Digital practices: an Aesthetic and Neuroesthetic approach to Virtuality and Embodiment

In this paper, I offer a description of various performance and art practices which involve interaction with 'new technologies'- such as, motion tracking, artificial intelligence, 3D modeling and animation, robotics, digital paint, interactive sound technology, and biotechnology. My theoretical approach consists of both an aesthetic perspective, a development from my previous liminal theorisation, and a neuroesthetic approach, which relates to the biological processes that inform how we perceive.

According to Heidegger:

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

(1977, 35)

Performance and technology in all its divergent forms is an emergent area of performance practice which reflects a certain being in the world - a Zeitgeist; in short, it provides a reflection of our contemporary world at the beginning of the twenty-first century. In a relatively short period of time there has been an explosion of new technologies that have infiltrated all areas of life and irreversibly altered our lives. Consequences of this technological permeation are both ontological and

epistemological, and not without problems as we see our world change from day to day.

It is my belief that digital practices as experimental artworks and performances both serve as critique and have an *indirect* affect on the social and political, though a redefinition of this term is certainly needed, in as much as they question the very nature of our accepted ideas and belief systems regarding new technologies. In this sense, the digital does what all avant-garde art does it is an experimental extension of the socio-political and cultural of an epoch.

Digital works present innovation in art practices, being at the cutting edge of creative and technological experimentation. It is also my belief that tensions exist within the spaces created by the interface of body and technology and these spaces are 'liminal' in as much as they are located on the 'threshold' of the physical and virtual. I am suggesting that it is within these tension filled spaces that opportunities arise for new experimental forms and practices. As such, I identify certain features that are central to these new practices. Firstly and foremost, the utilization of the latest digital technology is absolutely central since within these various art practices and performances there is an assortment of technologies employed. Another important trait is an accentuation of the corporeal in terms of both performance and perception with its emphasis on intersemiotic modes of signification,[1] a theorization, which can address linguistic but also non-linguistic modes of signification (kinetic, visual, aural, haptic, gravitational, proximic and tactile, and so on) since in much of this performance the body is primary and yet transient.

In my opinion such exemplary features demand a new mode of analysis which foregrounds the inherent tensions between the physical and virtual. These practices in different ways emphasize the body and technology in performance and they explode

the margins between the physical and virtual and what is seen as dominant traditional art practices and innovative technical experimentation. Therefore, my main premise is the exploration and investigation into the physical/virtual interface so prevalent within the digital.

As a development of my previous theorization on liminality (Broadhurst 1999a, 1999b, 2004b), I believe that aesthetic theorization is central to this analysis.[2] However, other approaches are also valid, particularly, those offered by recent research into cognitive neuroscience,[3] particularly in relation to the emergent field of 'neuro-esthetics' where the primary objective is to provide 'an understanding of the biological basis of aesthetic experience' (Zeki 1999, 2).

In digital practices, instrumentation is mutually implicated with the body in an epistemological sense. The body adapts and extends itself through external instruments. To have experience, to get used to an instrument, is to incorporate that instrument into the body. The experience of the corporal schema is not fixed or delimited but extendable to the various tools and technologies which may be embodied. Our bodies are always open to and 'intertwined' with the world. Technology then would imply a reconfiguration of our embodied experience. When the meaning aimed at cannot be reached by the body alone, it builds its own instruments and projects around itself a mediated world. Rather, than being separate from the body, technology becomes part of that body and alters and recreates our experience in the world. Moreover, the body is a system of possible actions since when we point to an object, we refer to that object not as an object represented but as a specific thing towards which we 'project' or propel ourselves (Merleau-Ponty 1962, 138), in fact a 'virtual body' with its phenomenal 'place' defined by task and location (25). This emphasis on a virtual body has resonance with and points to a

deconstruction of the physical/virtual body of digital practices, a body of potential and indeed, infinite creativity.

An example of this 'instrumentation' is magnetic or optical motion capture and has been used widely in performance and art practices for some time now. This involves the application of sensors or markers to the performer or artist's body. The movement of the body is captured and the resulting skeleton has animation applied to it. This data projected image or avatar then becomes some part of a performance or art practice. Motion tracking is used especially in live performances, such as, Merce Cunningham's *Biped* (2000a), where pre-recorded dancing avatars are rear projected onto a translucent screen giving the effect of a direct interface between the physical and virtual bodies**.**

Fig 1: Merce Cunninghan Dance Company performs "Biped" at the Lincoln

Center Festival 1999. Credit: ©Stephanie Berger.

   Also within Troika Ranch's dance theater, captured live or prerecorded images

freeze, fragment, speed up, slow down, or warp in a shimmering effect – all by means

of Isadora software.

