual system is better at discriminating horizontal and vertical lines does not mean that it is poor at discriminating oblique lines and curves. And granted that, when forced to choose, we prefer the scene in which the picture is straight to the one in which it is crooked, it cannot be the whole story, for what about the work of artists like Kandinsky, Malevich, Jackson Pollock and Frank Gehry? As Latto (*in press*) concedes, visual artists make ample use of oblique lines, perhaps *because* we are less good at seeing them. The oblique brush-strokes in Monet's *Springtime Through the Branches* (1878) vividly capture the image of leaves moving in the wind, and the sensuous curves in the work of Frank Gehry seduce visitors across the world.

While these examples may reveal another principle, that of a preference for fluid curves which one also finds in dance, and the fact that repetitive patterns on a plane create the impression of depth and motion, an artist can also deliberately choose to 'upset' the visual system and the principles that normally guide perception and recognition. The British artist Anish Kapoor, for instance, frequently uses dark pigments to create the illusion of deep voids, which seem to expand far into space, whereas in other works shapes or tonal differences appear to be painted on, but are in fact cut away from the material. It is precisely *because* the brain cannot form an adequate representation of the images that fall on the retina, or *because* the object appears out of context, that it summons a chain of associations. This is also why abstract art gives way to the wildest and most arbitrary interpretations: if the brain is free to roam, it will. The same can be said of dance in general.

Normally, if we see someone make a move we can infer the movement's intention and sometimes even the state of mind of the person making the movement: for instance whether he or she is angry or nervous. If the person sitting in front of us is reaching for her glass, we infer that she is going to drink from it. If, instead of bringing the glass to her mouth, we notice in a fraction of a second that she is

moving her arm towards us, we instantly duck for cover.[4] On an empty stage outside a social context, a movement's meaning and intention are more difficult to detect than in everyday life. What is the fuss all about? Why the raised legs? Why the frantic arm movements? Even walking can be ambiguous. Obviously, the stage-setting itself provides a context, which may impart a perceptual framework for the movements. Thus a ballet critic may write of a piece by William Forsythe for the Royal Ballet that it is not 'proper' ballet.

If we adopt the language of dynamical systems, a neural representation can be seen as the temporary formation of a pattern of activity within a network of neurons. Each such pattern can be said to form an attractor, like a basin in a landscape, to which the system converges after it has been perturbed (Skarda and Freeman 1987). At rest, neurons fire randomly, representing a stationary but chaotic state of low metabolic activity. Upon presentation of a familiar stimulus, the system goes through a limited number of cycles before it settles upon an attractor, like a ball on a roulette wheel. In the case of novel or ambiguous stimuli, the system may fail to reach a new equilibrium, and turn to a chaotic state of ongoing oscillations, as if the ball kept jumping from one compartment to another. The famous drawings of the duck/rabbit and the old woman/young girl can be seen as examples of the brain rapidly switching between two attractors. Learning, in this view, consists in the formation of a new attractor, following repeated exposure to the same stimulus.

Within this conceptual framework, works of art which destabilise perception push the perceptual system to what physicists call the 'edge of chaos' (Bak, Tang and Wiesenfeld 1987), a state where new connections, associations, meanings and levels of understanding can emerge. It may happen that almost instantly a new attractor is formed, the work categorised, its power to affect neutralised. It may also happen that we feel we suddenly see the world with new eyes, in which case the attractor landscape itself can be said to have been transformed. 'Music and dance can inhabit separate planes!' (Merce Cunningham). 'Any movement can be dance!' (Trisha Brown, Yvonne Rainer, William Forsythe).

Even though a work can be unsettling, independent of the artist's intentions—because of the lighting conditions, for instance—an artist wishing to disturb the perceptual system will, just like the artist

fine-tuning a work to its proper key, try to perfect the 'stimulus'. The same is true of the artist wishing to free his work from perceptual or emotional biases. One reason Mondrian sometimes spent weeks rearranging lines and blocks, and worked for several years on his *Boogie Woogie* paintings, may lie in the fact that there is no perceptual ground which favours one composition over another. When watching dance, seeing 'just' the movements stripped of the goals and contexts which normally guide action, we are at once *free* to focus on their inherent qualities, and *at a loss* to make sense of what is happening before our eyes. We constantly swing between looking only at the movements, and searching for meaning, accustomed as we are to the fact that movements tend to have a goal and a meaning. And so the dance critic who could not make sense of the performance will write that it lacked dramaturgy, unless he realises that that may have been its objective. Neutrality can be a goal.

An Evolutionary Perspective

It is an undeniable fact that some songs, paintings and ballets are more popular than others. In dance, we can think of *Riverdance*, musicals such as *West Side Story* and *Chicago*, and ballets like *Swan Lake* and William Forsythe's *In the Middle Somewhat Elevated*. But why is this so? Why aren't preferences uniformly distributed? It is also interesting to observe that certain configurations in dance seem to have a cross-cultural appeal. Synchronised rhythmical group scenes are found from classical ballet to African and Australian aboriginal tribal dances, from musicals to the dances of North American Indian tribes, from music-videos to Pina Bausch's *The Rite of Spring*.

Similarly, virtuoso solos attract widespread acclaim. Following an impressive solo, and regardless of whether it is ballet or opera, audiences across the world have the unstoppable urge to give way to their enthusiasm and interrupt the performance with spontaneous applause. From their apparent universality, these phenomena, like other capacities of the human brain, seem to be products of evolution and adaptation. To account for them, a different approach, rooted in evolutionary psychology, may therefore provide useful insights.

Natural selection is the process by which organisms best adapted to the environment survive. But as Darwin (1859) observed, natural selection cannot be the full story, since it does not account for the

intra-species differences between male and female. And because some traits, the peacock's tail being a prime example, have little survival value. Darwin (1859, 1871) proposed a second mechanism, sexual selection, the competition within one sex for mates, to explain the evolution of secondary sexual characteristics such as birdsong, colouring, plumage and courtship behaviour.[5] Now, colourful patterns not only attract the opposite sex, they also attract predators. Similarly, the peacock's tail makes it more vulnerable. This is why many biologists today refer to these and other secondary sexual features as 'fitness indicators' (Zahavi and Zahavi 1997). A peacock with a large tail, and deer with large antlers, send out the message, 'look at me, I'm strong and healthy, mate with me'. As Miller (2000) writes:

> Applied to human art, this suggests that beauty equals difficulty and high cost. We find attractive those things that could have been produced only by people with attractive, high-fitness qualities such as health, energy, endurance, hand-eye coordination, fine motor control, intelligence, creativity, access to rare materials, the ability to learn difficult skills, and lots of free time.

This theory could therefore provide a rationale as to why audiences rejoice at virtuoso solos. But avant-garde choreographers who cannot dance need not despair: it's not just about big jumps and virtuoso solos. Unintelligible works may indicate high sophistication and intellect on the part of the maker, and for that reason inspire admiration.

Walter Freeman has proposed that dance functions as the 'biotechnology of group formation', by offering a means to bridge the gap between self and other. He writes: 'To dance, is to engage in rhythmic movements that invite corresponding movements by others. The reciprocity fosters transcendence over the boundaries of self in physical and emotional communion' (Freeman 1995, p.153). Freeman does not consider dance as a performance art that may have emerged when it was discovered that, instead of joining in, it can be equally satisfying to watch others dance, and that watching together also creates a sense of community. Movements were fine-tuned to please the observer, and the implicit rules that govern communal dances

were abandoned. At a later stage, in a reflexive move, the assumptions that shape dance were questioned. But while these developments took place over the course of years or centuries, the human brain has not changed significantly since the beginning of the Holocene, some 10,000 years ago. And so we still get excited when we see a large group of dancers move in sync. Of course, accounts like these are highly speculative, and I am not saying that this is the final word.[6] But even if it is in the wrong direction, it is a first step.

Conclusion: Unspoken Knowledges

Every work of art is the product of a series of choices. In making these choices, artists are *implicitly* guided by the neural mechanisms associated with perception, attention and emotion, and by the legacy of the likes and dislikes with which evolution has equipped us. A work of art can therefore be said to express these mechanisms and the knowledge the artist has acquired about their workings.

A neuro-aesthetic analysis of dance and choreography does not deny the cultural context within which specific dance forms emerge, but acknowledges that neural mechanisms are the same in all human beings. It reveals the implicit choices choreographers make when they create a piece, and in so doing may tell us more about the workings of the brain. It does not claim that some dance performances are better than others. It does not disqualify any response, but studies different responses and tries to explain where they come from.

At any moment, an individual's experience is not based just on data provided by the senses, it is shaped by memories, desires and intentions, conditioned by expectations, coloured by emotions, and contingent on the physical state of the body. The reasons why a certain piece may be meaningful to someone lie beyond scientific investigation and philosophical speculation, and even beyond each person's self-understanding. What we *can* observe are regularities in what choreographers do and how audiences respond.

Two recent neuro-imaging studies show one possible route a neuro-aesthetic analysis of choreography might take to move beyond the present preliminary considerations. The first study used functional magnetic resonance imaging (fMRI) to compare the brain activity of a skilled artist and an ordinary person as they drew a series of faces (Solso 2001). Activity in the area associated with processing

faces was higher in the non-artist than in the artist, suggesting that the latter may process faces more efficiently. Interestingly, the right prefrontal cortex (see below) of the skilled artist was significantly more activated than in the non-artist. Taken together, these results suggest that the non-artist relies more on processing facial information while drawing a face, perhaps so as to ensure that the drawing represents a face, whereas a skilled artist is less engaged with individual features and more with their composition.

In the second study, participants watched a 30-minute excerpt from the film *The Good, the Bad and the Ugly* while lying in a scanner. Statistical analysis of the data revealed that on average about 30 per cent of brain activity of one individual corresponded with that of another person (Hasson *et al.*, 2004). Interestingly, the regions showing intersubject correlation extended beyond the primary visual and auditory cortices, which process basic perceptual features such as shape and pitch, towards 'higher' association cortices. The experimental set-up also allowed the researchers to relate the fMRI signals to segments of the film. Part of the correlation was explained by similar responses to highly salient incidents, such as gunshots and surprising changes of scene. Of equal importance, though, as the finding that part of the activation patterns was shared among different individuals, is the fact that another part was not. The areas which showed no intersubject correlation included the parietal cortex, and in particular the prefrontal cortex. The latter region receives its input from other brain areas, and is associated with the integration of sensory and memory information and the representation and control of action (Wood and Grafman 2003; Miller *et al.*, 2002; Damasio 1994). A recent study found that some regions of the prefrontal cortex are also involved in the reappraisal and cognitive regulation of emotions (Ochsner *et al.*, 2002).

Thus, while the primary perceptual and emotional responses are the same across different brains, the associations they elicit and the appraisal of these responses differ. This might explain why an audience responds unanimously to the same events, yet afterwards evaluates them in different terms.

We can thus imagine recording the brain activity of a choreographer as he watches a video of a short dance-phrase he has just choreographed, and subsequently ask for his comments. This process

can be repeated until the choreographer says the phrase is ready to be performed. We can also imagine recording and comparing the brain activity of one person watching the first version of the phrase, and the same or another person watching the final version. What should we expect from such an experiment and does it matter in any way what happens where inside the brain? For one thing, once a mechanism or locus of activation has been identified, its properties can be analysed. How does it function? Under what conditions? What are its thresholds? What are its limits? Effectively, this is what choreographers and artists in general also investigate, varying a stimulus'intensity, the context in which it occurs, its duration, quality, etc. With a fuller understanding of how implicit brain mechanisms shape the act of creating choreography and its audience's thoughts and feelings, we might appreciate more what it is that choreographers do, and replace blind admiration or heedless criticism with better-informed judgement.

Endnotes

1 The camera was mounted on a tripod, to ensure that it was aligned with the horizon.

2 Note that Merce Cunningham works with a pre-defined set of movements that form the basis for his chance operations, which is why a piece by Cunningham is instantly recognisable.

3 I am alluding here to the notion of a work of art as a compound of percepts and affects – coined by Deleuze and Guattari, 1994.

4 Luckily, the glass was half-empty.

5 Of particular interest in this respect are bowerbirds, so called because the males build intricate bower-like structures decorated with colourful objects, which are not used for breeding purposes, but solely to attract females during courtship.

6 As Miller (2001) writes, it should be emphasised that the biological function of art should not be confused with individual motivations for creating art, which may range from making money to social criticism, deep-felt anger, and commenting on other works of art.

11

Cognitive Science and the 'Dancing Brain'

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I begin with a disclaimer: my own area of research is not concerned with dance, nor with any of the arts. Instead, my interests lie in extending cognitive models of thinking to the understanding of scientific practices, particularly in historical contexts. Most of my recent work has centred on the life and work of the English physicist Michael Faraday (1791-1867), whose extensive diaries and laboratory notebooks have served many scholars as a unique 'window' into the mind of a creative scientific genius (Tweney, 2002).

At first sight, this is a problem area far removed from dance cognition, even given that, in an attempt to capture the interactive character of his experimentation, I once metaphorically compared Faraday's methods to a 'dance with nature.' For Faraday, I hoped to say, scientific inquiry was an unrelenting try at deepening his representations of physical phenomena, an orchestrated series of 'moves' in a space of possibilities defined in his laboratory by his creative generation of ideas, procedures, and specimens. At the time, I was trying to avoid the more common metaphor of science as a *struggle* with nature, as if combat were the basis of inquiry, the scientist *wrestling* with an unwilling and uncommunicative adversary. But Faraday was not in combat, even metaphorically – instead, he seemed at play,

serious play. The dance metaphor seemed to work because it captured the passion of his inquiry, even its joyfulness.

Along the way of my 'Faraday Project,' I undertook a personal journey through the science of the 19th century, my students and I even setting up and conducting some chemical and physical experiments, trying to capture what Faraday might have been up to (Tweney, Mears, and Spitzmüller, 2004). Like Ivar Hagendoorn, I believed the test of a good cognitive approach would be played out 'in the wild,' in the domain of real-world cognitive practices. Faraday in his lab, and myself mimicking his actions, makes me a kind of 'choreographer' of science, playing to the 'audience' of science studies specialists, hoping to engage their approval and pleasure for the meaning of my work for an understanding of Faraday. I thus resemble Hagendoorn in his studio and at the scholar's desk, both trying to bridge a gap not usually seen as bridgeable. I claim a right to comment on his work solely for this reason. I do not know dance, but I do know something of bridges.

As both practising choreographer and academic analyst, Hagendoorn brings a unique perspective, one that can enthral both academics and audiences. The promise is well-articulated here and in his earlier papers (e.g., Hagendoorn, 2003; 2004; see also his website, http://www.ivarhagendoorn.com). Just as art bridges a space between artist and audience, so too does Hagendoorn bridge a space between cognitive studies and dance.

In the present, all-too-brief, paper, Hagendoorn mirrors three trends in current cognitive science, touching on three areas that hold the promise of enhancing our understanding of dance: the experimental-psychological extension of fundamental perceptual and motor processes (his analysis of the oblique effect), the use of chaos and complexity theory to understand cognitive dynamics (his discussion of the possible understanding of art as pushing perception to the 'edge of chaos'), and the use of evolution and neuro-imaging of the brain (his discussion of an imagined experiment with a choreographer and perceiver looking at successive versions of a work in progress while brain processes are imaged). Each approach has recent successes in cognitive science generally; Hagendoorn has used them to good effect in approaching dance.

Horizontal and vertical lines are fundamental in perception, and people are more sensitive to them than to oblique lines (the 'oblique effect'). They appear preferentially in visual art and in dance as well, but these regularities (not 'laws,' as he carefully notes), are not the whole story. Artists and choreographers can and do violate such principles, one source for the role of surprise in art. Even at this level, faces, human bodily movement, and (I would add) causality and agency are fundamental as well.[1] Yet no list of such components can ever equal the whole. I recognize something similar from my work on Faraday. At first, I explored only his use of confirmatory and disconfirmatory evidence, as if one heuristic (or even a few) could capture the features of his experimentation in electricity and magnetism. A good story was had, but it was painfully incomplete. Only much later did I see that the *dynamics* of his research were lost in such an approach.

I thus read Hagendoorn's discussion of the oblique effect as showing the limits of a straightforward application of fundamental perceptual principles to the understanding of dance. Movement is dynamic, it happens in time, and the particular movement dynamics of dance (like those of Faraday in his lab) demand more than simple stimulus-response relations ('horizontal good, oblique bad' or whatever). More is needed than just the appreciation of human movement as familiar and predictable, else why choreograph instead of filming the crowds in a train station?

Citing Ramachandran & Hirstein (1999), Hagendoorn lists a handful of higher-order aspects of art, the peak-shift effect, isolation , contrast, and so on. These are relational and dynamic, they can be understood only with attention to the whole, and they imply a context within time as well as space. Hagendoorn includes here the importance of rupture and resolution, as in montage in film, quoting also a dancer's description of 'going against the logic of the movement.' Artists thus 'upset' the visual system deliberately, and there are many levels on which this can work. We are dealing here, I think, with the role of *surprise*, but writ large, a powerful move for the artist, as for the scientist who does more than simply ignore surprises. Like the scientific experiment with unexpected results, the dance movement that momentarily breaks an entrained perception can lead to new associations, new meanings; 'if the brain is free to roam, it will', and the roots of creative choreography thus seem illuminated.

The language of dynamical systems can be adopted from physics to describe such phenomena; patterns of activity arise and form attractors, 'like a basin in a landscape, to which the system converges after it has been perturbed.' This is no mere metaphor; Thelen & Smith (1994), for example, have described the development of infant locomotion using such language. Thus, initial crawling partly relies upon a "cliff attractor" to categorize local space, and this expands to include inclined slopes as the infant learns to descend a slope. Standing and walking introduce new regions of the state space, ones which must also be experienced to develop new attractors. Similarly, dance involves the emergence of attractors in a state space defined by sets of possible body movements (Hagendoorn, 2003). *Categorization* is the result, the grouping of events in a time-space context into abstract and generalized forms. Such language also fits Faraday searching through a space of confusing metallic specimens, deepening the "attractors" among regions of his categorization of the appearances of gold metal (Tweney, *et al.*, 2004). Hagendoorn reminds us that these too are dynamical achievements, Faraday using mind and eye, but also *action* — repeating and varied 'movements' of experiment — to create new meanings and new associations.

Finally, Hagendoorn treats of the promise of evolutionary models and of neuro-imaging for the understanding of dance. Here, alas, (by analogy with a 'proper' ballet that must include narrative structure), I must fulfill the obligations of a 'proper' comment and include some reservations. I am less sure than Hagendoorn that such 'biologization' of dance cognition will be fruitful. What evolves, of course, is *brains*, not behaviour *per se* (Panksepp & Panksepp, 2000), and accounts that link the early evolution with current behaviour are on slippery ground. Surer footing is, in my view, to be had from recent dynamic studies of cognition. It is of course interesting that sexual selection may be related to the prevalence and universality of dance, but there is no fossil record for the early manifestation of dance in human prehistory and so other models of the emergence of dance must be seen as equally likely. Why attribute dance to selection when it can also, as Hagendoorn implies by noting the prevalence of synchronization, be accounted for by dynamic principles? Fireflies will sometimes blink in synchrony, or birds flock, each patterned outcome being the product of simple dynamic principles acting deter-

ministically on independent individuals (Strogatz, 2003). So also the synchrony of dance can be seen as an *emergent* synchrony predicated upon voluntary repetitive movement, coordinated first by physical principles, and later increasingly entrained by goals and purposes.

