

# **Phase Transitions : Self-organising systems in participatory and performative interdisciplinary dance**

**Dr Jane Turner**

## **ABSTRACT**

Recognising the power of digital algorithms and biological viruses to radically affect everyday experience, it seems timely to investigate how self-organising systems operate in natural and cultural domains.

Drawing on extensive practice as a dance artist and researcher working at the intersection of art, science and the digital towards emergent performative outcomes, I aim to elucidate, through interweaving cycles of practice and research, the possibilities of Phase Transitions.

In so doing I point to postmodern dance methodologies, referencing my own performance works and those created in collaborative relationship with other artists. In seeking to articulate how such performances embody the scientific theory of Phase Transition I also discuss substantial works by significant choreographers in tracing the emergent outcomes of complex works.

In tracing the dialogic relationship between practice and theory I underline how independent contemporary arts practice contributes to the evolution of knowledge.

**Key Words:** Dance, Complexity, Interdisciplinarity, Phase Transition, Postmodern

## Phase Transitions : Self-organising systems in participatory and performative interdisciplinary dance

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'I feel I have been inside a painting, under and in the skin of creativity – crafting and crafted, creating and created, individually and collectively, myself and ourselves...' These words by Kiki Gale<sup>1</sup>, one of the participant performers I danced alongside in *Passage for Par* (Lee 2018), allude to a shapeshifting 2 in 1 experience that is implicit in the structuring of this two hour dance work involving 30 female performers made for Par beach in West Cornwall, England.

Simultaneously dance and visual art work and part of the shifting landscape, Rosemary Lee's "world-class contemporary art" (Spence, 2018), was presented at the turn of the tide in a "synergy between site and artwork" (ibid.). Based on a simple Breton folk dance the work evolved into a complex of weaving step patterns that unfolded across the landscape. I propose the work as an embodiment of Phase Transition.<sup>2</sup>



Figure 1: *Passage for Par* (Choreo: Rosemary Lee 2018)

Embodying is a process which gives tangible form to ideas. It is also a process by which the ideas dormant in practice emerge (Preston-Dunlop, Sanchez-Colburg 2002:7).

That an interconnected group of individual elements, here dancers, are capable of transforming into performance organism if appropriately networked is an

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<sup>1</sup> Shared via the project's Whatsapp group (personal communication 22-24/6/18), a portal of continued sharing and support for all those involved in the project.

<sup>2</sup> A short film by Graham Gaunt of the work can be accessed on vimeo <https://vimeo.com/276339048>

empowering understanding that mirrors tacit artistic understanding and scientific theory. Scientists have defined phase transitions as occurring due to a flow of energy/information between interconnected elements creating a dynamic shift, thus “changing from one defined state to another at a critical juncture” (Johnson 2001:111).

*Passage for Par* was made through a group of dancers working together somatically. Responsive somatic movement aims for mind-body interconnection, encouraging a practice that awakens and nurtures our senses, our abilities to hear deeply, to receive and respond and correspond.

Throughout the performance they are in close physical contact throughout sometimes working with spirals that draw on the Cornish serpent dance or ‘snails creep’. The folk type movement language of *Par* is ‘open source’ in the same way that much documented folk music is. The notion of ‘open source’ is inimical to modern computing and digital networks, emergent self-organising systems hewn through a scientific pathway forged by mathematicians such as Alan Turing who foresaw the potential of the “universal computer”, and “demonstrated using mathematical tools how a complex organism could assemble itself without any master planner calling the shots” (Johnson 2001:14).

The use of the term universal computer underlined a vital shift in mathematics, for Turing’s abstract notion of a machine was designed to tackle any mathematical problem “in the sense that a modern computer can carry out any program” (Coveney & Highfield 1995:30). The way that different individuals can find a way to join a spiralling Breton based social dance or choreographic structure, the core of *Passage for Par*, bears similarity to such a universal computer. Folk dances in their repetitive simplicity are easily accessed, but through through repetition and feedback evolve rich complexity.

### **Two masks of the same face**

Turing’s universal machine has particular relevance for my sci-art enquiry as it started “as a purely imaginary device”, a “thought experiment”(Gribbin 2004:114). We might call that a tacit knowledge, the body sensing and knowing before the mind is able to order and articulate. Imagining constructions before knowing that they are practically feasible is one of the traditional routes of the artist, and choreographer. The computer is of course now a constantly evolving organism and is used to explore every kind of knowledge as data. An analogy can be found between a computer and the shapeshifting dances I explore here. Just as the modern computer is able to take on the physical computational activity of a disciplinary problem to new solutions, a group of improvising dancers triggered by a simple set of rules are able to process wide ranging inputs of information towards the creation of surprising new patterns, a process of shared intelligence. As creative tool it is the computer programs and systems, and not the hardware parts, which allow the flow of information to new formations. Similarly, it is the process of doing, the release to the repetitive act of dancing that enables interconnections, the flow of information evolving intelligence to new cultural formations that can make new meaning with audiences as well as participants.