Fig 2: Danielle Goldman in *Surfacing* (2004). Photo: Richard Termine

In Stelarc's performances the body is coupled with a variety of instrumental and technological devices that instead of being separate from the body become part of that body. One such performance is *Muscle Machine* (2003), where Stelarc constructed an interactive and operational system in the form of a walking robot. This intertwining of body, technology, and world is important since, in this instance, instead of abandoning the physical body, instrumentation and technology extends it by altering and recreating its embodied experience.

Artificial intelligence is also featured in these technological practices, where the challenge is to demarcate the delimited human body from an artificially intelligent life form, such as, Jeremiah the avatar from *Blue Bloodshot Flowers* (2001) who was developed from surveillance technology.

Fig 3: Elodie Berland and Jeremiah from *Blue Bloodshot Flowers*, 2001. Director: Sue Broadhurst. Technology: Richard Bowden, Image by Terence Tiernan

One of the most interesting aspects of this performance is how much the performer/spectator projects onto the avatar. This is not so surprising since a substantial area of the human brain is devoted to face recognition (Zeman 2002, 216). The ability of humans to recognize facial expressions is so sophisticated that even very slight differences are noticed and made meaningful and that is why faces such as Jeremiahs have such a powerful effect on the spectator.

Moreover, although technology is central to its practices, the digital as a discourse cannot convert phenomena directly but depends on a preceding production of meaning by the non-digital. For instance, Jeremiah emulates the graphic design and animation of a recognisable representation, which is in this case a human head. The

digital, like all formal systems, has no inherent semantics unless one is added. One must add meaning. Thus digitally processed contents require different than ordinary habits of reading – reading digital contents demands thinking in terms of 'indifferent differentiation'. A thinking that makes little distinction between the referent and meaning or for that matter between 'reality' and representation.[4]

In digital practices, virtual bodies that are generated by physical movement through the mediation of digital technology are seen together with live performers. The performances with their interface and interaction between physical and virtual bodies can be seen to displace fixed categories of identity; each carries a 'trace' of the other, given that the virtual performers are the digital reincarnation of the human bodies. However, limits of the embodied self are not fixed since embodied emotional response can also be due to the stimulation of external objects that have been appropriated by the body (Ramachandran and Blakeslee 1999, 61-62). Digital practices, with their use of Mocap (motion capture) and artificially intelligent technologies take this appropriation further since the motions of a performer's body captured technologically featuring avatars, such as, Jeremiah, result in a modified extension of that physical body. The implication being that the embodied self as any other aspect of the conscious self is transitory, indeterminate, and hybridized.

A key influence on Cunningham's embodied practice is television with its effect on our 'modes of perception' (Reynolds 2000, 1). According to Cunningham, *Biped* (2000) was about working with technology and also to do with the notion of television channel surfing, 'flicking through channels on TV' (Kaiser 2004). This motif was evident in the presentation of the performance where 'movement phases are combined and recombined, and scale and pacing are in constant flux' (Scarry 1999).

However, Roger Copeland takes issue with this analogy and believes that television viewing is in its rhythm, a variety of flows that ultimately blur such essential distinctions as those between 'fact and fiction', and 'news and entertainment.' He argues that Cunningham's work does not go with the 'flow', since wholeness and unity together with the blurring of boundaries is rejected and the discreteness of the various elements is maintained (2004, 283-84). However, as Derrida writes, although a 'live' image broadcast on a television channel or screen monitor can never be uncontaminated by its 'censor, frame, filter', knowing or believing that the live or direct is possible is enough to transform 'the field of perception and experience in general' (2002, 40).

In the digital there is a proliferation of performances that utilize electronic sound technology for real-time interaction, such as, MIDI (musical instrument data interface) and Max, a real-time programming environment that has the special advantage of being interactive with visual and network technologies. Established as an agreed universal standard method for sending and receiving musical controller information digitally, the application of the basic MIDI interface has expanded in a variety of ways. It provides a standardized interface for a wide variety of control devices. Its codes have also been adapted to control various nonmusical devices to coordinate with video and graphics. The development of MIDI has had a strong impact on the accessibility and variety of interactions that can be utilized in performance handle music processing in real-time.

However, while computer processing speeds have increased, the MIDI protocol is still restricted to the 7 bit 1980's standard. This restriction of data also means that important musical information; for instance, timbre and pitch are not as accurately defined as is theoretically possible. Similarly, the processing methods used by MIDI

are restrictive for real-time interaction, being particularly weak at handling

continuously changing data.[5] This in turn has led to the proliferation of numerous

highly programmable interactive systems using MIDI inputs that can offer immediate

feedback, Max being the most widely used program for this purpose. It has also led to

the development of OSC (Open Sound Control),[6] which is a protocol that allows the

real-time control of computer-synthesis processes from gestural devices.