As for neuro-imaging, so little has been done with dance that it may seem premature to be critical, especially given the intriguing results of the few fMRI studies cited. Hagendoorn recognizes the essential limitation here, of course, in questioning 'does it matter in any way what happens where inside the brain?' I think he is exactly right in raising this issue, but I would caution that even if such localization is achieved, this will not easily lend itself to further understanding of its properties or functions, particularly not in fast-changing dynamic contexts.

These reservations aside, can we conclude that Hagendoorn has opened a bridge between cognition and dance? The answer is clearly yes, but he has opened another bridge as well. At the beginning of this paper, I discussed the metaphorical comparison of science to dance. Can I work the metaphor the other way? Is dance like science? Thanks to Hagendoorn, I now think the answer, in a deep sense, may be yes. Faraday's dance with nature was indeed one in which he was simultaneously choreographer, dancer, and audience. The gap Hagedoorn bridges is between dance and cognition, but it is between art and science as well.

Endnotes

[1] I am thinking of Michotte, 1963, in making this suggestion, especially his distinction between mechanical causality and those movements of people and animals in which the moving object appears as the source of its own movement. Michotte noted that changes in *shape* can be perceived as changes in *living movement*, and explored the circumstances under which this occurred.

12

Trans-disciplinary Approaches to Research into Creation, Performance, and Appreciation of Contemporary Dance

Catherine Stevens

Introduction

The many layers and dimensions of creating, performing, and appreciating contemporary dance make its analysis from a psychological perspective compelling and challenging. Movement material that is created, performed or observed engages motor and kinaesthetic processes and leads to cognitive and affective reactions. Rich in gesture, expression and affect, contemporary dance is a heightened form of non-verbal communication. The aim of this chapter is to demonstrate the need for new and diverse methods to investigate and explain the complex psychological processes that underpin creation, performance and appreciation of contemporary dance.

Earlier psychological investigations have often dealt with dance as discrete movement or steps, and questions of memory and imagery have been unnecessarily confined to codes that are verbal or visual. We argue there is more. Movement through space and time is continuous and its effects cumulative. Ideas that generate movement may be verbal or non-verbal, and may be expressed as movement or metaphor. Empathy and understanding may emanate from the

unconscious neural level of ' mirror neurons' (Decety & Chaminade, 2003) through to conscious recognition of shared circumstances and states (Sloboda, 1998). Communication is achieved through inter-relations and integration of physical, cognitive and emotional forms of knowing.

The first part of this chapter consists of a summary of the approaches we have used to date to examine choreographic thought, creativity, and audience response to contemporary dance in an effort to capture the temporal, spatial, visceral and affective characteristics of human creativity, action, and movement-perception. The second part of the chapter is prospective and describes new interdisciplinary methods for analysis of these domains.

Choreographic Cognition

As part of the Unspoken Knowledges and Conceiving Connections projects, we observed and documented the in-studio conception and evolution of a number of new dance works. These included *Red Rain* (choreographer Anna Smith), *Not Entirely Human* (Sue Healey, Michelle Heaven), parts of *Fine Line Terrain* (Sue Healey), and *Incarna* (Neil Adams). In 1999, as we observed choreographer Anna Smith and her dedicated team of dancers create, experiment with and refine movement material for what was to become *Red Rain,* we coined the term 'choreographic cognition' (Stevens, McKechnie, Malloch & Petocz, 2000).

Choreographic cognition refers to the cognitive and mental processes involved in constructing and refining movement-material with the intention of creating a work of art.

From the point of view of experimental cognitive psychology, choreographic cognition is a complex and problematic phenomenon because the underlying processes are hidden, rapid, multimodal, and non-verbal. These latter qualities bring into relief the paucity of many psychological theories in explaining human creative behaviour. Specifically, the majority of theories in cognitive psychology assume that human memory and cognition involve verbal and/or visual representation (for example, Anderson, Budiu & Reder, 2001; Collins & Loftus, 1975; Raajimakers & Shiffrin, 1981).

In comparison, creativity in contemporary dance is movement-based and material evolves from experimentation and exploration in

the medium itself (Foster, 1976; Gardner, 1993; Hanna, 1979; Healey, this volume; Humphrey, 1959; Limon, 1955; Vaughan, 1990). The source of an idea in a new work may be drawn from any modality—visual image or space; heard or felt rhythm, beat, texture; visual, auditory, muscular, or psychological tension; emotion; sound; word; concept (Foster, 1986; Stevens, Malloch & McKechnie, 2001; Stevens, Malloch, McKechnie & Stevens, 2003). The idea is then expressed through movement, tension, and stillness. Second, most theories of cognition derive from studies of static items and objects such as words or pictures. Generating, performing, or observing contemporary dance defies this, too—movement-production and perception-processes being visual, spatial, temporal, and kinaesthetic.

Borrowed Models

One way to proceed is to borrow and adapt methods from domains that share features with contemporary dance. For example, methods to study movement may be taken from sports psychology (as in, Hanrahan, Tétreau & Sarrazin, 1995; Overby, Hall & Haslam, 1997; Starkes, *et al.*, 1990). However, theories of human movement that have been developed in the context of sport do not explain the underpinnings of movement generated to be novel, expressive, and interpreted by both expert and novice observers. As an alternative, models of creativity developed in the context of creative or performing arts, such as music or the visual arts, may be adopted, but they rarely consider the temporal, spatial, and non-verbal qualities of creating new phrases of movement.

While dance shares much with other art forms, it is also unique. Like architecture and sculpture, it manipulates volumes of space for aesthetic and expressive purposes, but unlike architecture and sculpture its product does not stand frozen in time. Like painting and drawing, dance for the observer is a visual experience, but, unlike these, it is not a static object. Like music and poetry, dance takes place via movement through time, but unlike these it is for the observer a manifestly visual experience. Like all other art forms, dance is expressive and emotionally communicative (giving rise to the 'aesthetic experience').

Unlike all other art forms, however, dance is literally embodied in the moving human form. Thus time, space, motion, and the human

body are the media for choreographic cognition (Stevens, McKechnie, Malloch & Petocz, 2000). In light of the ephemeral, temporal, and spatial qualities of dance, we took an approach that did not rely on a single method to study choreographic cognition, but used converging operations to address issues in different and complementary ways.

Analysing Creative Processes in Choreographic Cognition

As detailed in the Epilogue, our first method to study choreographic cognition used the case-study paradigm. The case-study method enabled the tracking and analysis of behavioural markers of creative processes. Data for the case study included studio video-footage and journal notes made by the choreographer and one of the dancers. A 24-week chronology of making *Red Rain* was compiled. An analysis of the main themes of the work using a method of description and analysis borrowed from musicology (Schenker, 1979) was provided. The creative work of the choreographer and dancers was described using the Geneplore model of creative cognition (Finke, Ward & Smith, 1996).

The case study brought to light a cycle of generative and exploratory processes of problem-finding, problem-solving and metaphorical thinking. More specifically, and guided by the Geneplore model, we identified generative phases or pre-inventive structures with properties that promote discovery (Finke *et al.*, 1996). Cognitive processes and examples of pre-inventive structures from *Red Rain* included: retrieval (red images—tomatoes, blood, red earth, red wax, red kidney beans); association (concept of blood led to associated concepts of life, veins, arteries, spine, death, ritual); synthesis (blend breathing, blood with red/blue paper); and analogical transfer (paper sculpture as spine or personal history, helix analogy to DNA). Pre-inventive properties in creative cognition of which evidence was found in the development of *Red Rain* included novelty, ambiguity, meaningfulness, emergence, incongruity, and divergence. Exploratory phases and examples included: attribute-finding (red/blue paper as a womb, nest); conceptual interpretation (beans as blood-flow, or aurally as rainfall); functional inference (book/spine paper sculpture); and hypothesis testing (helix pattern problem and solution).

In keeping with the scientific or hypothetico-deductive method on which experimental psychology is based, future investigations are

needed to document the evolution of other new works by different choreographers and dancers. The content is likely to differ radically from *Red Rain*. However, if the Geneplore model has psychological validity for contemporary dance, then commonalities in the processes and stages should be observed across a range of works, contexts, and choreographers.

Recording Audience Response to Dance

The term 'choreographic cognition' may also be applied to the cognitive processes of members of an audience as they watch, interpret, and respond to contemporary dance. Renee Glass's research (chapter 8) with the Audience Response Tool (ART) records and compares cognitive, aesthetic, and affective responses of audience members who have attended a pre-performance information session with those who have not. The effect of dance experience and/or training on cognitive and affective reactions has also been manipulated and analysed (see chapter 10). Our methods converged in that movement-motifs, features, and themes of *Red Rain* described in the case study were echoed in interpretations of the work provided by audience members using ART.

Analyses of choreographic processes using a case study approach, and perceptual and cognitive responses of audience members using psychometrics methods, revealed contemporary dance to be a rich behavioural phenomenon deserving of attention from cognitive, social and developmental psychologists. Our investigations revealed that creation of contemporary dance is a generative process that may be applied to a pulse, rhythm or gesture abstracted from visual, auditory, kinaesthetic or tactile modalities. The artistry of choreographer and dancer is to express these ideas in bodily form.

Cognition in dance is quite literally embodied knowledge. By embodied knowledge we mean procedural memory for sequences and movements (Solso & Dallob, 1995; Smyth, Pearson & Pendleton, 1988; Smyth & Pendleton, 1990, 1994; Starkes *et al.*, 1990), 'embodied' in the sense of the body as a medium whose movements carry information, for performer and observer, about physical, conceptual, and psychological aspects of the world (Ayres, 1973; Iyer, 2002; Sloboda, 1998; Thelen, 1995).

Framed this way, choreographic cognition provides a litmus test for psychological theories that purport to explain human memory,

creativity, communication, and language. Much work remains to develop psychological theory that can explain the parallel, multidimensional, and ineffable processes at work in choreographic cognition. Work may also proceed to develop methods for capturing responses of audience members in real time as a performance unfolds.

New Methods to Investigate Contemporary Dance

There are at least three aspects of choreographic cognition—as it relates to choreographer, dancer or observer—that warrant scrutiny and that elude most empirical investigations. First, the dynamic and temporal nature of contemporary dance requires the recording of cognitive, affective, aesthetic and physiological reactions through time, as creation, performance, or observation of movement unfolds. Second, it may be informative to record and analyse the underlying neural activity of observers as they watch contemporary dance. The moderating effect of specialist movement-expertise could also be examined if continuous recording methods are developed that capture cognitive, affective, and physiological reactions. Neural activity and behavioural (continuous response) data could then be compared and correlated. Third, the impact of dance exposure and training on development from the perspective of social processes, personality, self-esteem, memory and spatial abilities could shed light on developmental processes across the lifespan, from new and emerging artists, to established artists and those late in their careers.

New methods are needed to capture these three dimensions of choreographic cognition. Concomitantly, innovative theories are needed to interpret and correlate the resulting time-series data, and to examine and explain the intimate conceptual link between choreographer, dancer and observer. Suggestions for potential methods and theories will now be outlined.

Recording On-Line, Continuous Responses to Dance

The Audience Response Tool (ART), as we have seen, provides comprehensive recording of open-ended and discrete (rating-scale) responses. However, ART is retrospective, and the reliance on human memory is problematic. Encoding and retrieval of information from human memory is known to be a constructive and reconstructive

process (Bartlett, 1932; Cowan, 1995; Loftus, 1979). Introspective or retrospective accounts of a dance performance will always be tainted by the act of retrieval. That is, initial perceptions, responses and reactions will combine with existing knowledge and be influenced by expectations. Responses gathered after a performance may differ from initial reactions as a result of omissions, rationalisation, and interpretation.

A method that captures cognitive and/or affective responses in real time eliminates the problem. Accordingly, we are developing an on-line, continuous-measurement device that can be programmed to record cognitive or affective responses along one or two dimensions while a work is performed. The hardware for such a system consists of a hand-held computer with an external input device such as a joystick to allow input with a twice-per-second sampling rate.

Recording continuous cognitive and affective responses

Schubert (2001) and Cowie, Douglas-Cowie, Savvidou, McMahon, Sawey and Schroeder, (2000) have used continuous-sampling methods to record emotional two-dimensional responses to affective stimuli such as music and faces (see Figure 1, overleaf). For example, Schubert's (2001) Two-Dimension Emotion Space (2-DES) consists of a computer screen that depicts emotional labels in 2-D space with one dimension referring to valence and the other to arousal. As a musical piece plays, participants use a computer mouse to move the cursor around the four quadrants to indicate either the emotion they recognise is being expressed by the music, or the emotion they feel in response to the music.

The data gathered using this method is in the form of a time-series. A trajectory through the 2-D/four-quadrant emotion-space is derived, and emotional reactions can be related to the structure of the musical piece. Methods gleaned from time-series analysis are available to gauge the lag between significant structural, melodic, rhythmic, dynamic or harmonic points in the music, and listeners' points of change in emotional response (Schubert, 2001; 2004).

A similar procedure may be adapted to record continuous responses to contemporary dance. Observers may respond using a single dimension from low to high that represents grades of qualities such as happiness or enjoyment, or judgments of complexity or

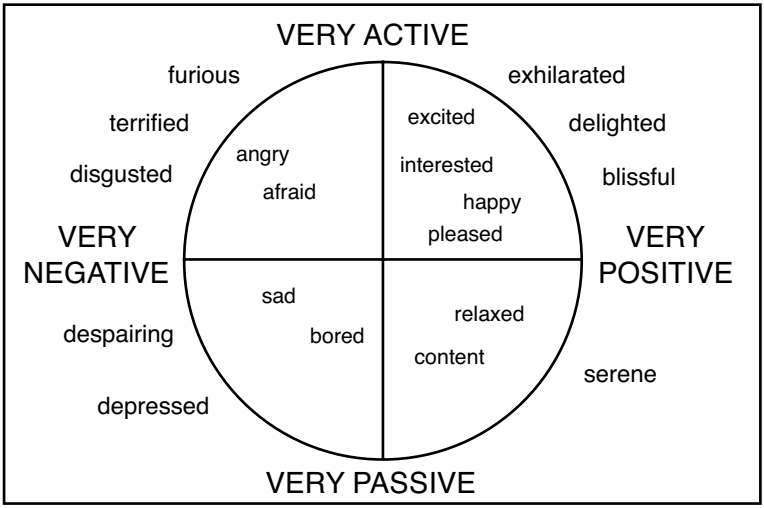

Figure 1: *An instrument for recording perceived emotion*
© R. Cowie, 2000

predictability. A two-dimensional representation of emotion could also be used (Cowie *et al.*, 2000; Schubert, 2001). Sessions would commence with training and practice trials to ensure that participants are familiar with the recording device, and that the method does not distract attention or interfere with reaction to the work. The data can be analysed as a time- series, and compared with the sequence of events in the work. Consistency in type and intensity of response across audience members may also be deduced.

Recording physiological reactions to dance

Responses to dance by expert and novice observers often include visceral and somatic reactions (see chapter 8). It is well established that people entrain to a beat or rhythm (Jones, 1976; Large & Jones, 1999; Wing, 2002). For example, children and adults accurately synchronise a motor response such as finger-tapping to the pulse of auditory isochronous sequences, rhythmic sequences, and music (Drake, Jones & Baruch, 2000; Large, Fink & Kelso, 2002), and adults adapt their breathing according to actions they observe (Paccalin & Jeannerod, 2000). It should also be the case that observers of dance entrain to the various time-scales of movement in dance. Anecdotally, dancers

report that when they watch dance they have a sense of dancing themselves (for example, Marie Rambert in Foster, 1976, p.44; Hanna, 1979). To test this hypothesis empirically it is necessary to measure physiological responses, such as pulse or respiration, that may synchronise to music and movement, and that signal or correlate with emotional and/or somatic reactions.

It is now possible to record many channels of physiological data as individuals observe performance of a live dance work. Physiological indices that can be measured easily using a small cuff on the finger include pulse rate and galvanic skin-response. Electromyogram (EMG) or muscle activity may be measured using surface electrodes, and a belt worn around the diaphragm can be used to record respiration. These physiological responses may be related to level of arousal, startle response and attention, sympathetic muscle activity, and entrainment of respiration or pulse.

Research questions to be asked include: Do observers entrain to the pulse and rhythm of a dance work? Is there evidence of sympathetic muscle activity, particularly in those with extensive dance training? Are physiological responses correlated with cognitive or emotional responses recorded using the 2-DES apparatus?

The technology for recording and analysing multivariate time-series data is readily available. The challenge for this research is the development of testable theories that guide interpretation and explanation of interrelations between the affective, cognitive and physiological data, and the multiple time-scales to which individuals of differing levels of knowledge and expertise may entrain and respond.

Brain Activity During Movement-perception and Action

Psychologists have long speculated that perception and action are intimately linked—that *observing* an action involves the same repertoire of motor representations as is used to *produce* the action (Castiello, 2003; Chaminade, 2002; Decety, 2001; Liberman & Mattingly, 1985). One implication of this view is that the capacity to understand another's behaviour and to attribute intention or beliefs to others is rooted in a neural execution/observation mechanism (Grèzes & Decety, 2001). Recent findings in neurophysiology suggest that in monkey ventral premotor cortices there are neurons that code goal-directed motor acts such as grasping, holding, and manipulating

objects—a ' motor vocabulary' of actions related to prehension (Rizzolatti & Arbib, 1998). Notably, a percentage of F5 grasping neurons also fire during *observation* of specific 3-D objects even in the absence of any movement directed toward them (Murata *et al.*, 1997).

It seems that representation of an action can be triggered either by presence of the object or by the *memory* of it. Gallese *et al.*, (1999) propose that 'mirror neurons' provide the neurophysiological basis for the capacity of primates to recognise different actions made by other individuals: the same motor pattern which characterises the observed action is evoked in the observer and activates its own motor repertoire. This matching mechanism offers the advantage of using a repertoire of coded actions in two ways at the same time: at the output side to act, and at the input side to analyse the visual percept. Such a matching system has now been demonstrated in humans. Transcranial Magnetic Stimulation (TMS) of the motor cortex of subjects *observing* hand actions made by the experimenter determined an enhancement of motor-evoked potentials in the same muscular groups that were used by the experimenter in *executing* those actions (Fadiga *et al.*, 1995). It appears that when we observe an action, we use the repertoire of motor representations used to produce the same action—it is a system of *sympathetic response.*

Live contemporary dance is a particularly rich context for real-world investigation of the role of so-called 'mirror neurons' in expression, communication and empathy through human movement. For example, contemporary dance may communicate not only through narrative and metaphor but also at the level of shared understanding of the dynamics and constraints of the physical and biological world. Sloboda (1998) argues that meaning in music comes from the way it embodies the physical world in motion, and that human understanding of music comes from our capacity for analogical thinking. Contemporary dance, too, embodies the physical world in motion and, it could be argued, may be doubly powerful in that it can be understood both by analogy and by direct perception.