The term Phase Transition originally derived from chemistry to describe, for example, a transition from liquid to gas. Steven Johnson opens his book *Emergence* (2001) by explaining how slime mould, a brain-less primitive organism, came to represent a significant new leap for scientists “trying to understand systems that use relatively simple components to build higher-level intelligence” (Johnson 2001:11). Slime mould demonstrates that simple components combine to create a group organism that is able to progress and evolve – in this case, by slowly moving through wood. An exemplar of emergent behaviour it “oscillates between being a single

creature and a swarm” (ibid:13) just as with *Passage to PAR* the viewer sees both a shapeshifting whole in a seascape, as well as the individual performers that make it.

Virus spreading, whether biological or informatic, have in common that they involve large amounts of similar elements interacting at local level, following simple rules that respond to feedback and their environment, and are subject to pattern recognition and indirect control. Such emergent systems evolve from the bottom up and operate far from equilibrium as is so evident in our global pandemic. Although unpredictable, through understanding how self-organising systems operate we can navigate uncertainty. Molecular biologist Brian Goodwin, in proposing an open approach to practical research provides pertinent guidance; “We need to learn how to engage appropriately with the natural magic of the world. Most of the natural systems on which the quality of our lives depend are complex, uncontrollable and unpredictable, though their behaviour is self-consistent and therefore intelligible to scientific study” (Goodwin, 2003).

Recognising this natural magic of simple rule systems triggered my own exploration of chaos, complexity and emergence. The proliferating dance patterns that were emerging from dance improvisations I initiated seemed similar to fractals. Fractals<sup>3</sup> show self-similar geometrical patterns emerging from an endlessly reiterated equation in a feedback loop. Mandelbrot was able to show that this ‘new geometry’, through the rapidly evolving computing power of the 1970s, whilst irregular, contained order. Such self-similarity and iteration on many scales can be seen in the dance or musical motif that interweaves in variations through a choreographic or compositional work. The performed work will lead the audience through a journey, that is unexpected, and that they further evolve through their own responses and reactions.

### **Postmodern Dance**

Somewhere between improvisation and choreography, art and science, my practice based research builds from the interdisciplinary foundations laid by postmodern choreographers working collaboratively with other artists.<sup>4</sup> Starting with improvisational play and experimentation of key ideas channelled through a sensitised body to the techniques, abilities and histories of many bodies, the choreographic work emerges almost by itself, often swiftly and in surprising ways.

As a choreographer, my focus is the making of dance based performance works that will find and hold the attention of audiences. The pressure on the choreographer is to produce new experience, dynamic novelty, often under pressure of little time and few resources. Understanding how to construct a complex performance system towards generating original ideas and motifs for performance development is therefore of great value.

Towards this goal, contemporary dancers might work with ‘Release’ techniques that focus on breath, skeletal alignment, inner awareness, muscle relaxation, and the use of gravity and momentum to find new ways of moving. These practices interconnect with eastern disciplines and therapeutic movement approaches such as

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<sup>3</sup> A term coined by Benoit Mandelbrot when an IBM worker in the late 1970s. “Mandelbrot set up a mathematical equation on a computer which through colour coding its different values shows itself as an evolving intricate swirling pattern that demonstrates self-similarity on many scales” (Hofstadter 2007:69).

<sup>4</sup> Particularly composer John Cage and choreographer Merce Cunningham in their chance based performance making where the throwing of the dice decided how a collage of performance materials might be put together for the first time in performance.

Qigong and Feldenkrais techniques that assume the transformational potential of the body.

Such approaches put the dancer at the centre of the dance. The dancer tunes how the body can operate towards uncovering 'found' efficient movement evolving from walking, standing, rolling, transitions between these, as well as gestures and the externalisation of internal images. By listening to the body's possibilities new movement patterns unfold into shared improvisations, tropes become recognised, and may form the foundations of new composition. Such self-organised tropes find echoes in the notion of 'hubs' in complexity. "Hubs appear in most large complex networks that scientists have been able to study so far. They are ubiquitous, a generic building block of our complex, interconnected world" (Barabasi 2003:63). Hubs are nodes (points of connection) that attract many connections. In a dance they might be particular motifs/phrases, or gestures that become key components of the dance. Barabasi sites the rise of Google as the most used search engine as an example of how hubs form, noting that "popularity is attractive" (2003:86), for just as "highly connected actors are more often considered for new roles, highly cited papers are more likely to be cited again, connectors make more new friends (ibid)." Similarly, dancers in an improvisatory system will be attracted to certain movement motifs that may arise during a session. The more different dancers perform that movement, investing it with new developments through the process of feedback, the more it becomes known. When this happens it is divested of its novelty status and becomes an established motif or hub within the improvisation, in effect a new element in its own right that may become a part of the architecture of the composition.