As an example, *Amplification* by Phillip Adams takes as its subject matter the contemporary cult of the pornography of car crashes. Adams faced a problem of how to represent a distorted experience of time (a common experience during a car crash) in dance terms. The

problem of conveying the nature of the experience in real time was solved by breaking up movement-material into brief distorted and fractured components, and performing a long and complex sequence of them at a perilously fast tempo (see figure 2). The effect was of rapid, violent movement seemingly (and paradoxically) occurring in slow-motion. Adams' exploration of body and temporal distortions can be understood both directly *and* by analogy. Mirror neurons and the sympathetic neural and possibly muscular response activated as we observe dance is a candidate mechanism to explain communication through direct perception.

Figure 2: *Performers: Shona Erskine, Luke George, Geordie Browning, Stephanie Lake, in* Amplification*, 1999 Choreography © Phillip Adams*
Photo © Jeff Busby, design – 3 Deep

Corballis (2003) posits that language evolved from hand gestures rather than vocal calls. He theorises that in early bipedal hominids facial gestures increasingly supplemented hand ones, gradually accompanied by vocalisations. Eventually all gestures of mouth and tongue became distinguishable acoustically, and hand gestures became redundant. Corballis notes that gestures with the hand continue as an accompaniment to speech.

The theory proposed by Corballis explains the universality of human movement and gesture—heightened in dance—as a means of

communication. Dance in this theoretical context is an important medium in which accounts of communication through movement may be tested and evaluated. For example, cross-cultural investigations of the universal recognition of body gestures and alarms.

Research is currently under way in a number of laboratories around the world using brain-imaging techniques to capture neural activity as a person observes and/or enacts a particular movement (for example, Decety, Chaminade, Grèzes & Meltzoff, 2002). Conceptual frameworks for the research include the coupling of perception and action and the notion that perception of others' motion, such as the ability to identify, interpret and to predict the actions of others, plays a major adaptive role (Grèzes, Fonlupt, Bertenthal, Delon-Martin, Segebarth & Decety, 2001). For example, if the same representations are used for both reading others' actions and producing them, an important issue relates to the way we easily distinguish the actions we produce from those generated by others (Decety, *et al.*, 2002; Jeannerod, 2003).

In one brain-imaging study, Positron Emission Tomography (PET), scans indicated that the left inferior parietal cortex is involved in producing imitation, whereas the right homologous region is more activated when one's own actions are imitated by another person (Decety *et al.*, 2002). Examining the effect of expertise, and using functional Magnetic Resonance Imaging (fMRI), Lee, Kim and Woo (2001) demonstrated that novice observers perceive dance simply as movement.

By contrast, stronger activity in the left superior temporal sulcus and angular and fusiform gyri of professional choreographers suggests that they analyse movement with knowledge of choreography and the extraction of symbolic units that activate a semantic network associated with the meaning of particular gestures and actions. One explanation of this phenomenon may be the potential interplay and/or competition between procedural and declarative memory (Poldrack & Packard, 2003).

Our own research will use magneto-encephalography (MEG), a brain-imaging technique with good temporal and spatial resolution, to capture the flow of activity in the brain as participants synchronise or entrain to a beat presented visually and aurally. Behavioural, muscular and neural responses will be recorded and compared during

perception and action conditions. To test the hypothesis that movement-perception and neural simulation are constrained by an observer's motor competence, expertise and expectations (Chaminade, *et al.*, 2001; Jeannerod & Frak, 1999), movement expertise of the observer will also be manipulated.

While the technology is available to record the flow of activity in the entire brain as participants observe, image or enact movement, mathematical and analytical tools to describe and summarise the *dynamics* of human movement are required. Dynamical systems theory (Freeman, 1999; Gregson & Pressing, 2000; Mitchell, 1998; Port & van Gelder, 1995; Stevens, *et al.*, 2002) may be applied to analyse dynamical properties of the movement-stimulus, as well as the dynamics of associated neural activity and flow. Robust mathematical models of biological and human movement are needed to complete this story. Convincing animations of biological motion will herald the discovery of mathematical equations that describe human movement. Currently, models exist for walking and running based on equations for the motion of a pendulum (Alexander, 1984), for flapping movements based on equations for the motion of a mass spring (Thelen, 1995), and to generate variations of predefined motion-sequences (Bradley & Stuart, 1998). Other complex human movements await mathematical analysis, parameterisation, and synthesis (Camurri, *et al.*, 2000; Camurri, Lagerlöf & Volpe, 2003; Jalics, *et al.*, 1997; Ude, 1999).

Effects of Dance on Development, Identity and Memory

At the other extreme of the behavioural spectrum, the effect of participation in contemporary dance programmes on child and adolescent development, personal identity, and cognitive abilities, also warrants systematic investigation. Anecdotal reports of the personal and social benefits of active arts programmes exist, but there are few controlled longitudinal studies of the effects, or theories to explain possible underlying mechanisms.

A spin-off study from the Conceiving Connections research project is currently under way, examining self-concept, self-esteem, identity and personality attributes of adolescents participating in the Quantum Leap Youth Dance Program at the Australian Choreographic Centre. Scores on a range of social and personality scales (for example,

Marsh, 1999) will be measured at the beginning and end of the Quantum Leap programme. The intention is to capture development over the 12-month period, to document the programme and process and disseminate findings nationally and internationally so that similar programmes may be implemented elsewhere.

Given the wealth of non-verbal material in contemporary dance, it is surprising that only a few researchers have used dance as a medium for the examination of temporal, kinesthetic and spatial cognitive processes (Hanrahan, *et al.*, 1995; Smyth & Pendleton, 1994; Solso & Dallob, 1995; Starkes, *et al.*, 1987). A new project will investigate the nature and mechanisms of short-term and long-term memory for movement and spatial and temporal stimuli among new and expert dancers and choreographers. Whether movement-material is coded and/or transformed in verbal, spatial or kinaesthetic terms will also be investigated.

Conclusions

Psychological processes involved in contemporary dance from the vantage point of choreographer, observer, and dancer have been considered. This complex phenomenon has many facets, and its investigation and explanation require the use of theories and tools from many disciplines. For example, creative processes in choreography have been considered using tools from psychology and musicology.

Measurement and interpretation of audience-response has drawn on techniques from sports psychology, psychophysiology, and neuroscience. Memory and personality issues may be examined using experimental methods and psychometric tools gleaned from cognitive, social and developmental strands of psychology.

Three themes recur in the prospectus for research outlined in this chapter. First, work is needed to develop theories and testable hypotheses to drive investigations that make use of current technologies such as Peak Motus motion-capture, the mathematics of dynamical systems theory, and brain-imaging methods such as PET, fMRI and MEG. Second, as human movement is defined by its passage in time, tools for analysis of time-varying events and multiple time-scales are needed. Third, research questions relating to contemporary dance will only be answered by using the breadth and complementarity of an interdisciplinary approach. In many instances the technology and tools for

interdisciplinary studies are available, and we await specification of detailed and integrated theories from which precise, testable hypotheses may be derived. The descriptions and views offered in this volume may go some way to realising that goal.

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13

Chronology of Creating A Dance: Anna Smith's *Red Rain*

Catherine Stevens

Introduction

Video material as well as journal notes document a nine-month project led by choreographer Anna Smith and seven highly experienced professional dancers. The video and written data present a rare glimpse of artists in action as they conceive, develop, reject and refine movement material for a new work. The interactive nature of choreographer and dancers working together to develop a work ensured the recording of discussions and the sharing of ideas both in words and movement.

This chapter concentrates on the weekly log entries made by one of the dancers and the annotations of the video footage made by the choreographer. Our aim is to describe and investigate this particular creative journey and identify aspects of the choreographic process that conform to theories of creativity.

Defining Contemporary Dance

In contemporary dance the major medium is movement, deliberately and systematically cultivated for its own sake, with the aim of achieving a work of art. It is communicative and expressive; it is visual, spatial, temporal, kinaesthetic, sensual, evocative, affective, dynamic,

and rhythmic. Recording and describing the creation and composition of such a complex, multi-modal form of artistic behaviour can offer new insights into human cognitive processes.

In studying the conception and choreographic realisation of a dance work we can expect to observe the recognised hallmarks of creative thinking. These include:

1. Problem-identification and solving (Goldsmith, 1985; Kay, 1994; Wakefield, 1994);
2. Metaphorical thinking (Boden, 1996; Finke, Ward & S. M. Smith, 1996; Martindale, 1990);
3. Juxtaposition of contradictory ideas (Anderson & Helstrup, 1993; Koestler, 1964; Rothenberg, 1994);
4. Imagery (Finke, 1993; Isaksen, Dorval & Kaufmann, 1991/2; Kaufmann & Helstrup, 1993; Reed, 1993; Rieber, 1995; Simonton, 1994).

Rehearsal and performance of new and complex movement-material implicates memory for material that is visual, spatial, kinaesthetic, motoric, temporal (Hanrahan, Tétreau & Sarrazin, 1995; Overby, 1990; K. L. Smith, 1990; Smyth & Pendleton, 1990, 1994; Solso & Dallob, 1995; Starkes *et al.*, 1987, 1990). Contemporary dance is a highly complex instance of human cognitive processes—short-term and long-term memory, multi-modal imagination, learning, performance, and expressive communication.

Background to the Work

The project involved choreographer Anna Smith working closely with eight highly experienced and professional dancers. All dancers were female; ages ranged from 21 to 26 years. Dance studios were used at the Victorian College of the Arts and the Choreographic Centre, Canberra. Sessions where movement-material was created, developed, modified, and selected were recorded on digital video. This technology provided good quality images and enabled dancers to view easily a sequence recorded in that or an earlier session.

Entries were made in journals on a daily basis by the choreographer Anna Smith and one of the dancers undertaking an honours degree (Nicole Steven). Anna's entries included notes on progress

during each session as well as ideas and images to be explored in movement.

Movement-material was also developed with, or inspired by, the use of particular props. All movement-material was developed without particular music in mind. Performances of *Red Rain* used a recording of the music from *The Ghost Opera* by Tan Dun performed by the Kronos Quartet.

Dancers and choreographer worked four to five days per week (averaging 15 hours per week) over nine months creating, developing, sequencing and refining the movement-material. As the movement-material evolved and changed it was recorded on video by the choreographer whenever she felt a useful phrase had emerged or when any movement idea needed to be remembered for future reference or development.

From the outset, movement-material was generated in response to ideas and images expressed by the choreographer, as well as from comments by the dancers. There was no fixed or explicit narrative. Gradually, certain material was selected, principally by the choreographer, further improvised, learned and refined by the group. Video footage was checked and phrases of movement sequenced and re-sequenced. The final work premiered at Gasworks Theatre, Melbourne, in November 1999.

Chronology of the Process

A summary of ten hours of video material in chronological order is contained in Appendix 2. The summary contains descriptive notes from the choreographer and includes the date and duration of each developmental unit. The 14-week logbook written by, Nicole Steven forms the basis of the following chronological description of the choreographic process.

Weeks 1–4

The choreographer began by asking the dancers to think about, and respond to, ideas and images associated with the colour red. Sharing of ideas, associations, images of red and the blood-filled interior of the human body took the dancers into the beginnings of movement. Early experimentation investigated what choreographer Anna Smith labelled 'through-lines'. The aim was to find a 'pathway out of the

body' from the pelvis and out through another part of the body. Dancer Nicole Steven documented the through-lines or pathways she developed:

> My second through-line: At the tip of sacrum; Around to iliac crest; Head of femur; Spiral through thigh; Drops out knee cap' (Steven, 1999, Week 1).

These written notes were used to prompt the dancers' own memories and facilitate explanation to other dancers. By the end of the first week the choreographer introduced an idea for the work based on a paper sculpture relating to the inside of a vein or artery. The dancers discussed and explored movement suggested by veins, pulsing, breathing, pressure, blood flow.

In the second week, the body through-lines were scrutinised and sequenced. The choreographer asked the dancers to bring something red to rehearsal, and discussion of the objects and their inherent versus secondary 'redness' ensued. Some of the objects were used as a basis for new movement; for example, red kidney beans were studied and their feel, sound, textural qualities, observed. The dancers attempted to use the beans while producing their individual through-lines. In the final work, the beans were poured in streams from bowls and from folds held against the dancers' bodies, or were pushed against a prostrate dancer leaving the trace of her form on the floor as she rolled away (Images on following pages). The red kidney beans became a central metaphor for the idea of blood throughout the work. In another experiment in Week 2 the dancers took turns in having red wax dripped onto their skin (Image p.174). Nicole noted:

> We discovered a rather strange sensation as the hot liquid wax cooled to become a stiff and rigid, almost suffocating, second skin, only to crack and peel cleanly away from the skin as soon as movement was introduced.

Beans are pooled or trickled. In the closing moments of the work they are poured in a torrent of 'red rain'. The sound recalls rain on an iron roof.
PHOTO: ANNA SMITH.

Red kidney beans were used to outline the shape of a prone body.
PHOTO: ANNA SMITH.

The line of the body left behind suggested traces written in blood.
Photo: Anna Smith.

In the studio, the dancers experimented with the wax of a red candle dripped on skin – the wax evoking sensuous images of fragility, blood.
Photo: Anna Smith.

In Week 3 large squares of paper with one side red and the other blue were used in the studio. One experiment with the paper resulted in:

> 'a beautiful sculpture which resembled some kind of a nest around K. as she lay on the floor. The paper was scrolled and curled … it was frail yet seemed to protect her. It also enveloped around her, the red interior, revealing occasional slithers of blue from the other side of the paper seemed very life-giving, like a nest or womb' (Steven, 1999, Week 3).

The following image illustrates the paper nest. During this week the choreographer introduced the idea of a lack of oxygen in the blood or body and the dancers were asked to consider what effect this would have on movement.

The ensemble referred to this image as the 'nested child'. Thickly textured paper curls in folds around the body of the dancer. To the choreographer, the red and blue colours of the paper suggest both life-giving and life-draining qualities.

Photo: Anna Smith.

Another paper sculpture was introduced in Week 4. Created by sculptor Elizabeth Boyce it consisted of several small rectangles of white paper joined by a thread that ran through the centre of each rectangle. The choreographer hung the length of rectangles and asked for the dancers' responses to the sculpture (Image below). For Nicole, the sculpture was reminiscent of the human spine with each piece of paper a vertebra—the thread like a spinal cord. The group spoke of possibilities of using red ink, symbolising blood, to write their histories along the paper spine. Around this time, the choreographer recorded in her journal:

> Shapes fashioned from handmade paper transform the space: it is laid on the ground and curls around a body like a nest. A paper wall, made from vertical strands can be interpreted in a number of ways. Each is, perhaps, a book. The cotton that holds them together, a spine of a book, or a body. (Anna Smith, 1999).

Dancers responded individually to a single paper strand and later demonstrated their improvisation or movement response to the

The paper spines become doorways, corridors and portals. In the performance of Red Rain they are lit to suggest a mysterious curtain that both conceals and reveals.

Photo: Anna Smith.

other dancers. The nature of the vertical strand presented a challenge for the kind of movement material that could be used. Dancer K. produced a successful phrase—its appeal lying in the 'subtle, beautiful way the paper reacted to the slightest movement from her body' (Steven, Week 4, 1999). Dancers and choreographer discussed using an entire wall of the hanging spines in performance. Nicole noted that sharing their ideas about the paper led to a satisfying insight about the large, two-toned squares of paper and their relation to blood in the body—the red and the blue suggesting oxygenated and de-oxygenated blood.

Weeks 5–7

A change in the quality of movement-material occurred in Week 5. The initial through-lines were flowing in character and they maintained a stream of motion through a certain pathway in the body. To find a new awareness of each section of their bodies, the choreographer asked the dancers to construct movement that truncated the through-lines already established. Nicole noted the difficulty of this 'changing dynamic', and the choreographer taught the dancers what was intended through demonstration. As before, the group learned phrases developed by individual dancers. An improvisation task was constructed as a way to help the dancers 'break up the habitual flowing awareness [that] already [existed] in our body as trained dancers' (Steven, 1999, Week 5).

An effective method was to have someone else dictate the parts of the body where movement would be initiated. After pilot-testing the task, the dancers added certain descriptions of quality and dynamic to the bodypart instructions. Thus, each dancer responded to verbal instructions given by other dancers. For example, 'Right elbow behind back, shoulders tilting, left hand reaching'—with each dancer interpreting the cue.

Sessions involved individual improvisation and then selection of particular phrases of movement. As each unit originated with a single dancer, the units were labelled with a dancer's name. The dancers viewed the video and the choreographer selected portions of each dancer's movement-material. Each dancer then learned all of the selected improvisations. Nicole commented on the experience of re-creating her own improvisation that had been captured on video:

> I can say that largely I could remember the feeling associated with that particular movement. Yet actually re-creating it was difficult in that I was now looking at the image on the screen rather than being given a prompt which would initiate the movement … D. had a rather different experience with one particular movement of her own. She could not recall the moment when she had improvised that movement. (Steven, 1999, Week 5)

In Week 6 the series of paper spines forming a wall or curtain was used and further improvisations recorded. Nicole was struck by the relation of the dancers to the paper wall:

> The unfolding paper spines as the dancer moved away from the sculpture appeared almost as though the spine was being removed from the dancer's internal body.

Week 7 involved revision and consolidation of the movement-material created previously. Nicole observed:

> The material was starting to sit in my body more comfortably … Finally, the strain of remembering was fading and I could begin to really inhabit the movement (Steven, 1999, Week 7).

The choreographer began to sequence phrases and structure them in time.

Weeks 8–14

The dancers supplemented their own ideas and imagery with library research on the symbolism of red, particularly in other cultures. The dancers reported their findings back to the group and observed the universality of many of the ideas, symbols and rituals. In the ninth week the choreographer taught the dancers a phrase of her own movement-material. It picked up the idea of through-lines, blood-related imagery and linked in with earlier movement. It occupied a larger area of space than the dancers had used up to this point. This phrase was linked with another and structured around the wall of

paper spines. Nicole noted that integration of this material was difficult. The still, linear hanging paper was juxtaposed with frantic, erratic truncated movement. Larger phrases began to be loosely sequenced.

In Week 10 the group returned to texts found from their library research and the book *Juice of Life* (Camporesi, 1995) was the focus for inspiration. As a fresh alternative, the dancers split up and spent a day in personal rehearsal. Each dancer improvised an individually chosen passage from *Juice of Life*. The dancers regrouped in Week 11 and shared their ideas and phrases of movement-material. The choreographer selected sections.

Most of the movement was tense and dramatic. Phrases created by H. were different. She had chosen a section of text that referred to the cyclical nature of life and the circulatory system. Nicole described the phrase as consisting 'of a repeating pattern which appeared to circle back and forth around itself. It was really beautiful, and had a persistent lulling rhythm' (Steven, 1999, Week 11). Sections of all the phrases were learnt and H's phrase was learnt in its entirety. The remainder of the week was spent piecing these movements together and recording them on video.

Another prompt to develop new movement came from a text read aloud by the choreographer that captured the images of blood and the opposing ideas of life and death:

> At the ends of the universe is a blood red cord that ties life to death, man to woman, will to destiny. Let the knot of that red sash, which cradles the hips of the goddess, bind in me the ends of life and dream. (*Awakening Osiris*; in Ellis, 1998, p.180).

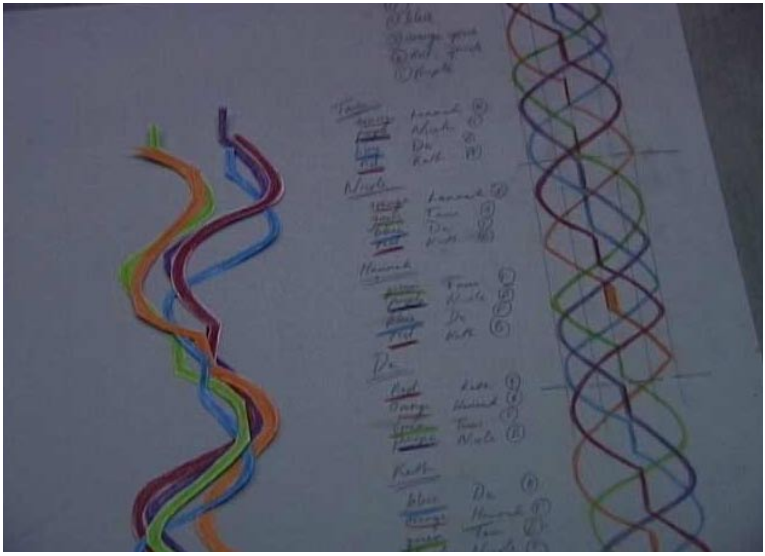
Nicole noted that this technique was new to the process and that it seemed to 'add texture and value to the movement' (Steven, 1999, Week 12). Ideas for the beginning of the piece began to emerge at this time incorporating earlier improvisations produced in response to: dripping blood; the wax sequence; movement from peeling wax; paper; text; truncated sequences; and dripping wax.

The dancers and choreographer discussed the intricacy of pathways of blood in the body and one of the dancers mentioned the DNA

double helix. The choreographer then introduced the idea of an unfolding helix or plait-like pattern made up of five dancers in constant motion. The helix would require rapid and continuous whole body movement from all dancers, with each taking a different path while performing complex, individual transitions. Work on the helix consumed hours of discussion, experimentation and spatial and temporal planning. The video shows choreographer and dancers drawing the pattern and coding the path of each dancer in colour (Image below).

The dancers walked through the pattern, perfecting their path and speed to avoid collision with each other. Coloured tape was used to mark out different strands on the studio floor. Finally, additional movement was added and the use of imagery encouraged.


http://www.mup.unimelb.edu.au/ebooks/0-522-85144-4/videos.html#HelixPattern



Colour-coded braid pattern or helix in Red Rain. Individual coloured strands represent the floor path of a dancer. Each dancer performed a sequence of idiosyncratic and complex movement transitions as they travelled along their path. On the video, the dancers discuss their perceptions of this process and its spatio-temporal complexities.
PHOTO: ANNA SMITH.

In Week 14 the new task was to find a solution to the helix-movement such that a circular phrase developed by H. might link two or more dancers in an arcing pattern.

Weeks 15–24

During the latter months the images and ideas from Week 1 recurred, continuing to inspire and frame movement: visual, rhythmic and visceral images such as blood rushing, pulsing in and out. The choreographer noted these ideas in her journal:

> Soaking the high air scarlet; blood silently burning; blood knotted to life and death. For me, these words engender imagery which is textural, sensuous, provocative; there is also pain and loss…Many ideas are giving birth to the movement material and the qualities I attach to it: a visceral relationship with images and objects. Blood and life; a torrent flows.

Props continued to impel movement or enhance newly emerging sequences. Four months into the project there were distinct and identifiable sections to the work: Section 1 merged with Section 2. The process of sequencing seemed to be an emergent one; Anna's journal captures the mystery and frustration of not always being fully aware of the final work:

> On Friday I had a great rehearsal; I think I passed through a difficult stage. I always feel as though I am over-anxious to know the work; what it is. But it is not alive yet so how can I possibly expect to know what it is? It has to breathe its own existence, and I have to be patient, to allow it to evolve itself. The work is an organism which creates its own body, so to speak. Does this make sense? Perhaps I understand the dilemma much better now (Anna Smith, 22/7/99).

After five months, there were five discernible sections to the piece. Much work had been invested in sequencing and developing transitions between movements and sections. The transitions functioned to link bodies in time and space while maintaining the tone

and flow of the piece. Movement-material was further combined either serially or in parallel—a byproduct of the parallelism of the helix pattern as well as the choreographer encouraging duo-work, with dancers practising their sequences 'against' others. The parallelism was a distinctive feature of the final work.

During the fifth and sixth months, props of paper, beans, wax continued to be used in the studio and these featured in the final work. By six months, the essence of the work was all but complete, the name of the work had been decided, and time was spent rehearsing and refining. *Red Rain* emerged as a title during the group's residency at the Canberra Choreographic Centre (17/8/99) in response to the choreographer's closing image in the work.

Description of the Final Work

The final 40-minute work begins with the delicate sound of water dripping gently through a dancer's fingers into a hidden pool. It ends with a torrent of 'red rain' pouring over bodies and falling in huge droplets of sound. There is something archetypal about the complex of image and sound: an evocation of ancient memories, perhaps of sacrifice and renewal. Between these powerfully conceived images the work unfolds in finely wrought structures that suggest the cycles of experience in which rituals of birth and death, isolation and community, mark the passing of women's lives.

In a review of the premiere, Fairfax (1999) wrote that:

> [M]ountains of blood-red kidney beans cascade across the floor and pile up to snug into the contours of the dancer's bodies while blood-red light creates rectangular patterns across the floor, boxing up the dancers and isolating them singly, and in groups, so that sometimes as many as four or five different things are happening at once. Meanwhile, a Japanese paper sculpture, strung ribbon-like across the stage and suspended in a shaft of white light (Image 13f), becomes a place for refuge, a shuttered window with dancers flickering past, contemplative, wilful figures in an ordered and highly ordering world (Fairfax, 1999).

Dance critic Hilary Crampton (1999) noted that imagery in *Red*

Rain is suggested, not explicit. The structures are complex—at times lingering on single moments, at other times flooding the stage with a myriad of images that can be read in different ways. The use of props is integral to the work—thick scrolls of paper form a womb-like nest, in which a diminutive figure curls, foetus-like, overshadowed by a dancer, tall, poised, archaic, with angular gestures. The images recur, the context changes, so that they can be read as tenderness, hope, despair, depending on the juxtaposition of figures and dynamics of the movement.

Crampton explains that the work has an inner tension and muscularity arising from the spine—movements coil and release into explosions of athletic energy. One is aware not only of the dancers, but also of the space behind them as limbs reach back, shoulder blades seem to take on life, like blossoming angel wings. It is as if the dancers are forever trying to bring the past with them (Image below).

The 'sail' image from a performance of Red Rain.
PHOTO: ANNA SMITH.

Creative Development and Creative Relationships

The development of *Red Rain* has been traced through an analysis of the journal of Nicole Steven that draws on the technique of musical structure analysis (Stevens, Malloch, McKechnie & Steven, 2003) developed by Heinrich Schenker (Forte & Gilbert, 1982; Schenker,

1979). It appeared to author Stephen Malloch that the task of beginning to discover relationships and important developmental moments in the creative journey as related in Nicole Steven's journal was a similar task to analysing a musical score, and the task of unearthing the more important elements, and investigating their inter-relationships, may be well served through a Schenkerian-style analysis (see Stevens, Malloch, McKechnie & Steven, 2003).

Cognitive Analysis

A useful organising framework for an analysis of choreographic cognition is Finke, Ward and Smith's (1996) Geneplore model of creative cognition. The model assumes that in the initial generative phase pre-inventive structures are invoked that have properties that promote creative discovery. The properties are exploited in the subsequent exploratory phase wherein attempts are made to interpret the pre-inventive structures in meaningful ways. During creative cognition, pre-inventive structures are generated, regenerated and modified in creative exploration.

Generative Processes in Red Rain

Generative cognitive processes that are specified in the Geneplore model include retrieval, association, synthesis, analogical transfer and categorical reduction. An early generative process evident in the creation of *Red Rain* involves retrieval and discussion of red images by dancers and choreographer. Images were visual and verbal in modality (for example, tomatoes, blood, red earth, red sunset), but also tactile (red wax, fire), olfactory (wine, roses), gustatory (plums, kidney beans, berries) and haptic (carpet). Single images elicited the retrieval of other associated images. For example, the notion of blood led to the associated concepts—life, bodily pathways of veins, arteries, the spine, death, and ritual.

Generativity through synthesis in the creation of *Red Rain* is evident in the blending of associations. Breathing, air, oxygenated and de-oxygenated blood, were blended mentally with the blue-red paper sculpture (Week 4). Examples of analogical transfer (Gentner, 1989) can be seen in the hanging paper sculpture being regarded equally as a spine or a personal history (Week 4; Image p.176). The complex five-strand helix is an example of movement-material analogous to the

double helix structure of DNA. Categorical reduction, where objects or elements are reduced to more primitive categorical descriptions, captures a quality of contemporary dance where an idea or concept is expressed in a primitive or reduced form through changes to movement and dynamic qualities. The simplification of movement-material or tempo change is also a form of reduction, such as the selection of H's circling movement from the more tense and dramatic improvisations inspired by *Juice of Life*.

Pre-inventive properties characteristic of creative cognition include novelty, ambiguity, meaningfulness, emergence, incongruity, and divergence. Examples of pre-inventive properties from *Red Rain* include novel motifs and cues for developing movement around the pelvis; the ambiguity of blood-related images as being both life-giving and life-draining; and the emergence of new or larger structures and sections in the work from linking or juxtaposing smaller units. Convergence and divergence are both present in the final work where at times there is synergy between movement and music, and at other times a divergence of aural and spatial dynamics.

Exploratory Processes in Choreographic Cognition

Exploratory phases involve attribute finding, conceptual interpretation, functional inference, contextual shifting, hypothesis testing and the search for limitations. Attribute finding may refer to the exploration of emergent features that result from the creation of conceptual combinations and metaphors (Finke, Ward & Smith, 1996, p.24).

There is an abundance of such explorations in the creation of *Red Rain*. An interesting transition occurs with an image becoming more contextualised as the work develops, and its metaphorical relations take shape. The red/blue paper, for example, becomes at once a womb or a nest (see Image p.175); the flow of red kidney beans appears visually as bloodflow, and aurally as rainfall; and new movement patterns emerge from combinations and intersections of individually developed phrases.

The speculation and experimentation of dancers with the book/spine paper sculpture is a good example of functional inference and the exploration of potential uses of a pre-inventive structure. Props both inspired development of movement material and were used to enhance particular sequences in *Red Rain*. For example, the wall of

paper spines was used to suggest passages and doorways, umbilical attachments, wisps of memory or history flowing this way or that. Images that were initially visual and verbal were transformed into events to be experienced using auditory, haptic or spatial senses—beans for sound and blood dripping, wax as skin, and the DNA helix unfurling in space and time.

The exploratory phase of creative cognition is also characterised by processes of problem-solving. Hypothesis testing, as a means to test and evaluate different solutions to movement, spatial and temporal problems in *Red Rain*, includes the construction of the five-person dynamic helix. Five hours or two full rehearsal periods of studio time were dedicated to creation and implementation of the human helix. The duration of this rapidly executed sequence in the final work is a mere 20 seconds. It is also significant that the complexities of this movement-material, the parallelism and structure informed much of the final work. For example, the impression of turbulent flow created by several dancing bodies was imaginatively contrasted with sequences of subtle delicacy enacted between two or three dancers, or with the inward focus of a single stilled figure with its evocation of silent introspection. Experiments with dripping red wax were conducted in the studio in Week 2 (see Image p.174) and, in Week 14, a solution was needed that allowed a circular phrase to link two or more dancers in an arc shape.

Conclusion

The creative process for *Red Rain* may be summarised as a cycle of generative and exploratory actions. The cyclical process is likely to contribute to the non-linearity of the composition processes—the final work bears little resemblance to the series of individual movement sequences that emerged during the initial generative tasks and explorations.

The choreographer must determine solutions to the problem of linking body and limb positions into a narrative of expressive movement while linking individually developed sequences. The linking and transition movements between individual moments must become an integral part of the artwork. Ideally, the final work will appear seamless—movements do not sit as discrete beads on the string of time but unfold fluidly as sculpted shapes of time. Thus creativity in composing

dance lies as much in sequencing, melding and linking the parts of the work as in the creation of the parts themselves.

Acknowledgement:
Based on 'Choreographic Cognition: the time course and phenomenology of creating a dance' by C. Stevens, S. Malloch, S. McKechnie & N. Steven. In Pragmatics & Cognition, Vol. 11, No. 2, 2003, pp.297–326. With kind permission of John Benjamins Publishing Company. Amsterdam/Philadelphia. http://www.benjamins.com

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Unspoken Dialogues: A Response

Hilary Crampton

Introduction

There is a delicious irony in the notion of a day-long talk-fest to discuss Unspoken Knowledges. It could be argued that this paradox underpins the very reason why dance is an art form that struggles to be taken seriously. Its non-verbal and transient nature makes it seem impossibly ephemeral and difficult to position as an object of scrutiny. In the art of dance, so much is unspoken, unrecorded. The values and benefits are presumed to be uncertain, impossible to substantiate, and consequently unverifiable.

The investigation teams on the two projects, Unspoken Knowledges and Conceiving Connections, contributed an interesting combination of disciplines enabling them to reach beyond the insularity of the dance world to reveal the complex cognitive skills that, when taken for granted, remain invisible and render dance apparently inconsequential. The combination of two investigators deeply grounded in dance, and two investigators with little or no background in dance but with all the tools of scientific inquiry—a demand for specificity, a need to measure and quantify—must have presented some interesting communication challenges. As Catherine (Kate) Stevens wrote:

> It took between 12 and 18 months to identify and articulate common goals, methods and questions … We were, and still are, interested in different levels of analysis—but now this is complementary rather than contradictory….In her writings, Shirley would look for models in the universe, in societies, in cultures. I followed the scientific method: I had a need to control extraneous variables, to manipulate a small number of key factors, and measure some quantity of behaviour (unpublished paper, n.d.).

The responses set out in this chapter are inevitably influenced by my own deep immersion in dance since childhood, which has included experience as dancer, dance maker, teacher and now dance critic. It is this latter role, requiring so much dance watching, that has provoked my concerns about where contemporary dance might be headed in Australia. Have the present working conditions for choreographers starved them of opportunity and diminished imaginative potential? Is the art form in danger of creative redundancy? How do audiences conceive connections? What is the responsibility of choreographers towards audiences?

The questions raised by this research lie at the very heart of the contribution the arts make to society. How does the choreographer, working with an ensemble of dancers, create a choreographic structure that, out of the accretion of research, motivational imagery and actions, will mean more than the sum of its parts? How do audiences, with their disparate experiences of life and dance, draw meaning from a performance greater than the stream of movements, images and patterns that comprise a choreographic work? The making and sharing of meaning lie at the heart of how we function as social beings.

Unspoken Knowledges

Some of what was presented in the Unspoken Knowledges forum probably came as no surprise to dance aficionados. The forms of communication in the dance studio, the ability to remember complex sequences of movement, the refined spatial and temporal awareness, the capacity to absorb and interpret fragmented verbal and non-verbal cues are taken for granted. Because the majority of dancers

begin their relationship with dance in childhood, they acquire a seemingly innate understanding of these processes, inhibiting the ability to scrutinise or question the process.

Shirley McKechnie has posited that the choreographic process is a dynamical system; an exquisite microcosm of social interaction, resulting in an outcome largely unpredictable at the start of the process—achieved through imagination, planning, experimentation, compromise, and decision-making. While the choreographer is ultimately the single controlling eye, the dancers inevitably contribute to the development of material. So, much of the whole process will be unspoken—information will be absorbed and exchanged kinaesthetically.

McKechnie's application of dynamical systems theory to analysing the choreographic process raises questions of how that process interacts with and is impacted upon by other systems that shape how the arts are practised. The studio-process may be relatively cloistered, but the opportunity to engage in dance-making at a professional level is shaped by policy in Australia, where the arts are exceptionally dependent upon a multi-level system of government support. This also could be defined as a dynamical system in which the art-making processes are nested and which, to some degree, controls them. The question of just how much the policy system might influence the art-making system forms the basis of this response. I do not wish to imply that governments intentionally seek to influence the artists' creative process. Nevertheless, where there is such a high level of dependence we need to consider whether through custom and cultural adaptation it limits the imagining of alternative creative possibilities and the ways the various art forms organise themselves. The term 'arts industry' is now common parlance, implying a certain organisational structure that allows for a technocratic approach to measuring the 'worth' of the arts in society at odds with how artists and art lovers value their worth.

Luxury of Time

The primary focus of Unspoken Knowledges was on the lengthy developmental process resulting in *Red Rain*, choreographed by Anna Smith together with her team of seven dancers. It is important to recognise that this work occurred outside the usual support system for

the arts. It was an opportunity created through the Australian Research Council (ARC) and its funding for the Unspoken Knowledges project. The purpose of such funding is to stimulate inquiry, and ultimately contribute to the advancement of knowledge. ARC funds allow time for inquiry and reflection; typically, therefore, these investigative projects attract far greater levels of funding than the grants disbursed through the arts and cultural policy mechanisms.

To artists, the sums made available and the time-span for research projects seem extraordinary, used as they are to limited funds and the expectation of a quick turnaround between the awarding of funds and the presentation of a supposedly finished product. That temporal difference alone suggests a very different belief about the value and importance of the two activities—research and art-making. Yet both are acts of creativity and exploration that require time—time to research, time to reflect, to synthesise and finally to give form to conclusions.

In conversation, Anna Smith said she believed the experience of choreographing *Red Rain* enabled her to change the way she worked. It allowed for a process of inquiry and exploration with the dancers, assisting her to break through habitual patterns. The result was an award-winning work. The research funding contributed not only to advancing knowledge; it also allowed an artist to grow, and brought a significant new work to Australia's dance repertoire. How can we evaluate that benefit?

Rules of Engagement

As opposed to other fields of production where consistency and efficiency are considered highly desirable traits, habitual patterning in the arts can ultimately lead to stultification. Art-making is demanding. In dance, this is particularly so because the creative process involves not just a single creative mind. While a choreographer may come to the studio with pre-conceived ideas, the mounting of these ideas upon the ensemble of dancers demands complex communication, experimentation and adjustment. It also requires the willing engagement of the dancers to a greater or lesser degree, depending on whether the working methodology is authoritarian or collaborative. Even the most autocratic of methods makes demands on the dancers' decision-making capacities in matters of timing, negotiation of

spatial patterns and dynamics. Dancing is a sentient activity, not a mechanical one.