Computer scientist John Holland, when researching emergent systems to analyse behaviour, builds models of, for example, interconnected neurons. Through that experience he noted that "shearing away detail is the very essence of model building. Whatever else we require, a model must be simpler than the thing modelled" (Holland 1998:24). Postmodern dancers similarly work on releasing a simple ease of movement. Once they are 'sheared' of historical detail, they can build with the choreographer the language and culture, an ecology from which the performance work may evolve. The postmodern compositional process shares similarities with computer modelling in that starting states and simple rules drive a dynamic process that is dependent on parts interacting through multiple repetitions and feeding back to evolve the whole. Often this process is the performance.

When a dancer in performance repeats simple everyday movements she is modelling a human moving for the viewer. In that act of modelling the dancer masters and presents a refined representation of familiar movements so that they can be reconsidered collectively in new ways, removed from the context of their usual usage in everyday living. This strategy is common in the choreographic practice of many postmodern dance makers. For example, dance pioneer Trisha Brown created a number of works during the 1970s based entirely on the process of repeating simple movements. Taking their titles from the acts of Accumulation that formed them, Brown referred to them as part of a mathematical cycle of works (Teicher 2002) laying down a marker of disciplinary borders crossed.

### **Flock & Swarm**

Steven Johnson opens his book *Emergence* (2001) by explaining how slime mould, a brain-less primitive organism, came to represent a significant new leap for scientists "trying to understand systems that use relatively simple components to build higher-level intelligence"(Johnson 2001:11). Slime mould demonstrates that simple components combine to create a group organism that is able to progress and

evolve, in this case by slowly moving through wood demonstrating phase transition as it “oscillates between being a single creature and a swarm” (ibid:13).

Such oscillation between self and group, similarity and difference, was the behavioural outcome derived from setting up a complex system to create an emergent performance at London’s Conway Hall in 2012. *Flock & Swarm* (2012) involved some of my company TURNING WORLDS’ dancers alongside a large collection of volunteer dancers of diverse experience, age and cultures who joined me for three workshops to become acquainted with the rules that would govern an evolving emergent performance in real time<sup>5</sup>. As Coveney & Highfield accord “The study of complexity has also shown us the importance of diversity and randomness in sustaining the capability of adaptive innovation” (1995:332)



**Figure 2: *Flock & Swarm* (Choreo: Jane Turner 2012)**

One of those performers, Catalina Zuliani, noted of the experience “The organic way in which patterns emerge also help us let go of them easily and move on to new ones, which I think was key in the success of the event, as not one pattern or image was necessarily hammered through to exhaustion”(personal communication 24/10/12). In my experience working with vast numbers of people over time exploring the possibilities of a complex system to create emergent performance I am confident of positive responses to the ‘science’: “I find these ideas fascinating! The whole concept is so natural and organic and it happens constantly in life so it feels right to engage with it and explore it in a performance environment.”(ibid.)

Elizabeth Dempster echoes this notion of a dance being an organism, extrapolating from the biological to discuss the postmodern dancer’s body as an evolving part of a larger community of bodies: “The post-modern body is not a fixed, immutable entity, but a living structure which continually adapts and transforms itself. It is body available to the play of many discourses. Post-modern dance directs attention away from any specific image of the body and towards the process of constructing all bodies” (Dempster 1994:32-3).

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<sup>5</sup> Accompanied by clarinetist Kate Romano playing live to a looped, sampled recording of her own music composition.

Referred to as a living structure Dempster acknowledges the ever evolving, changing nature of performance works as both biological, of the body/all bodies, and of the shared intelligence of its creators and performers. By underlining that through the act of dancing the body becomes more than itself, through phase transition become all bodies, so a *Flock & Swarm* (2012) performance answers the question “how does a persistent, flexible organization emerge from relatively inflexible components” (Holland1998:82).

Ant colonies are also an excellent example of complex systems that are made up of large numbers of same elements, where the ants, which interact and respond only to local information, generate a complex society. Ant colonies are self-generating systems, where the crucial behaviours that define them as emergent are clearly demonstrated by the ants themselves. Each of the ants has a set of behaviours that are triggered by certain environmental situations and pheromones (scent) left by other ants. In picking up scents that trigger different actions, they are richly connected readers of signs, such as: follow that pathway, forage for food, enemy nearby, as are we, and these semiotic interactions contribute to “a form of collective memory” (Bloom 2000:38).