Townsend and Busmeyer write of the limitations of 'static-deterministic theories' of decision-making, the method of analysis that has dominated research into decision-making processes until recently[1] They suggest that these theories are inadequate because 'they fail to describe two very basic facts about human decision-making behaviour—the variability and the temporal evolution of preferences'.[2] In art-making, as opposed to processes more driven by a desire for efficient and predictable outcomes, the artist will often seek to exploit variables rather than to control them, thus undertaking a deliberately unpredictable journey to arrive at an end that is the result of a dynamical process.

Townsend's and Busemeyer's quotation from William James' *The Principles of Psychology* beautifully captures the experience of art-making.

> The deliberation may last for weeks or months, occupying at intervals the mind. The motives which yesterday seemed full of urgency and blood and life to-day feel strangely weak and pale and dead … something tells us that all this is provisional, that the weakened reasons will wax strong again, and the stronger weaken … and that we must wait a while, patient or impatiently, until our mind is made up for good and all.[3]

The key element in this description is time –a recurring theme, perhaps an indication of the prevailing feeling that we are all time-poor. The policy process, however, is driven by the desire for determinable outcomes achieved within tight timelines. Productivity is the order of the day—but of what value will that so-called productivity be if it is undernourished, and the creative potential unfulfilled?

While policy arises from a maelstrom of ideologies, issues, special interests and inevitable compromises, it is often presented as if arising from an orderly process. Peter Bridgman and Glyn Davis write that 'public policy is intentional … is about making decisions and testing their consequences … it is structured … with a recognisable sequence of steps.[4] Policy requires accountability and measurement.

It does not cope well with unpredictability, and the policy system that supports the arts allows no room for prevarication or vacillation. It exists as a pattern of application deadlines, application guidelines, assessment criteria and acquittals, all couched in terms that line up with government policy agendas.

Ultimately, public policy is about allocating resources. If the resources are inappropriately or inadequately distributed, the result can be a let down for government, for the recipients of those resources and, ultimately, the public. In cultural policy, this impacts in various ways upon the individual artists—the time and resources that they have to create work, the terms under which they are eligible, and, in consequence, the ways they are influenced to express their ideas. These artists are not just reacting to social trends, but to the limiting conditions of policy imperatives. The real values to society of the art experience disappear under the weight of statistics: resources outlaid, number of artworks completed, box-office figures and hypothesised economic spin-offs.

Failing System

The arts community makes constant demands for more recognition, more funds, more resources, more appropriate strategies to ensure a healthy arts ecology, but at the same time adheres to a system that appears to be failing us. We cling to the peer-assessment process because it gives an appearance of balance and democratic decision-making. Peers have an important role to play in understanding the processes, recognising the trends, acknowledging artistic merit and arguing for investment in it. However, peers cannot create resources—they can only identify the need. In that sense they are powerless, caught as if in a vice between the frustration of artists who fail to attract support and a government that appears deaf to their recommendations. As presently practised, it is a strategy headed for breakdown.

The arts community has been committed to this system for so long that we are blind to its impending failure. The principles may seem ideologically sound, but the system can no longer cope with the complexity of demands made upon it. We have become so inculcated into the habitus of this system, that we fail to recognise our adaptation is the result of a subconscious conformity to ritualised practices.

The habitus, Pierre Bourdieu suggests, 'ensures the active presence of past experiences, which, deposited in each organism in the form of schemes of perception, thought and action, tend to guarantee the "correctness" of practices and their constancy over time'.[5] Our capacity to find ways of working outside the system, and to claim appropriate working conditions for creative development, is undermined by our reliance on present policies and an inability to imagine alternatives.

There is no doubt the paucity of funds contributes to policy failure. In the case of contemporary dance this has reached such a desperate state within the Australia Council that radical decisions appear necessary. *Resourcing Dance: A review of the subsidised dance sector*, commissioned by the Australia Council's Dance Board in 2003, proposes that a minimum of $3–$5 million needs to be injected into the sector to ensure a balance between sustaining existing dance companies and nurturing emerging choreographers and those who function outside organisational support. To fail to nourish this vulnerable sector virtually ensures atrophy of the art form. It is this sector that prepares the artists of the future; it is where they *practise* their craft and gain recognition. They are essential to sustaining the creative vitality of the form.

Under present conditions, the independent/emergent sector suffers from a funding allocation that is perforce *ad hoc*—small sums, distributed widely, offering only occasional opportunities for individual artists to make and present work. No wonder the work is often undercooked, lacking adequate development time and access to the necessary resources. Add to that the inevitably brief performance seasons, resulting in limited audience reach and difficulty in attracting critical reviews, and the result is choreographic malnutrition.

Choreographers such as Ros Warby, Simon Ellis, and Tracie Mitchell choose to work small, presenting infrequently, taking longer to develop their work and emphasising both quality and innovation. These are artists of substance. Their chosen working methods, however, come at a price for the art form. In order to retain artistic integrity, they present only a limited amount of work, often unfunded. This constrains their capacity to make a living through their art, as well as the opportunities for audiences to engage with the work. There is little potential for audience development—their work reaches the

converted, but few beyond that circle. The lack of funding and the demands for better management, marketing and audience growth are in opposition.

Conceiving Connections

Conceiving Connections is a logical extension of the Unspoken Knowledges project. It dovetails nicely with the obsession of the various arts-policy bodies over audience development. Yet Conceiving Connections goes beyond the market-driven research that looks at demographics, education and income levels. It seeks to identify how audiences glean meaning from observing contemporary dance. What cues assist them? How might the knowledge gained influence choreographers? More contentiously, what is or should be the relationship between choreographers and their audiences?

There is no doubt that contemporary dance demands a lot of an audience. The diversity of approaches to performance, to movement-language, and to content, renders much work opaque to all but the initiated. Often it seems that the choreographer is happy to reach a small and exclusive audience. Programme notes, even when they exist, may prove totally mystifying. The performance style may be inwardly focussed, offering little for the audience to relate to either in terms of symbolic representation or human communication. The movement-material may be dense, a relentless stream of multidirectional action, so hyperactive that there is no time for contemplation and little hope of retaining movement-patterns in the memory. Too often, there seems to be a self-serving conviction that the desire to perform is justification enough: audiences should be content to passively accept whatever is offered.

The Audience Factor

Choreographers, and dancers, are in love with movement. Choreographer Glen Tetley refers to dance as 'heightened life', a desirable end in itself for the maker and the doer. But what of the watcher? The training of dancers does not prepare them to consider this issue. Perfection of movement is the only goal. There is little in our social conditioning or education that recognises the influence of movement-language, even though we engage in reading it unconsciously. The dancer and choreographer, so strongly immersed in the medium,

assume or ascribe an expressiveness that is not necessarily evident to the lay audience. The result can be a significant gap between the belief of the dance artist and the expectations of an audience.

In art circles, to suggest that the audience should be considered is to tread on dangerous ground, with implications of selling out on artistic integrity, becoming populist, or of 'dumbing down'. Implicit in all these fears is a certain disrespect for this generic object called the 'audience'. The research being conducted into audience perceptions, therefore, has much to offer in illuminating the communication between artist and perceiver. It also raises the question of whether the audience is part of the choreographic dynamical system.

What do we know of how dance is perceived and received? The answer at present is virtually nothing. In terms of the way dance is valued and used in promoting the arts, it seems clear that there is some powerful attraction, since promotional material for arts festivals, cultural tourism and representations of cultural identity so often relies on photographs of dance. Why? Perhaps because good dance photographs capture vitality, the essence of life, featuring superbly fit bodies doing extraordinary, beautiful and graceful actions. The photograph offers one form of perception—it is motion captured. It allows time for contemplation; time to go away, and to return for further consideration.

Live dance is another form of perception entirely, so aptly demonstrated in *Held*, by choreographer Gary Stewart. *Held* is a collaboration between Stewart, American dance photographer Lois Greenfield, and the dancers of Australian Dance Theatre. While the performers engage in high-flying leaps, aggressive grappling and spectacular falls, Greenfield captures moments that are projected on giant screens. For the watcher, there is a pull between the stark clarity of the black-and-white shots, and the manic energy of the bodily projectiles. The temptation to relinquish the struggle of keeping up with the action and simply stay with the larger-than-life frozen images is compelling. It is a graphic illustration of the demands that contemporary dance can make upon audiences.

Conclusion

Unspoken Knowledges and Conceiving Connections are case-studies. Their scope is inherently limited, but they open up possibilities for

further research into the art form of dance, and into how dance serves as a highly sophisticated vehicle for human thought and communication. These two projects are essentially about the 'thinking body'. Unspoken Knowledges reveals the mix of intellect, physical action and emotion that dance maker and performers draw upon—the thinking process of dance. In fact, these are processes all of us use in our daily lives to a less developed degree, and they are vital to human survival and development.

Equally importantly, Conceiving Connections potentially offers some insight into how audiences 'read' or derive meaning from contemporary dance. We read physical signals all the time; gesture accompanies and amplifies speech; yet there is a view that the audience for contemporary dance is limited. Why might that be so? Is this a problem only for choreographers to grapple with? Is it an indication of a more fundamental loss of ability to engage with and interpret movement—an evolutionary trend in a society increasingly overburdened with instant information bytes, disabling our capacity to observe and translate. If the latter, it is a worry because we all need the capacity to negotiate time and space, and to read how others are using these elements. Being able to recognise and play with the choices enhances our state of mind, our sense of pleasure, and our social functionality. The fact that there has been so little research into the dance/audience relationship is perhaps an indication of the degree to which movement is such an innate aspect of our lives that we take it for granted.

While I hesitate to lay the responsibility for audience-reaction solely at the feet of the choreographer, Conceiving Connections does raise implications for just what should be included in the education of dance artists—beyond training in the art form. What connections might be made between their art and the issues that shape human thought, social trends and world developments? More particularly, the positing of the choreographic process as a dynamical system raises the question of whether the audience is a part of that system. Van Gelder and Port write:

> [n]ot just any set of aspects of the world constitutes a system. A system is distinguished by the fact that its aspects somehow belong together. This really has two sides. First,

> the aspects must interact with each other; the way any one of them changes must depend on the way the others are. Second, if there is some further aspect of the world that interacts in this sense with anything in the set, then clearly it too is really part of the same system. In short, for a set of aspects to qualify as a system, they must be interactive and self-contained: change in any aspect must depend on, and only on, other aspects in the set.[6]

If considered from this perspective, one could propose that cultural policy is a part of the choreographic process. Appropriate policy strategies enable appropriate work processes. Inappropriate strategies could be said to disable the process, resulting in underdeveloped work or forcing adaptation that changes the form of the work.

The relationship between choreographer and audience might seem to be systemically connected, but in fact their interconnectedness is less concrete. From an economic perspective, clearly it is imperative that choreographers attract audiences. From creative and communication perspectives, little is known about the cross-influences of choreography on audiences and audiences on choreographers. There is almost no dynamic dialogue. Conceiving Connections may offer some insight into this relationship.

In his presentation at the Unspoken Knowledges forum, Robin Grove stated that the arts are 'our most serious form of play'. It is interesting to reflect that educators frequently refer to the early years of life as the most formative, when we learn at an extraordinary pace. A major part of that learning is achieved by 'play'. Essentially, play is the basis of pure research. Physicists, scientists and philosophers take ideas, play with them, reposition them, speculate until the 'Eureka' light flicks on and the next leap in understanding is made. They document their processes in detail, and attempt to replicate the results to ensure they are on the 'right' track. The published results of formal research and of art-making may take very different forms. They are usually aimed at different audiences, and intended to achieve different responses. There is an assumption that the academic researcher seeks clear and unequivocal meanings, which may give concrete answers, or raise further questions pointing a pathway to new knowledge. There is no such assumption by artists who deal in metaphor,

and who seek to stimulate the imagination, but both research and art fill vital roles in individual and social development.

If there is one consistent issue throughout this research, it is the importance of time, time to explore, to reflect and to compose. This element is not well supported in short-term project funding. The value of time is more than an economic derivative. If we consider funding to the arts as an investment, then surely it makes no sense to create terms that effectively ensure that the investment will result in a poor return.

The nature of dynamical systems is that, at the point of their potential extinction, those with strong survival instincts find new possibilities for regeneration and growth. If choreography is a dynamical system, what adaptations does it need to regenerate and become recognised and valued for the vital force it has been and could be in the future? This research raises some challenging questions for artists, policy makers and educators alike, as well as for the investigators. What more might we understand, not only about the art form but also about how it might enhance our understanding of human cognition?

Endnotes

1 van Gelder, Port (eds), *Mind as Motion: Exploration in the Dynamics of Cognition*, 1995, p.102.

2 Ibid., p.117.

3 Ibid., p.102.

4 Bridgeman, Davis, *Australian Policy Handbook*, 1998, p.4.

5 Bourdieu, *The Rules of Art: Structure and genesis of the literary field*, 1996, p.54.

6 van Gelder and Port, 1995, p.5.

Appendix 1: Some Outcomes
Publications 1999 – 2004

1. Journals and Conference Papers

Glass, R., 'Observer Response to Contemporary Dance', University of Western Sydney, MARCS 2003.

Glass, R., 'The Effect of Information and Dance Experience on Psychological Responses to Contemporary Dance', *Proceedings of the International Association for Empirical Aesthetics* (IAEA), Lisbon, September 2004.

Grove, R., 'In the House of Breathings', in *Papers and Proceedings of the Australia New Zealand Dance Research Society Forum*, Susan Graham (ed.), Auckland University of Technology, October 1999.

Grove, R., 'Making Ends Meet: Cultural Identities and World Dance', *Sixth Annual Conference of the Korean Dance Society for the Future*, Seoul, 1999.

Grove, R., 'Knowing What's Good For Us', in *Papers and Proceedings of the Australia New Zealand Dance Research Society Forum*, Susan Graham (ed.), Auckland University of Technology, October 2001.

Grove, R., 'Unspoken Knowledges', in R. Lansdown (ed.) *The Critical Review*, James Cook University, Cairns, no.41, 2001, pp.1–10.

Grove, R., 'A Night Out', in P. Craven (ed.), *Best Australian Essays of 2002*, Black Inc, Melbourne, 2003, pp.118–129.

Grove, R., 'A Slant of her Own: Laurel Martyn, Portrait of the Artist', in I. Britain (ed.), *Meanjin*, Australia Centre, University of Melbourne, vol. 62; 2, 2003, pp.188–195.

Grove, R., 'Lynne Golding: National Star', in M. Potter, (ed.) *Brolga: An Australian Journal about Dance*, no.20, June, 2004.

Grove, R., 'Changing Directions: Embodied Minds and Mindful Bodies', *Proceedings of the International Association for Empirical Aesthetics* (IAEA), Lisbon, September 2004.

Heaven, M., The Choreographer–Performer Collaboration, Unpublished MA Thesis, University of Melbourne, 2000.
McKechnie, S., 'Choreography as Research', in M.M. Stoljar (ed.) *Creative Investigations – Redefining Research in the Arts and Humanities*, The Australian Academy of the Humanities, Canberra, 1996.
McKechnie, S., 'Unspoken Knowledge: Thinking in Space and Time', in *Papers and Proceedings of the Conference of* the Asian-Pacific Confederation for Arts Education (ASPACE), Lasalle-SIA, Singapore, July 1999.
McKechnie, S., 'Seasons, Cycles and Patterns in the Mind', occasional paper in the *30th Symposium, Academy of the Humanities*, Canberra, November 1999.
McKechnie, S. & Grove, R., 'Thinking Bodies: A Dialogue' in Potter M. (ed.) *Brolga: An Australian Journal About Dance*,.12, June, 2000, pp.7–14.
McKechnie, S., 'Mind in Motion: Seeking a Theory of Choreographic Cognition' in Denton, M. (ed.) *Choreography and Dance*, (issue ed. Meg Denton), vol.6: 2,3, New York, 2001.
McKechnie, S., 'New Perspectives on Collaboration in the Choreographic Art', in *Papers and Proceedings of the Australia New Zealand Dance Research Society Forum*, Susan Graham (ed.), Auckland University of Technology, October 2001.
McKechnie,S., 'Movement as Metaphor: The Construction of Meaning in the Choreographic Art', in Stevens, C., Burnham, D., McPherson,G., Schubert, E., & Renwick, J. (eds) *Proceedings of the 7th International Conference on Music Perception & Cognition* (ICMPC7), Causal Productions, Adelaide 2002.
McKechnie, S., 'Nurturing the Choreographic Imagination', *Dance Educators Professional Association Conference*, UNSW, Sydney, October 2002.
McKechnie, S., *Creativity, Cognition and the Emergence of Ideas: A dynamical process*, University of Melbourne, Vice Chancellor's Colloquium, December, 2002.
McKechnie, S., 2 entries (i) 'Choreography and Choreographers', (ii) 'Research and Writing – Research in the Creative Arts', in Scott-Maxwell, A. & Whiteoak, J., (eds) *Currency Companion to Music and Dance in Australia*, Currency House Inc., Sydney 2003, pp.131–136; 584–585.
McKechnie, S., 'Disagreeable Object', in Potter, M. (ed.) *Brolga: An Australian Journal About Dance*, 18, June, 2003, p.32.
Stevens, K. & S. McKechnie, S. Malloch, A. Petocz, 'Choreographic Cognition: Composing time and space', in Woods, C. & G.Luck, R. Brochard, F. Seddon, S. O'Neill, Sloboda, J. (eds), *Proceedings of the 6th International Conference on Music Perception and Cognition*, Keele, U.K., University of Keele, 2000.
Stevens, C. & McKechnie, S., 'Composing in Space, Time, Light and Sound: A Study in choreographic cognition', *International Journal of Psychology*, 2000, 35, p.100 (Abstract).
Stevens,C., S. Malloch, S. McKechnie, 'Moving Mind: The Cognitive Psychology of Contemporary Dance', in Potter, M. (ed.) *Brolga: An Australian Journal About Dance*, 15, December 2001, pp.7–14.

Stevens,C., S. Malloch, R. Haszard, S. McKechnie, 'Shaped Time: A dynamical systems analysis of contemporary dance', in Stevens, C. & D.Burnham, G. McPherson,E. Schubert, J. Renwick, (eds) *Proceedings of the 7th International Conference on Music Perception & Cognition* (ICMPC7), Causal Productions, Adelaide 2002.
Stevens, C., S. Malloch, S. McKechnie, N. Steven, 'Choreographic Cognition: The time-course and phenomenology of creating a dance', in *Pragmatics and Cognition*, 2003 11(2) pp.299–329.
Stevens, C. (ed). Program and Abstracts, Unspoken Knowledges: A Research Forum on Contemporary Dance and Choreographic Cognition, Melbourne International Festival, 2003.
Stevens, C., 'Conceiving Connections: Increasing industry viability through analysis of audience responses to dance performance', Partnerships in Humanities Research Symposium, UWS Sydney, February 2004.

2. Film/Video/Web

http://ausdance.org.au/unspoken Australian Dance Council, Ausdance Inc., Canberra, 1999.
http://ausdance.org.au/connections Australian Dance Council, Ausdance Inc., Canberra, 1999.
Healey, S., *Fine Line*, a dance film in collaboration with Shona Erskine and Victor Bramitch, Sydney 2003 (Premiered at Unspoken Knowledges Forum, Federation Hall, Victorian College of the Arts, Melbourne, October 2003).
Heaven, M. with L. Curham, *Installation*: video footage onto hanging scrims and transparent surfaces, projections onto sphere and sculpture, School of Art Gallery, Victorian College of the Arts, December 2000.
McKechnie, S. (interviewer) Oral History Project Conceiving Connections, National Library of Australia, 10 audio CDs with transcripts: Healey,S. TRC 4956/1&2, Heaven, M. TRC 4958, Medlin, M. TRC 4957 1&2, Parrott, C, TRC 4959, Sky, H. & McCormick, J. TRC 4954/1&2, Smith, A. 4955/1&2.

3. Awards

Red Rain received the Victorian Green Room award for original choreography in 1999 (Anna Smith).
Quiescence and *Spun by a Thread* received the Victorian Green Room award for original choreography in 2001 (Anna Smith).
Unspoken Knowledges received the Fulbright Association Selma Jean Cohen Award for International Dance Scholarship in 2001 (Robin Grove).
Fine Line the film, commissioned by the Conceiving Connections project in 2003, received first prize in the Independent section of Correografo Elettronico-2004, Napolidanza, Italy (Sue Healey).
Fine Line the film, received best dance film award, Auslance, 2003 (Sue Healey)

Appendix 2: Creating *Red Rain*

Choreographer Anna Smith's annotations of video, March–September 1999

Date	Description	Comments
3/3/99	Dancers: Nicole, Tamara, Hannah, Kathleen Investigation of the through-lines – from the pelvis out through an appendage. Aim – to find a pathway/line out of the body.	through-lines
	Discussion on the above How do we remember sequences that are internal and relating to the through-lines?	discussion
	Showing of the through-lines Nicole demonstrates two studies Tamara Hannah Anna	through-lines
	Michelle Heaven asks what it is that we are doing. An explanation of thinking by Anna follows – likening it to the veins and a system of blood flow.	discussion
12/3/99	Nicole/Tam/Hannah/De/Kath Sequence of the through-lines joined together Nicole and Kath same sequence	through-lines
	Kath in paper square Kath in paper square with Tam outside of paper Kath in paper with Nicole/Tam/Hannah/De outside the paper all doing the same sequence	large paper squares

Date	Description	Comments
	Nicole lying on the ground, Hannah pushing the beans against her body Feet in the pile of beans – spreading the beans into shapes	beans
	Hannah dripping wax onto her body	wax
	Nicole – through-line sequence that does not originate in the pelvis De Kath Tam Hannah	through-lines
	Shirley asks what the task was, an explanation from the choreographer follows Each dancer explains their movement pathways	discussion
	Discussion with Shirley and dancers – what difference does the music have when it is on/off for the sequence?	discussion
26/3/99	Kathleen with single paper strand Kathleen – folding sequence Hannah – response to the paper strand – arms and head sequence Deidre – 2 sequences – response to folding paper Nicole with paper strand Tamara	single paper strand responses
	Hannah/Nicole/De/Kath – sequence together. One of the choreographers sequences. It is called the 'dead arm' De/Tam – same sequence Nicole/Hannah/Kath – same sequence Kath dances her folding sequence against Nicole/De/Tam	
8/4/99	Tam in studio 1 doing the choreographers 'spine' sequence Kath and De – same sequence	spine sequence
	Nicole explains her truncated sequence then shows it Deidre, Kath, Hannah	truncated sequences
	improvisation with instructions. Eg. Head down, feet outwards, folded inwards Hannah & Nicole Nicole talks about the improv, the group asks her questions about the experience Hannah and Nicole start improv for 2nd time with modifications to the instructions	improvisation with body instructions

Date	Description	Comments
8/4/99	Hannah and Nicole – improvisation & response to the instructions from the dancers Nicole in improv Hannah in improv Deidre in improv Kathleen Tamara Kathleen Anna	improvisation
9/4/99	Dancers go through the first sequence made/ joined together from the improvised material revisited from the video. The sequence is – Nicole's head, Hannah's head, Nicole's #1, Deidre's #1, Hannah's points, Nicole's #2, Deidre's #2, Nicole's #3.	sequence from improvised material
12/4/99	Hannah talks about the music that has been used. Hannah explains why she doesn't want to use it for the sequence. Deidre explains her response to the music	discussion
	De/Tam/Kath/Hannah go over the sequence from last week, adding 'Deidre's fingertips' to the sequence.	sequence from improv
	The dancers learn Tamara's 'sore sides' Dancers go over the improv sequence adding – Kath's shoulders, Kath's turtle neck, Tams elbows, and Tams sore sides Sequence shown Sequence shown	sequence from improv
	Discussion on the flowlines material Dancers go over the flowlines sequence with the aid of the mirror Dancer show the flowline sequence	flowlines/ through-lines sequence
	Dancers go through the sequence that is initiated from movement in the spine to move the body Nicole goes through her 'truncated sequence' Hannah goes through her truncated sequence Anna writes down the sequences in her journal	truncated sequences
	In studio 2 improvising with the paper strands. Anna/Tam/Hannah/Deidre	
	Anna explains the relevance of the paper strands. Shirley prompts discussion with questions and responses. Robin grove asks about the sculptor. Anna discusses the relevance of the large squares of paper	discussion on the paper

Date	Description	Comments
	Tamara describes how she approached the paper strand. 3 to 4 responses Hannah shows her response to the paper Deidre shows her response to the paper Discussion with the dancers on the individual paper strands	individual paper strands
15/4/99	Structured improvisation with the paper wall Tamara Kathleen Hannah Deidre Hannah lowering slowly De/Hannah/Kath lowering slowly Tamara and De – Tamara places paper spines on Deidre includes Deidre in long lunge with paper spines on and down her body Kathleen incorporates her phrase from the individual strand into the wall Deidre with paper spines on her back Tamara shows the 'dead arm' sequence to the side and behind the paper wall Tamara and Kath show the same sequence behind the paper wall Hannah slowly bend down to the floor with the paper spines on her outstretched arms De/Kath/Tam/Hannah with one paper on the head and one paper on the shoulder, slowly going to the floor De/Kath/Hannah in the paper wall against Tamara who is doing the 'dead arm' and spine sequence	first time with the paper wall
16/4/99	Kath's movement response to the image of wax dripping Nicole's Tamara explains her response to the wax dripping Deidre shows her movement response to the wax Deidre explains her response Kath explains her response Nicole explains her response	'wax dripping' responses
28/4/99	Studio 6 Working with the large pieces of Japanese paper De shows movement sequence from the improvised material(taken from the video) while other dancers curl paper around Kath who is lying on the floor Image of Kath in the Nest Kath goes to the paper nest and Tam joins Deidre in the sequence while Nicole finishes building the nest.	the paper 'nest'

Date	Description	Comments
18/5/99	Dancers respond to text. Nicole explains her response then shows the movement Tamara Kathleen Hannah explains her response and shows her movement, this becomes 'Hannah's circle' Anna	response to text
	Nicole/Hannah/Kath/Tamara – movements have been selected from each of these dancers phrases that were responses to text Each dancer sequences the movements in her own pathway	phrases made from the text material
	Deidre explains her response to the text and shows her movement Des sequence against Nicole, Kath and Hannah	
19/5/99	Nicole De and Tamara do the through-lines against the text Nicole starts the through-lines and this is picked up by De then Tam We start to play with ideas for the beginning of the work It incorporates the 'blood dripping', and wax sequence	1st attempt at opening
25/5/99	Deidre explains her text driven movement sequence	
	Nicole De and Tam. Show the text against the through-lines, Kath and Hannah then join in. The sequence is the same as seen on 19/5/99 but has changes as follows: Change in the position of Tam and De inclusion of a new 'wax' sequence adding of movement form 'wax peel' continuing to Tams 'wax drip' first try at a weave repeat of all the above Anna explains part of the weave to the dancers, and talks about the timing at the beginning of the section.	
26/5/99	Pathways of 3/5 people in the helix pattern Anna explains the process of the helix and a discussion with the dancers follows A pathway of a plait is shown Dancers work on the task of the plait Shirley asks a question on the 'oscillations' and Anna explains. The dancers are asked what is difficult about the process	pathway of the helix

Date	Description	Comments
28/5/99	Anna explains the 5 person weave/helix Shows the drawing from her log dancers sort the information given to them dancers add movement to the pattern	weave
	Anna asks the dancers what was so complex about the pattern Hannah responds Nicole responds Tamara responds Kath responds De responds	discussion
31/5/99	Hannah/De/Nicole – 3 weave Tamara/De 2 weave	
2/6/99	Working on the 5 stranded helix/weave with the aid of tape on the floor Sheridan joins the dancers	
4/6/99	Anna explains the improvisation for the duo material. Uses text : red pool swells, crimson wine pours over etc. improvisation Hannah/Deidre/Sheridan/Tam improv in pairs de & tam, Hannah & Tam, Hannah & Sheridan improv cont. With a change. One person uses the images in the pair Anna explains Hannah & Sheridan Anna & Tam Tam & De	improvisation
	Tam & de Hannah & Sheridan Anna explains – asking them to think more about the movement in the spine	
7/6/99	Tam & De 'hanging' and their duo material taken from the improv includes sitting and perching on the body Repeating this sequence with alterations to perches	'hanging'
11/6/99	Beans inside the large paper squares We piece a few things together for the opening. This includes: hangs/flowlines/wax/beans/paper/perches/wax sequences/text material/truncated sequence. Repeat this with different camera angle Repeated again in a bigger studio. Includes three weave with 2nd track of the music, then the 5 weave Anna explains what has been presented/videoed	section 1

Date	Description	Comments
16/6/99	Kath with beans inside the paper against Nicole & Sheridan who are dancing Hannah's 'circle' Kath reveals the paper strand from the beans and starts her movement from the paper strand – others do the 3/5 weave in the background	single paper strand
21/6/99	Changes: Nicole tries the flowlines sequence behind Kath Nicole – truncated sequence Kath – unveiling paper strand, then her paper strand sequence The 3 weave behind Kath	
21/6/99	Anna talking about the task while Nicole/Hannah/Kath/De – sequence creating a different dynamic of the previous sequence. The dynamic of 'blood rushing in and out/pulsing in and out. Nicole & De show their sequence Hannah & Kath show sequence Kath & Hannah against Nicole in their respective sequences	truncated sequence
	Kath unfolding the single paper strand with Nicole up the back (in line) doing the previous sequence. De and Hannah enter to do 3 weave with Nicole this progresses down stage to Kath. Then Nicole and De continue with their sequence (which becomes the truncated sequence). This is followed by Hannah and Kath in their sequence.	
12/7/99	Nicole doing truncated sequence against the other dancers who walk forward in the space. The dancers now are: Hannah/De/Kath/Sheridan/Brooke/Jade/Nicole. the dancers have the kidney beans held in their tops. Dancers release the beans onto the floor Nicole goes into flowlines sequence De & Sheridan do the 'hangs' Anna continues to instruct the dancers through the first section of the work.	1st attempt at the walking sequence with beans at the beginning of the work section 1
	Dancers goes through a 2x 3 weave	weave
	Kath in the beans lying on the floor. This sequence evolves to become the floor sequence in the last section of the work	beans
14/7/99	Sheridan does short solo. This is Nicole's truncated sequence. Nicole Kath De enter to do 3 weave followed by Brooke, Jade, and Nicole in the 3 weave 5 weave into Kath's truncated sequence(Kath/Brooke/de)	weave

Date	Description	Comments
	section one into section 2 with Kath doing solo, then Sheridan's solo while Jade and Hannah do a series of perches. The five weave is added plus the extension of the weave into Kath's truncated sequence	section 1 & 2
	De and Brooke do a series of perches while Hannah and Jade do the sequence where the beans are pushed into the lying body to create trace lines of the body.	
	Jade with beans in the middle of the large paper squares doing the floor sequence taken/adapted from the through-lines Jade against Nicole and Brooke on the floor doing the same sequence instructed by Anna Anna explains the process. Changing the facing of the dancers so that their heads are downstage. Then this is shown	beans & floor sequence
	Kath in the nest – slowly getting out of the nest	
20/7/99	Anna explaining what is shown Section 2	
	Jade in the beans on the floor surrounded by the large pieces of paper with Nicole and Brooke. Floor sequence	
20/7/99	Dancers building nest around Kath with Anna talking through what will be shown. Section 1 & 2 trying a few different things:(1) starting with Kath in the nest (2) the beans get poured onto the large paper squares (3)	
	Dancers go through the sequence created from the videoed improv material eg. Tam's sore sides, De's fingertips... This is the start of section 3 with the paper wall.	
	Deidre solo Beginning of section 4, with large paper squares Nicole over Kath and behind De's solo	
28/7/99	Dancers go through the beginning of Section 1. Only a few dancers at rehearsal	
30/7/99	Beginning of section three. Then section 4 with De's solo, with added sequence of Kath Sheridan and Jade across the back Jade changes the large paper squares and puts them onto Brooke De and Jades duo against Brooke	section # 3

Date	Description	Comments
17/8/99	Choreographic Centre Section 2 with hanging books Hannah unfolds the hanging paper into Section 3 Section 4 De's solo	Choreographic Centre
26/8/99	Section 1, 2, 3, 4 adding on from de and Jade duet into the group sequence. Then into the beginning of section 5	
2/9/99	Nicole's lecture Demonstration	
	Run through of the work from Section 2 to 5	
	Discussion with the students	
2/9/99	Discussion with the university of Western Sydney Students	
3/9/99	Run through at the Choreographic Centre Section 1 Section 2 Section 3 Section 4 Section 5	
9/9/99	Run through at the Playhouse Theatre in Canberra Section 1 Section 2 Section 3 Section 4 Section 5	

Bibliography

Adshead, J., V. Briginshaw, P. Hodgens, M. Huxley, 'Skills and Concepts for the Analysis of Dance', in Adstead, J (ed.), *Dance Analysis: Theory and Practice,* Dance Books, London,1988.

Alexander, R.M., 'Walking and Running', *American Scientist,* 72, 1984, pp.348–354.

Allard, F., & Starkes, J.L., 'Motor-skill Expertise in Sports, Dance, and Other Domains', in K.A. Ericsson and J. Smith (eds.), *Toward a General Theory of Expertise* (Cambridge U.P., 1991), pp.126-152.

Anderson, J.R., Budiu, R., Reder L.M., 'A Theory of Sentence Memory as Part of a General Theory of Memory', *Journal of Memory & Language*, 45, 2001, pp.337–367.

Anderson, R.E. & Helstrup, T., 'Multiple perspectives on discovery and creativity in mind and on paper.' In Roskos-Ewoldson, Intons-Peterson, Anderson (eds.), *Imagery, Creativity, and Discovery: A Cognitive Perspective*, Elsevier,.1993, pp.223–253.

Ayres, B., 'Effects of Infant Carrying Practices on Rhythm in Music', *Ethos*, 1, 1973, pp.387–404.

Bak, P., C. Tang, K. Wiesenfeld, 'Self-organised Criticality: An explanation of 1/f noise', *Physical Review Letters*, 59, 1987 pp.364–374.

Barthes, Roland (tr. Richard Howard), *The Responsibility of Forms: Critical essays on music, art, and representation*, Basil Blackwell, Oxford, 1986.

Bartlett, F.C., *Remembering: A Study in Experimental and Social Psychology,* Cambridge University Press, Cambridge, 1932.

Bawden, M., & Maynard, I., 'Towards an Understanding of the Personal Experience of the "Yips" in Cricketers', *Journal of Sports Sciences 19* (2001), pp.937-953.

Beilock, S.L., & Carr, T.H., 'On the Fragility of Skilled Performance: what

governs choking under pressure?', *Journal of Experimental Psychology: General 130* (2001), pp.701-725.
Bjørkvold, J-R., *The Muse Within: Creativity and communication, song and play from childhood through maturity*, HarperCollins, New York, 1992.
Blacking, J., 'The value of music in human experience', in The 1969 Yearbook of the International Folk Music Council, 1969. Republished as Chapter One, 'Expressing Human Experience through Music', in Bohlman, P. & B. Nettl, (eds) *Music, Culture and Experience: Selected Papers of John Blacking*, University of Chicago Press, Chicago,1995.
Boden, M.A. 'What is creativity?' In Boden (ed.), *Dimensions of Creativity*, MIT Press,1996, pp 75–117.
Bourdieu, Pierre, *The Rules of Art: Structure and genesis of the literary field*, tr. Susan Emanuel, Polity Press, Cambridge, 1996.
Bradley, E. & Stuart J., 'Using Chaos to Generate Variations on Movement Sequences', *Chaos*, 8, 1998, pp.800–807.
Bridgeman, P., & G. Davis, *Australian Policy Handbook*, Allen & Unwin, Sydney, 1998.
Brockman, J., *The New Humanists: Science at the edge*, Barnes and Noble, New York, 2003.
Bronowski, J., *The Ascent of Man*, British Broadcasting Corporation, London, 1978.
Brysha, B., 'The Legacy of New England'. in *Dance Australia*, 15, 1984.

Cadopi, M. & J.F. Chatillon, R. Baldy, 'Representation and Performance: Reproduction of form and quality of movement in dance by 8- and 11-year-old novices', *British Journal of Psychology*, 86, 1995.
Camporesi, P., *Juice of Life: The Symbolic and Magic Significance of Blood* (tr. Barr R.B.), Continuum, New York, 1995.
Camurri, A., Hashimoto S., Ricchetti M., Ricci A., Suzuki K., Trocca R., Volpe G., 'EyesWeb: Toward gesture and affect recognition in interactive dance and music systems', *Computer Music Journal,* 24, 2000, pp.57–69.
Camurri, A., Lagerlöf I., Volpe G., ' Recognizing Emotion from Dance Movement: Comparison of spectator recognition and automated techniques', *International Journal of Human-Computer Studies,* 59, 2003, pp.213–225.
Card, A., 'Choreographing a Continent: Modern dance and constructions of national identity in Australia', *Choreography and Dance*, 6: 2 & 3, 2001, pp.59–90.
Casey, E., 'The Ghost of Embodiment: on bodily habitudes and schemata', in D. Welton (ed.), *Body and Flesh*, Blackwell, 1998, pp.207-225.
Castiello, U., 'Understanding Other People's Actions: Intention and Attention', *Journal of Experimental Psychology: Human Perception and Performance*, 29, 2003, pp.416-430.
Chaminade, T., *et al.*, 'Is Perceptual Anticipation a Motor Simulation? A PET study', *Neuroreport*, 12, 2001, pp.3669–3674.
Chaminade, T., *et al.*, 'Does the End Justify the Means? A PET exploration of the mechanisms involved in human imitation', *NeuroImage,* 15, 2002, pp.318–328.