Similarly, Howard Bloom, in his book *Global Brain* (2000), presents an interdisciplinary argument for life as an evolved networked intelligence where it is the health of the collective memory, or the self-organised system, that is the key to the survival and progression of the elements that make it. Citing the situation of two ant armies meeting unexpectedly, and therefore fragmenting because of the impact of conflict, “Victory belongs to the group which can reconstitute its links with the greatest speed” (2000:37). Adaptability is a considerably valuable skill.

Through my experience of working with collections of different elements I am familiar with the focus oscillating between the individual and the group. The seemingly paradoxical, two-in-one identity of organic structures echoes ideas found in Chaos Theory and it is observed in twentieth-century quantum physics which “opened up not only onto a complex relationship between observer and observed but also onto the more complex notion, the destabilizing notion, that elementary particles appear to an observer as a wave, but also as a particle “(Morin 2008:17). Morin usefully draws in the observer-observed relationship as part of the wider oscillation between the shifting states of material. In my working process I observe, and want to share with an audience the sensations that Kiki Gale expressed at the opening of this writing; the workings of transformation itself.

In creating a choreographic response to Valerie Ross’s new music composition *The Cusp of Life* (2019) for The Sound of Change Concert as part of the Cambridge Festival of Ideas<sup>6</sup>, the repetitive sound of the beating heart that operates as a core of this work invited deep connections for the dancing somatic body.

*The Cusp of Life* translates Ross’ observations of open-heart surgery into sonic interpretations of transcendence and enabled me, as choreographer working with three young dancers, to assemble a loosely structured choreographic system that would only encounter the live work for the first time on the day of the performance. This new work at nearly 30 minutes length combined electronic composition with live instrumentation, and contained space and resonance that the choreographic organism could enter into for performance interaction. I would argue that it is because of Valerie and my shared understandings of sci-art synergies that enabled our collaboration to work with minimal actual contact. We drew on a trust evolved

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<sup>6</sup> *Cusp of Life* (2019) Music by Valerie Ross, Choreography by Jane Turner, Live flute by Laura Falzon, Dancers: Lansinet Berete, Erika Postnikova, Sam Tchoukeu (1st performance) at Churchill College Chapel as part of the International Conference on Musical Intersections in Practice (MIP2019)

through shared understandings hewn in our first collaboration, the performance of her composition *Blue Note* (2014), where the acoustic elements of this work were similarly only assembled on the day of performance. Musicians and dancers rely on somatic intelligence that enables interconnection<sup>7</sup> with complex dynamic languages and for and between other instruments and performers, and thus enabling emergent behaviour (performance) to resonate.

Postmodern dance practices have at their core the questioning and breaking of boundaries: between art and everyday experience, the personal and political, subject and object and the embrace of full bodily experience with all its extremes of pleasure, pain and jouissance<sup>8</sup>. By enjoining those you dance with, whether for performance or pedagogy, to trust in contributing their thoughts and responses they are empowered to see themselves as creative beings whose actions and voice contribute to compositional transformations. In so doing all gain ownership, thus commitment, understanding of and responsibility to the work. Enabling sophisticated and intelligent performance that draws on a rich web of knowledge and experience in ritualistic process is a creative and perhaps political act with long-term implications.

### **Jouissance**

Finding unique ways of narrating such jouissance is, for me, particularly evident in the work of Pina Bausch, the German choreographer internationally regarded as one of the greatest artists of the 20<sup>th</sup> century. In the restaging of her 1978 three hour-long tanztheater work *Kontakthof* ('meeting place') in 2000, Pina Bausch used male and female non-professional performers aged over 65. In the reworking of the themes underscoring the work: the interrogation of male/female relationships, the offering of self to others for validation and acceptance, the ritualisation of habit, the revealing of inner motivations and experience, was powerfully communicated through the often invisible voices of elders. Bausch's works tell stories, whilst breaking conventions. At one point we see a woman instruct a man in hip gyrating, urging him in a heavy German accent to create 'big fat juicy circles'. At another point in the performance a woman in a purple dress exhorts the audience for some coins to put into a rocking horse. She gains some but the rocking horse doesn't have an electric source, instead she rides the horse to make it rock, attracting a queue of other women waiting for a 'go', as we all begin to recognise that the rocking provides sexual frisson. In the restaging of *Kontakthof* with 'non-dancers' who are clearly in a stage of life where the demands of conventional dance performance are difficult, the work offered powerful pathos. As with so much postmodern work, performances of *Kontakthof* are founded on a complex network of local relationships that question how we deal with our bodies and relationships in our lived environments. Such emergent performance is understood as a live event that results from the play of relationships between the elements (the older performers, the music, the set, the music, the audience) on stage in time, responding to a set of rules or triggers.