Clark, A, *Being There: putting brain, body, and world together again* (Cambridge, MA: MIT Press, 1997), p.180.
Clark, A., & Chalmers, D, 'The Extended Mind' *Analysis 58, 1998,* pp. 7-19.
Clynes, M., 'The Communication of Emotion: Theory of sentics', in Plutchick, R. and H. Kellerman, (eds) *Emotion: Theory, Research and Experience*; vol.1, *Theories of Emotion*. Academic Press, New York, 1980.
Collins, A.M., Loftus, E.F.,'A Spreading Activation Theory of Semantic Processing', *Psychological Review,* 82, 1975, pp.407–428
Collingwood, R.G., *The Idea of History*, Oxford University Press, Oxford, 1961.
Connerton, P., *How Societies Remember*, Cambridge University Press, 1989, p.102.
Coppola, D.M., Purves, H.R., McCoy, A.N. and Purves, D. (1998), Œ The distribution of oriented contours in the real world,, Proceedings of the National Academy of Sciences USA, 95, pp. 4002-4006.
Corballis, M.C., *From Hand to Mouth: The origins of language,* Princeton University Press, New Jersey, 2003.
Cowan, N., *Attention and Memory: An integrated framework,* Oxford University Press, New York, 1995.
Cowie, R., Douglas-Cowie, E., Savvidou, S., McMahon, E., Sawey M., Schroeder, M., 'Feeltrace: An instrument for recording perceived emotion in real time', in Cowie, R., Douglas-Cowie, E., Schroeder M. (eds.), *Speech and Emotion: Proceedings of the ISCA Workshop,* Newcastle, 2000, pp.19–24.
Cox, M. & Theilgaard A., *Mutative Metaphors in Psychotherapy: The Aeolian mode*, Tavistock, London 1987.
Crampton, H., 'Winners and Losers: Doing the Funding Square Dance: on being a 'multicultural artist' ', *Choreography and Dance*, 6: 2 & 3, 2001, pp.125–138.
Crampton, H., Comments on Anna Smith's '*Red Rain*', 1999 (unpublished).
Cupchik, G. C. 'Emotion in Aesthetics: Reactive and reflective models', *Poetics, 23*, 1994.

Damasio, A., *The Feeling of What Happens: Body, emotion and the making of consciousness*, Vintage Press, London, 2000.
Damasio, A., *Descartes' Error: Emotion, reason and the human brain*, Avon, New York, 1994.
Darwin, C., *The Origin of Species*, Wordsworth, London, 1998 (1859).
Darwin, C., *The Descent of Man, and Selection in Relation to Sex*, London: Penguin, 2004 (1871).
Dawkins, R., *The Selfish Gene,* Oxford University Press, London, 1989.
DeCasper, A.J. & W.P. Fifer, 'Of Human Bonding: Newborns prefer their mother's voices', *Science*, 208, 1980.
Decety, J., Chaminade, T., Grèzes J., Meltzoff A.N., 'A PET exploration of the neural mechanisms involved in reciprocal imitation', *NeuroImage,* 15, 2002, pp.265–272.
Decety, J., 'Is there Such a Thing as Functional Equivalence Between Imagined, Observed, and Executed Actions?' In Meltzoff A.N., Prinz W. (eds.), *The Imitative Mind: Development, Evolution, and Brain Bases,*

Cambridge University Press, Cambridge, 2001.
Decety, J. & T. Chaminade, 'Neural Correlates of Feeling Sympathy', *Neuropsychologia,* 41, 2003, pp.127–138.
Deleuze, G. & F. Guattari, tr. H. Tomlinson and G. Burchell, *What is Philosophy?*, Columbia University Press, 1994.
Dennett, D., *Darwin's Dangerous Idea*, Simon and Schuster, New York, 1995.
Di Pellegrino, G., L. Fadiga, L., Fogassi, V. Gallese, G. Rizzolatti, 'Understanding Motor Events: A neurophysiological study', *Experimental Brain Research*, 71, 1992.
Dissanayake, E., *Art and Intimacy: How the Arts Began*, University of Washington Press, Seattle and London, 2000.
Donald, M. *Origins of the Modern Mind: Three stages in the evolution of culture and cognition*, Harvard University Press, Cambridge, MA., 1991.
Drake, C., Jones M.R., Baruch C., 'The Development of Rhythmic Attending in Auditory Sequences: Attunement referent period focal attending', *Cognition*, 77, 2000, pp.251–288.
Dreyfus, H., 'The Current Relevance of Merleau-Ponty's Phenomenology of Embodiment', *Electronic Journal of Analytic Philosophy*, 1996, http://ejap.louisiana.edu/EJAP/1996.spring/dreyfus.1996.spring.html

Edge, Hoyt L., *A Constructive Post-Modern Perspective on Self and Community: From Atomism to Holism*, Edwin Mellen Press, Lewiston, New York, 1994.
Ehrenzweig, A., *The Psychoanalysis of Artistic Vision and Hearing*, Sheldon Press, London, 1953.
Eliot, George, *Middlemarch: A study of provincial life*, Chatto and Windus, London, 1957.
Eliot, T.S., *On Poetry and Poets*, Faber & Faber, London, 1961 (1957).
Ellis, N., *Awakening Osiris: A New Translation of the Egyptian Book of the Dead*, Elsevier, 1998.
Erickson, F. 'Going for the Zone: The social and cognitive ecology of teacher-student interaction in classroom conversations', in D. Hicks (ed.) *Discourse, Learning and Schooling*;(pp.29–62), Cambridge University Press, New York, 1996.
Eysenck, H.J., *Decline and Fall of the Freudian Empire*, Viking, Middlesex, 1985.

Fadiga, L. & L. Fogassi, G, Pavesi, G.Rizzolatti, 'Motor Facilitation During Action Observation: A magnetic stimulation study', *Journal of Neurophysiology*, 73, 1995.
Fadiga, L. *et al.*, 'Motor Facilitation During Action Observation: A magnetic stimulation study', *Journal of Neurophysiology,* 73, 1995, pp.2608–2611.
Fairfax, V., 'Patience pays off',. review of *Red Rain*, Gasworks Theatre', *The Age*, November 23, 1999.
Fifer, W.P. & C.M. Moon, 'The Effects of Fetal Experience with Sound', in Lecanuet, J-P. & W.P. Fifer, N.A. Krasnegor, W.P. Smotherman, (eds) *Fetal Development: A psychobiological perspective*, Erlbaum, Hillsdale, New Jersey, 1995.
Finke, R.A., Ward T.B., Smith S.M., *Creative Cognition: Theory, research, and*

applications, MIT Press, Cambridge, 1996.
Finke, R.A., 'Mental imagery and creative discovery', in Roskos-Ewoldson, Intons-Peterson, Anderson (eds.), *Imagery, Creativity, and Discovery: A Cognitive Perspective*, Elsevier, 1993, pp.255–285.
Fogel, A. & E. Thelen, "Development of Early Expressive Action from a Dynamic Systems Approach", Developmental Psychology, 23, 1987.
Forte, A., Gilbert, S., *Introduction to Schenkerian Analysis. Norton*, 1992.
Foster, R., *Knowing in My Bones,* Adam & Charles Black, London, 1976.
Foster, S. L. (ed.), *Choreographing History*, Indiana University Press, Bloomington, 1995.
Foster, S. L. (ed.), *Corporealities: Dancing, knowledge, culture and power*,
Routledge, London/New York, 1995.
Foster, S.L., *Reading Dancing: Bodies and subjects in contemporary American dance*, University of California Press, Berkeley, 1986.
Freeman, W.J., *How Brains Make Up their Minds,* Weidenfeld & Nicolson, London, 1999.
Freeman, W.J., *Societies of Brains: A study in the neuroscience of love and hate*, NJ: Lawrence Erlbaum Associates, Hillsdale, 1995

Gallese, V., Craighero L., Fadiga L., Fogassi, L., 'Perception through Action' , *Psyche*, 5(21), 1999.
http://psyche.cs.monash.edu.au/v5/psyche-5-21-gallese.html.
Gardner, H., *Frames of Mind: The theory of multiple intelligence* (second edition), Harper Collins, London, 1993.
Gentner, D., 'The mechanisms of analogical learning', in In Vosniadou, Ortony (eds.), *Similarity, analogy, and thought*, Cambridge University Press, 1989, (pp.199–241).
Gittings, Robert, *The Odes of Keats and their Earliest Known Manuscripts in Facsimile*, Heinemann, London, 1970.
Goldsmith, R.E., 'Adaption-innovation and cognitive complexity', *The Journal of Psychology*, 119, 1985, pp.461–67.
Gombrich, E.H., *Meditations on a Hobby Horse: and Other Essays on the Theory of Art*, Phaidon Press, New York, 1963.
Gregson, R.A.M., Pressing J., 'Dynamic Modeling', in Tassinary L.G., Cacioppo J.T., Berntson G. (eds.), *Principles of Psychophysiology: Physical, social and inferential elements,* Cambridge University Press, New York, 2000.
Grezes, J., Decety J., 'Functional Anatomy of Execution, Mental Simulation, Observation, and Verb Generation of Actions: A meta-analysis' , *Human Brain Mapping*, 12, 2001, pp.1–19.
Grèzes, J., Fonlupt P., Bertenthal B., Delon-Martin D., Segebarth C., Decety J., 'Does Perception of Biological Motion Rely on Specific Brain Regions?, *NeuroImage,* 13, 2001, pp.775–785.
Grove, R., 'Balancing Acts: Ballet in Australia, 1930-1955', *Voices*: *The journal of the National Library of Australia*, 6:.2, Winter 1996, pp.21–34
Grove, R., 'Visions Fugitive: Ideologies of Dance in Australia, 1930-1960', *Choreography and Dance* (issue ed. Meg Denton), 6: 2 & 3, New York, 2001.
Grove, R., 'A Slant of Her Own: Laurel Martyn, portrait of the artist', in I. Britain

(ed.), *Meanjin*, Australia Centre, University of Melbourne, 6: 2, 2003.

Hagendoorn, I.G., 'The Dancing Brain', *Cerebrum*, 5 (2), 2003(a).
Hagendoorn, I.G., 'Cognitive Dance Improvisation: How study of the motor system can inspire dance (and vice versa)', *Leonardo*, 36 (3), 2003(b).
Hagendoorn, I.G., 'Some Speculative Hypotheses about the Nature and Perception of Dance and Choreography', *Journal of Consciousness Studies*, 11 (3–4) 2004.
Hanna, J.L., *To Dance is Human: A theory of nonverbal communication,* University of Texas Press, Austin, 1979.
Hanna, J.L., *The Performer-Audience Connection: Emotion to metaphor in dance and society,* University of Texas Press, Austin,1983.
Hanrahan, C., Tetreau B., Sarrazin C., 'Use of Imagery while Performing Dance Movement', *International Journal of Sport Psychology*, 26, 1995, pp.413–430.
Hasson,U., Y.Nir, I. Levy, G. Fuhrmann, R. Malach, 'Intersubject Synchronization of Cortical Activity during Natural Vision', *Science*, 303, 2004.
Haugeland, J., 'Mind Embodied and Embedded', in Haugeland, *Having Thought*, Cambridge, MA, Harvard University Press, 1998, pp. 207-237.
Hepper, P.G., 'The Behaviour of the Fetus as an Indicator of Neural Functioning', in Lecanuet, J-P., W.P. Fifer, N.A. Krasnegor, W.P. Smotherman (eds) *Fetal Development: A psychobiological perspective*, Erlbaum, Hillsdale New Jersey, 1995.
Heylighen F., 'The Science of Self-organization and Adaptivity'. http://pespmc1.vub.ac.be/Papers/EOLSS-Self-Organis.pdf, viewed…
Hoffman, M.L., 'Perspectives on the Difference between Understanding People and Understanding Things: The role of affect', in Flavell, J.H., & L. Ross (eds), *Social Cognitive Development,* Cambridge University Press, New York, 1981.
Hopkins, J., 'Psychoanalysis, metaphor and the concept of mind', in M.P. Levine (ed.) *The Analytic Freud: Philosophy and psychoanalysis*, Routledge, London, 2000.
Hopkins, J., 'Conscience and Conflict: Darwin, Freud, and the origins of human aggression', in D. Evans & P. Cruse (eds), *Emotion, Evolution, and Rationality*, Oxford University Press, Oxford, 2004.
Huizinga, Johan, *Homo Ludens: A study of the play element in culture*, Beacon Press, Boston, 1955.
Humphrey, D., *The Art of Making Dances,* Holt, Rinehart & Winston, New York, 1959.
Hurley, S., *Consciousness in Action,* Cambridge, MA, Harvard University Press, 1998.
Hutchins, E., *Cognition in the Wild*, Cambridge, MA, MIT Press, 1995.

Isaksen, S.G., Dorval, K.B., Kaufmann, G., 'Mode of symbolic representation and cognitive style', *Imagination, Cognition and Personality*, 11, 1991–2, pp.271–277.
Iyer, V., 'Embodied Mind, Situated Cognition, and Expressive Microtiming in

African-American Music', *Music Perception,* 19, 2002, pp.387–414.

Jaffe, J. & Felstein, S., *Rhythms of Dialogue*, Academic Press, New York, 1970.
Johnston, M. & Lakoff G., *Metaphors We Live By*, University of Chicago Press, Chicago, 1980
Jalics, L., Hemami, H., Clymer, B., Groff A., 'Rocking, Tapping and Stepping: A prelude to dance', *Autonomous Robots*, 4, 1997, pp.227–242.
Jeannerod, M., 'The Mechanism of Self-Recognition in Humans', *Behavioral Brain Research,* 142, 2003, pp.1–15.
Jeannerod, M., Frak V., 'Mental Imaging of Motor Activity in Humans', *Current Opinion in Neurobiology*, 9, 1999, pp.735–739.
Jones, M.R., 'Time, Our lost Dimension: Toward a new theory of perception, attention and memory', *Psychological Review*, 83, 1976, pp.323–335.
Juarrero, A., *Dynamics in Action,* MIT Press, Cambridge, 1999.

Kauffman, S., 'Order for Free', in J. Brockman (ed), *The Third Culture*, Simon & Schuster, New York, 1995.
Kaufmann, G., Helstrup, T., 'Mental imagery: Fixed or multiple meanings? Nature and function of imagery in creative thinking', in Roskos-Ewoldson, Intons-Peterson,. Anderson (eds.), *Imagery, Creativity, and Discovery: A Cognitive Perspective*, Elsevier, 1993, pp.123–150.
Kay, S., 'A method for investigating the creative thought process', in Runco (ed.), *Problem Finding, Problem Solving, and Creativity*, Ablex Publishing Corporation, New Jersey, 1994, pp. 116–129.
Kleinginna, P.R. & A.M. Kleinginna, 'A Categorized List of Emotion Definitions, with a Suggestion for a Consensual Definition', *Motivation and Emotion*, 5,1981.
Koestler, A., *The Act of Creation*. Hutchinson, 1964.
Kohler, E. & C. Keysers, M. Umiltà , L. Fogassi, V. Gallese, G. Rizzolatti, *Science*, 297, 1970.
Kurtz, V., & M.F. Schober, 'Readers' Varying Interpretations of Theme in Short Fiction', *Poetics*, 29, 2001.

Langer, Susanne K., *Feeling and Form*, Routledge & Kegan Paul Ltd, London, 1953.
Large, E.W., Fink P., Kelso J.A.S., 'Tracking Simple and Complex Sequences', *Psychological Research*, 66, 2002, pp.3–17.
Large, E.W., Jones M.R., 'The Dynamics of Attending: How people track time-varying events', *Psychological Review,* 106, 1999, pp.119–159.
Latto, R., (in press), 'Do we Like what we See?', in Malcolm, G. & Paton, R. [eds], *Multidisciplinary Studies of Visual Representations and Interpretations*, Elsevier, Amsterdam
Latto, R., & D. Brain, B. Kelly, 'An Oblique Effect in Aesthetics: Homage to Mondrian (1872–1944)', *Perception*, 29, 2000
Latto, R. & K. Russell-Duff, 'An Oblique Effect in the Selection of Line Orientations by Twentieth-century Painters', *Empirical Studies of the Arts*, 20, 2002

Lecanuet, J-P., 'Prenatal Auditory Experience', in Deliège, I. & J. Sloboda, J. (eds),. *Musical Beginnings: Origins and development of musical competence*, Oxford University Press, Oxford, New York, Tokyo, 1996.
Lee, K-M., Kim C-M., Woo S.H., 'FMRI Comparison Between Expert and Novice Perception of Dance', *NeuroImage*, 6, 2001, p.907.
Liberman, A.M., Mattingly I.G., 'The Motor Theory of Speech Perception Revised', *Cognition,* 21, 1985, pp.1–36.
Limón, J., 'Composing a Dance', *The Juilliard Review*, II, 1955, pp.17–25.
Loftus, E.F., *Eyewitness Testimony,* Harvard University Press, Cambridge, 1979.

Malloch, S., 'Mothers and Infants and Communicative Musicality', Special Issue of *Musicae Scientiae*: *Rhythm, musical narrative and origins of human communication*, (1999/2000).
Malloch, S., 'Musicality: The art of human gesture', in C. Stevens, D. Burnham, G. McPherson, E. Schubert and J. Renwick (eds), Proceedings of the *7th International Conference on Music Perception and Cognition*, Sydney, 2002.
Malloch, S., C. Scott, R. Črnčec (in review), 'The Importance of Timing in Teacher-talk: A model and experimental findings'.
Marsh, H.W., *Self Development Questionnaire I, II and III,* SELF Research Centre, University of Western Sydney, Sydney, 1999.
Martindale, C., *The Clockwork Muse: The Predictability of Artistic Change*, Basic Books, New York, 1990.
McKechnie, S., 'Australians Making Dances: The spatial imperative', in *Dance - Australian Made: Papers and Proceedings*, AADE Publications, Canberra, 1991.
McKechnie, S., 'Movement as Metaphor: The construction of meaning in the choreographic art', in Stevens, C., D. Burnham, G. McPherson, E. Schubert, J. Renwick (eds), *Proceedings of the 7th International Conference on Music Perception & Cognition*, Causal Publishers, Adelaide, 2002.
McKechnie, S., 'Voices from Australia: A tribute to Peter Brinson', in *Dance Research: The Journal of the Society for Dance Research*, vol. XV, no.1, 1997.
McNeill, D., *Hand and Mind: What Gestures Reveal about Thought*, University of Chicago Press, 1992.
Merker, B., 'Synchronous Chorusing and the Origins of Music', Special Issue of *Musicae Scientiae*: *Rhythm, musical narrative and origins of human communication*, 1999/2000.
Michotte, A. *The perception of causality*, New York, Basic Books, 1963 (trans. By T.R. & E. Miles).
Miller, E.K., D.J. Freedman, J.D.Wallis, 'The Prefrontal Cortex: Categories, concepts and cognition', *Philosophical Transactions of the Royal Society*, London B 357, pp.1123–1136,.2002.
Miller, G.F., *The Mating Mind: How sexual choice shaped the evolution of human nature*, Doubleday, New York, 2000.
Miller, G.F., 'Aesthetic Fitness: How sexual selection shaped artistic virtuosity as a fitness indicator and aesthetic preferences as mate choice criteria', *Bulletin of Psychology and the Arts* 2 (1), 2001.
Mitchell, R.W. & M.C. Gallaher, 'Embodying Music: Matching music and dance

in memory', *Music Perception*, 19, 2001.
Mitchell, M., 'A Complex-Systems Perspective on the 'Computation *v.* Dynamics' Debate in Cognitive Science', in Gernsbacher Derry S.J. (eds), *Proceedings of the 20th Annual Conference of the Cognitive Science Society,* New Jersey, 1998.
Moll, L., *Vygotsky and education: Instructional implications and application of socio-historical psychology*, Cambridge University Press, New York, 1990.
Murray, L., & P. Cooper, 'The impact of Psychological Treatment of Postpartum Depression on Maternal Mood and Infant Development', in P. Cooper and L Murray (eds), *Postpartum Depression and Child Development*, Guildford Press, New York, 1997.
Murray, L. & C. Trevarthen, 'Emotional Regulation of Interactions between Two-month-olds and their Mothers', in Field, T.M. & N.A. Fox (eds), *Social Perception in Infants*, Ablex, Norwood, New Jersey, 1985.
Murata, A., Fadiga, L., Fogassi, L., Gallese, V., Rads, V., Rozzolatti, G., 'Object Representation in the Ventral Premotor Cortex (Area F5) of the Monkey,' *Journal of Neurophysiology,* 78, 1997, pp.2226–2230.

Nadel, J., I. Carchon, C. Kervella, D. Marcelli, D. Reserbat-Plantey, 'Expectancies for Social Contingency in Two-month-olds, *Developmental Science*, 2 (2), 1999.
Nakano, S., 'Incidents make Communication: Teasing nurtures mindreading by perturbing interaction playfully', *The Bulletin of Fuji Women's College*, 33(1), 1996.
Nazzi, T. & F. Ramus, 'Perception and Acquisition of Linguistic Rhythm by Infants', *Speech Communication*, 41(1), 2003.

Ochsner, K.N., S.A. Bunge, J.J. Gross, J.D.E. Gabrieli, 'Rethinking Feelings: An fMRI study of the cognitive regulation of emotion', *Journal of Cognitive Neuroscience* 14, 2002.
Overby, L., Hall C., Haslam, I., 'A Comparison of Imagery used by Dance Teachers, Figure Skating Coaches, and Soccer Coaches', *Imagination, Cognition & Personality*, 17, 1997–1998, pp.323–337.
Overby, L., 'A comparison of novice and experienced dancers' imagery ability', *Journal of Mental Imagery*, 14, 1990, pp.173–184.

Paccalin, C., Jeannerod, M., 'Changes in Breathing During Observation of Effortful Actions', *Brain Research*, 862, 2000, pp.194–200.
Panksepp, J., *Affective Neuroscience,* Oxford University Press, New York, 1998.
Panksepp, J. & G. Bernatzky, 'Emotional Sounds and the Brain: The neuro-affective foundations of musical appreciation', *Behavioural Processes*, 60, 2002.
Panksepp, J. & Panksepp, J. B., "The seven sins of evolutionary psychology", *Evolution and Cognition*, 6, 2000, pp 108-131.
Papousek, H., 'Musicality in Infancy Research: Biological and cultural origins of early musicality', in Deliège, I. & J. Sloboda (eds), *Musical Beginnings: Origins and development of musical competence* , Oxford University Press,

Oxford, New York, Tokyo, 1996.
Papousek, M., 'Intuitive Parenting: A hidden source of musical stimulation in infancy', in Deliège, I. & J. Sloboda (eds), *Musical Beginnings: Origins and development of musical competence*, Oxford University Press, Oxford, New York, Tokyo, 1996.
Petitto, L., S. Holowka, L. Sergio, B. Levy, D. Ostry, 'Baby Hands that Move to the Rhythm of Language: Hearing babies acquiring sign languages babble silently on the hands, *Cognition* 93, 2004.
Petocz, A., *Freud, Psychoanalysis and Symbolism*, Cambridge University Press, Cambridge,1999.
Petocz, A., 'Psychology in the 21st Century: Closing the gap between science and the symbol', in J.R. Morss, N. Stephenson and H. van Rappard (eds), *Theoretical Issues in Psychology*: peer-reviewed chapter, Proceedings of the International Society for Theoretical Psychology, 1999 Conference, Kluer Academic Publishers, Boston, 2001.
Petocz, A. 'Science, meaning and the Scientist-Practitioner Model of Treatment', in D. Jones (ed.) *Working with Dangerous People*, Radcliffe Medical Press, Oxford, 2004.
Piaget, Jean *The Equilibration of Cognitive Structures: The central problem of intellectual development*, tr. Terrance Brown, University of Chicago Press, Chicago, 1985.
Poldrack, R.A., Packard M.G., 'Competition Among Multiple Memory Systems: Converging evidence from animal and human brain studies', *Neuropsychologia,* 41, 2003, pp.245–251.
Port, R.F., van Gelder T. (eds.), *Mind as Motion: Explorations in the dynamics of cognition,* MIT Press, Cambridge, 1995.
Potter, Michelle, 'The Armidale Summer Schools', in *National Library of Australia News*, National Library of Australia, Canberra, 2002.

Raajimakers, J.G.W., Shiffrin R.M., 'Search of Associative Memory', *Psychological Review,* 88, 1981, pp.93–134.
Ramachandran, V. S. & W. Hirstein, W. 'The Science of Art: A neurological theory of aesthetic experience', *Journal of Consciousness Studies*, 6,1999
Ramachandran, V.S. & E.M. Hubbard, 'Synesthesis—a window into perception, thought and language', *Journal of Consciousness Studies*, 8, no.12, 2001.
Read, Herbert, *The Philosophy of Modern Art*, Faber and Faber, London, 1964.
Reed, C. & M. Farah, 'The Psychological Reality of the Body Schema: A test with normal participants', *Journal of Experimental Psychology: Human Perception and Performance,* 21, 1995.
Reed, S.K., 'Imagery and discovery', in Roskos-Ewoldson, Intons-Peterson, Anderson (eds), *Imagery, Creativity, and Discovery: A Cognitive Perspective*, Elsevier, 1993, pp.287–312.
Ricks, Christopher, *Keats and Embarrassment*, Oxford University Press, London, 1974.
Rieber, L.P., 'A historical review of viualization in human cognition', *Educational Technology Research & Development*, 43, 1995, pp.45–56.
Rizzolatti, G. & M.A. Arbib, 'Language within our Grasp', *Trends in*

Neuroscience, 21, 1998.
Robb, L. 'Emotional Musicality in Mother-infant Vocal Affect, and an Acoustic Study of Postnatal Depression', Special Issue of *Musicae Scientiae*: *Rhythm, musical narrative and origins of human communication*, 1999/2000.
Rogoff, B., *Apprenticeship in Thinking: Cognitive development in social context*, Oxford University Press, New York, 1990.
Rothenberg, A., *Creativity and Madness: New Findings and Old Stereotypes*, The Johns Hopkins University Press, 1994.
Rowlands, M., *The Body in Mind: understanding cognitive processes,* Cambridge University Press, 1999.
Ruspoli, Mario, tr. Sebastian Wormell, *The Cave of Lascaux: The final photographic record*, Thames & Hudson, London, 1987.

Schank, R.C., *Dynamic Memory: A theory of reminding and learning in computers and people,* Cambridge University Press, New York, 1982.
Schank, R.C. & R.P. Abelson, *Scripts, Plans, Goals and Understanding,* Hillsdale, Erlbaum, New Jersey 1977.
Schenker, H., Oster, E. (tr. and ed.), *Free Composition (der freie Satz): Volume III of New Musical Theories and Fantasies,* Longman, New York, 1979.
Schore**,** A.N., *Affect Regulation and the Origin of the Self*: *The neurobiology of emotional development*, Erlbaum, Hillsdale, New Jersey.
Schore, A.N., *Affect Dysregulation & Disorders of the Self*, Norton, New York, 2003.
Schubert, E., 'Continuous Measurement of Self-Report Emotional Response to Music', in Juslin P., Sloboda J. (eds.), *Music and Emotion: Theory and Research,* Oxford University Press, Oxford, 2001, pp.393–414.
Schubert, E., 'Modeling Perceived Emotion with Continuous Musical Features', *Music Perception*, 21, 2004, pp.561–585.
Selby, J.M. & B.S. Bradley, 'Infants in Groups: A paradigm for the study of early intersubjectivity', *Human Development*, 46, 2003.
Siegman, A.W. & S. Felstein, *Of Speech and Time*, Erlbaum, Hillsdale, New Jersey, 1979.
Siegman, A.W. & S. Felstein, *Nonverbal Behaviour and Communication*, Erlbaum, Hillsdale, New Jersey 1987.
Simonton, D.K., *Greatness: Who Makes History and Why*, The Guilford Press, New York, 1994.
Skarda, C.A. & W.J. Freeman, 'How Brains Make Chaos in order to Make Sense of the World', *Behavioral and Brain Sciences*, 10, 1987.
Sloboda, J.A., 'Music Structure and Emotional Response: some empirical findings', *Psychology of Music*, 19, 1991.
Sloboda, J.A., 'Does Music Mean Anything?', *Musicae Scientiae*, 2, 1998, pp.21–31.
Smith, A., Daily journal for the creation of *Red Rain*, Victorian College of the Arts, 1999. http://ausdance.anu.edu.au/unspoken
Smith, K.L., 'Dance and Imagery: The link between movement and imagination', *Journal of Physical Education, Recreation, and Dance*, 61, 1990.

Smolin, L., *Life of the Cosmos*, Phoenix, London, 1998.
Smyth, M.M., Pearson, N.A., Pendleton L.R., 'Movement and Working Memory: patterns and positions in space', *The Quarterly Journal of Experimental Psychology*, 40A, 1988, pp.497–514.
Smyth, M.M., Pendleton L.R., 'Space and Movement in Working Memory', *The Quarterly Journal of Experimental Psychology,* 42A, 1990, pp.291–304.
Smyth, M.M., Pendleton L.R., 'Memory for Movement in Professional Ballet Dancers', *International Journal of Sports Psychology*, 25*,* 1994, pp.282–294.
Solso, R.L., 'Brain Activities in a Skilled *versus* a Novice Artist: an fMRI study', *Leonardo*, 34, 2001
Solso, R.L. *Cognition and the Visual Arts*, MIT Press, Cambridge, Mass., 1994.
Solso, R.L., Dallob R., 'Prototype Formation Among Professional Dancers', *Empirical Studies of the Arts,* 13, 1995, pp.3–16.
Starkes, J.L., Caicco, M., Boutilier, C., Sevsek, B., 'Motor Recall of Experts for Structured and Unstructured Sequences in Creative Modern Dance', *Journal of Sport & Exercise Psychology*, 12, 1990, pp.317–321.
Starkes, J.L., Deakin J.M., Lindley S., Crisp F., 'Motor versus Verbal Recall of Ballet Sequences by Young Expert Dancers', *Journal of Sport Psychology*, 9, 1987, pp.222–230.
Starkes, J.L., Caicco M., Boutilier C., Sevsek B., Stevens, C., McKechnie, S., Malloch, A., Petocz, A., 'Choreographic Cognition and Contemporary Dance: challenges for psychological theory and research', (unpublished manuscript), MARCS Auditory Laboratories, University of Western Sydney, Sydney, 2000.
Stern, D.N.& L. Hofer, W. Haft, J. Dore, 'Affect Attunement: The sharing of feeling states between mother and infant by means of inter-modal fluency', in Field and Fox (eds), *Social Perception in Infants*, Ablex Publishing Corporation, Norwood, New Jersey, 1985.
Steven, N., 'Working Process with Anna Smith: Log Entries', unpublished fieldwork project. Melbourne: School of Dance, Victorian College of the Arts, 1999.
Stevens, C., S. McKechnie, S. Malloch, A. Petocz, 'Choreographic Cognition: Composing Time and Space'. www.ausdance.org.au/unspoken/research/cognition. html, viewed …
Stevens, C., Malloch, S., McKechnie, S., Steven, N., 'Choreographic cognition: The time-course and phenomenology of creating a dance', *Pragmatics & Cognition*, 11, 2003, pp.299–329.
Stevens, K., S. Malloch, S. McKechnie, 'Moving Mind: The cognitive psychology of contemporary dance', *Brolga: An Australian Journal About Dance*, 15, 2001.
Stevens, C., Malloch, S., Morris R., McKechnie, S., 'Shaped Time: A dynamical systems analysis of contemporary dance' , in Stevens C., Burnham, D., McPherson G., Schubert, E., Renwick J. (eds.), *Proceedings of the 7th International Conference on Music Perception & Cognition,* Causal Productions, Adelaide, 2002, pp.161–164.
Stevens, K., S. McKechnie, S. Malloch, A. Petocz, 'Choreographic Cognition: Composing time and space', in Woods, C., G. Luck, F. Brochard, J.A.Seddon,

J.A. Sloboda, S. O'Neill (eds.), *Proceedings of the 6th International Conference on Music Perception & Cognition,* Keele, UK, 2000.
Stevens, K., 'Trans-disciplinary approaches to research on contemporary dance', MARCS Auditory Laboratories, UWS, n.d. – but see chapter 9 in this volume.
Strogatz, S., *Sync: How order emerges from chaos in the universe, nature, and daily life*, New York, Hyperion, 2003.
Sudnow, D., *Ways of the Hand: a rewritten account*, Cambridge, MA, MIT Press, 2001.
Sykes, Jill, 'Finding an Australian Identity in Dance', *Voices: The journal of the National Library of Australia*, 6:.2, Winter 1996, pp.35–46.

The Australia Council, *Resourcing Dance: A review of the subsidised dance sector*, Sydney, 2004.
Thelen, E., 'Time-scale Dynamics and the Development of an Embodied Cognition', in R.F. Port, and T. van Gelder (eds), *Mind as Motion: Explorations of the dynamics of cognition*, MIT Press, Cambridge, 1995.
Thelen, E. & Smith, L.B., *A dynamic systems approach to the development of cognition and action*, Cambridge, MA, MIT Press, 1994.
Tolstoy, Leo (tr. Louise & Aylmer Maude), *Anna Karenina*, Oxford University Press, London, 1949.
Tomasello, M. & L. Camaioni, 'A Comparison of the Gestural Communication of Apes and Human Infants', *Human Development*, 40, 1997.
Torey, Z. *Out of Darkness: A memoir*. Picador, London, 2003.
Torey, Z., *The Crucible of Consciousness*, Oxford University Press, Melbourne
Townsend, James & Jerome Busemeyer, 'Dynamic Representation of Decision-Making', in van Gelder and Port (eds), *Mind as motion: Exploration in the dynamics of cognition*, MIT, 1995.
Trehub, S.E., L.J. Trainor, A.M. Unyk, 'Music and Speech Processing in the First Year of Life', *Advances in Child Development and Behaviour*, 24, 1993.
Trevarthen, C. 'The Concept and Foundations of Infant Intersubjectivity', in S. Bråten (ed.), *Intersubjective Communication and Emotion in Early Ontogeny*, Cambridge University Press, Cambridge, 1998.
Trevarthen, C. 'Musicality and the Intrinsic Motive Pulse: Evidence from human psychobiology and infant communication', special issue of *Musicae Scientiae: Rhythm, musical narrative and origins of human communication*, 1999/2000.
Trevarthen, C. & S. Malloch, 'The Dance of Wellbeing: Defining the musical therapeutic effect', *The Nordic Journal of Music Therapy*, 9 (2), 2000.
Trevarthen, C. & S. Malloch, 'Musicality and Music Before Three: Human vitality and invention shared with pride, *Zero to Three*, 23(1), 2002.
Tweney, R.D., "Epistemic artifacts: Michael Faraday's search for the optical effects of gold", in L. Magnani & N.J. Nersessian (eds.), *Model-Based Reasoning: Science, Technology, Values*, New York, Kluwer Academic/ Plenum, 2002, pp 287-304.
Tweney, R.D., Mears, R.P., & Spitzmüller, C., "Replicating the practices of discovery: Michael Faraday and the interaction of gold and light", in M.

Gorman, R.D. Tweney, D. Gooding, & A. Kincannon (eds.) *Scientific and technological thinking*, Mahwah, NJ, Lawrence Erlbaum Associates, 2004, pp. 137-158.

Ude, A., 'Robust Estimation of Human Body Kinematics from Video', *Proceedings of the International Conference on Intelligent Robots and Systems,* IEEE, Korea, 1999, pp.1489.

Vaughan, D., 'Merce Cunningham', in *Cage, Cunningham, Johns: Dancers on a Plane,* Thames and Hudson, London, 1990, pp.81–87.

van Gelder, T. & R. Port, 'It's time' in van Gelder & Port (eds), *Mind as Motion: Exploration in the Dynamics of Cognition*, MIT Press, 1995.

Vygotsky, L.S. *Mind in Society: The development of higher psychological processes* (M. Cole, V. John-Steiner, S. Scribner, E. Souberman, (eds), Harvard University Press, Cambridge, MA., 1978.

Wakefield, J.F., 'Problem finding and empathy in art', in Runco (ed.) *Problem Finding, Problem Solving, and Creativity*, Ablex Publishing Corporation, New Jersey, 1994, pp 99–115.

Walk, R.D., & H. L. Pick, *Perception and Experience,* Plenum Press, New York, 1978.

Watt, R. & R. Ash, 'A Psychological Investigation of Meaning in Music, *Musicae Scientiae*, 11(1), 1998.

Weinberg, M.K. & E.Z. Tronick, 'Beyond the Face: An empirical study of infant affective configurations of facial, vocal, gestural and regulatory behaviors', *Child Development,* 65, 1994.

Wertsch, J.V., *Culture, Communication and Cognition: Vygotskian perspectives*, Cambridge University Press, Cambridge, 1985.

Wilson, E. O., *Consilience: The unity of knowledge*, Little Brown and Company, London, 1998.

Wing, A.M., 'Voluntary Timing and Brain Function: An information processing approach', *Brain & Cognition,* 48, 2002, pp.7–30.

Wittman, M. & E. Pöppel, 'Temporal Mechanisms of the Brain as Fundamentals of Communication—with special reference to music perception and performance', special issue of *Musicae Scientia: Rhythm, musical narrative and origins of human communication*, 1999/2000.

Wolf, N., M.Gales, E. Shane, M. Shane, 'The Developmental Trajectory from Amodal Perception to Empathy and Communication: The role of mirror neurons in this process', *Psychoanalytic Enquiry*, 21(1), 2001.

Wood, J. N. & J. Grafman, 'Human Prefrontal Cortex: Processing and representational perspectives', *Nature Reviews Neuroscience*, 4, 2003

Zahavi, A., & A. Zahavi, *The Handicap Principle: A missing piece of Darwin's puzzle,* Oxford University Press, Oxford, 1997

Zukav, G., *The Dancing Wu Li Masters*, Fontana, Great Britain, 1980.