Bausch<sup>9</sup> famously created performance works by asking questions of performers. These simple starting points trigger original outcomes, often concerning

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<sup>7</sup> Sarrazin, N., & Morelli, S. (2016) Teaching Embodied Musickmaking: Pedagogical Perspectives from South Asian Music and Dance. *College Music Symposium*, 56. Retrieved November 28, 2020, from <https://www.jstor.org/stable/26574452>

<sup>8</sup> Whilst the term was coined by Jacques Lacan, it is used here in the feminist understanding of going beyond the accepted confines of patriarchy as defined by French feminists Helene Cixous' and Catherine Clement in their definitive work *The Newly Born Woman*(1986).

<sup>9</sup> Bausch died 30 June 2009 but her Wuppertal company continues to tour her works internationally.



“everyday social experiences of the body” (Servos 1998:38) that are modelled into “objectifying sequences of images and movements” (ibid.). And these sequences of images are put together in works as collage or montage: “linkage of scenes in free association, without the need for continuity of plot, psychology of character, or causality, also refuses to be deciphered in the normal way. It defies interpretation” (ibid.).

Servos’ analysis of how Bausch’s work challenges theorists’ or critics’ attempts at deconstructing it points to a kind of performance organism that evolves beyond definitive boundaries. In Bausch’s performance works we see the use of unusual, challenging stage settings as a key creative strategy in creating distinct ecologies. In *Viktor* (1986) huge earth walls skirting the stage are gradually eroded as individuals throw shovels of the earth down into the performance space throughout the duration of a work which includes: a woman throwing bread gently to feed an origami paper bird; a woman approaching a microphone on a stand but her only utterance is a deep groaning exhalation of tiredness? pain? after which she falls onto the extended arms and feet of a line of men on their backs in a row next to her. The men use their hands and feet to pass her prone body along their line. She is put back onto her feet to only walk back to the microphone and repeat the process. Such resonant pain of repetition is contrasted by, for example, someone leading a sheep onto the stage.

These colliding images vividly illuminates how the individual negotiates personal obsessions and needs within a constantly changing, collapsing or absurd environment. In Bausch’s works we see the use of “systems whose state changes over time. Systems such as these are multifaceted, complex and interdependent. They constantly push and pull at themselves to create the sensuous irregularity and unpredictability that is the signature of our physical environment” (Briggs 1992:15). Briggs’ scientific definition of a dynamical system echoes the signature strokes of Bausch’s oeuvre, also created from sensuous, visceral activities between people in relationships of ‘irregularity and unpredictability’. This tension between individual and environment is provided by an enormous concrete wall tumbling down at the opening of her work *Palermo, Palermo* (Bausch 1990).

Such works illustrate the chaos and complexity intrinsic to living systems, whilst tenderly showing the simple humanity that somehow keeps everything holding together. Paul Cilliers, the author of a core text for my research, *Complexity and Postmodernism*, points to the importance of chaotic activity to healthy living systems, “Equilibrium is another word for death”(1998:6), which Briggs illustrates further, “Heart attacks and epileptic seizures are, scientists think, a form of self-organised chaos which occurs when the heart or brain suddenly becomes too regular” (Briggs 1992:110) and heart attacks so often point towards death. Deathly regularity is antithetical to the jouissance of dance which is made of all bodies, which Katherine Lett illustrates in her article ‘A Case for Chaos Theory in Nursing’; “Strategies such as abandoning false notions of control and acceptance of the uncertainty of the future are proposed as means by which nurses can apply chaos theory to their practice” (Lett 2001:16).

Accepting uncertainty is part of the creative path, and it seems also of the scientific. In tracing parts of my choreographic journey I hope to foreground how successful expansive collaborations with diverse other selves, disciplines and environments evolves new intelligence. Through the prism of phase transitions shifting perspectives feed dialogic enquiry mediated through a complex body that Theodore Schatzki phrases so clearly: “Practice theory’s embrace of embodied understanding is rooted in the realization that the body is the meeting point both of mind and activity and of individual activity and social manifold” (2001:8).

By making interconnections between postmodern dance and the science-sourced theories that unravel the complexity of our universe I hope to point towards

the possibilities of recognising the thinking body's shifting identity as an interconnected part of the continual evolution of Culture and Nature.

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