MIDI, Max, and OSC are central to the performances of Troika Ranch who fuse

traditional elements of music, dance, and theatre with real-time interactive digital

technology. They are pioneers in their use of MidiDancer and Isadora software, which

can interpret physical movements of performers and as a result that information can

be used to manipulate the accompanying sound, media, and visual imagery in a

variety of ways, thus providing a new creative potential for performance. Likewise,

Palindrome, who focus on the interface and interaction between virtual sound and the

physical body, also utilize such sound technologies. Artistic directors Robert

Weschler and Frieder Weiss have designed and developed interactive software and

hardware, including Eyecon, a camera based motion sensing system. Their

choreography is affected by the live generation of sound through the use of sensors

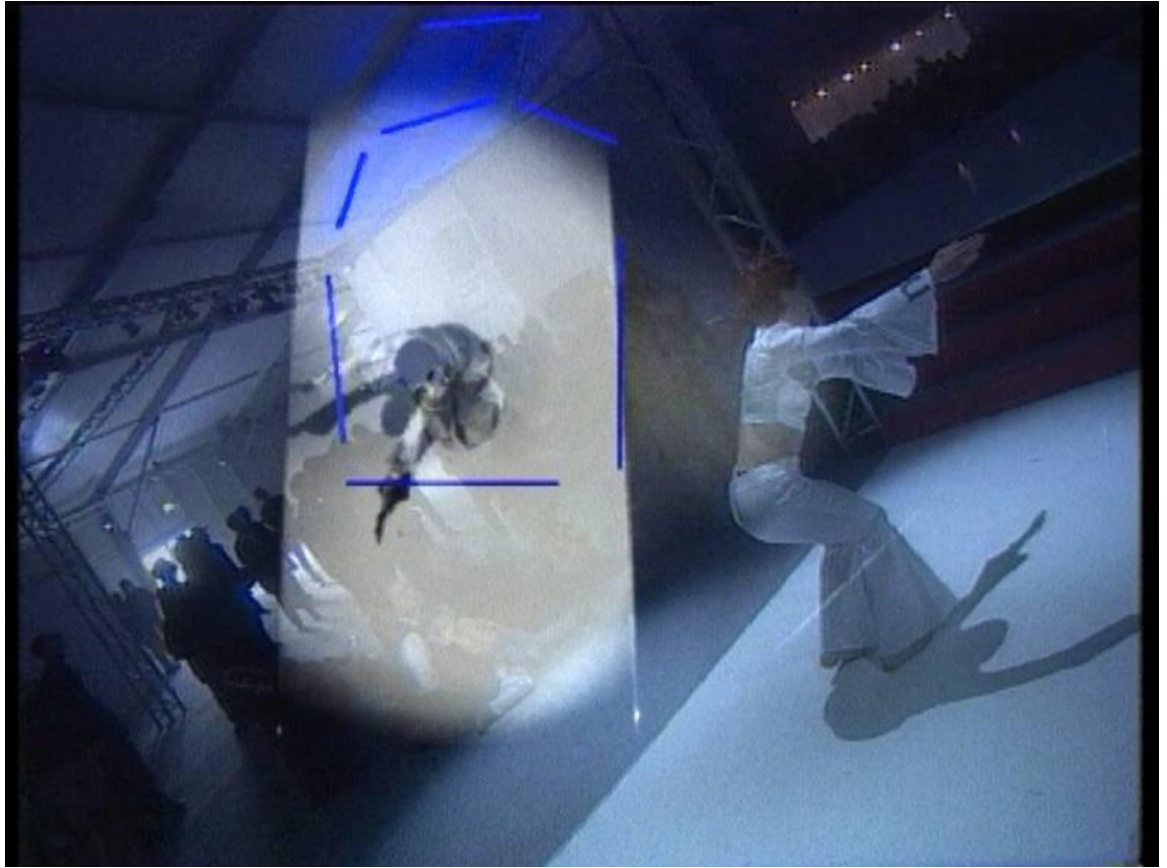and real-time synthesis, and those movements in turn shape the resulting music.

Fig 4: Demonstration of EyeCon System, Palindrome Intermedia Performance
Group (2000), Dancer: Aleksandra Janeva. Photo: Jürgen Henkel.

A variant use of EyeCon has involved Palindrome's 'shadow' performances,
where using an infrared light source and infrared-sensitive camera, a performer's
shadow is projected in different colors, with various amounts of time delay, position,
and orientation shifts.

Fig 5: *"Solo4>Three"* (2003). Dance and Choreography: Emily Fernandez.
Interactive video system: Frieder Weiss. Photo credit: Ralf Denke

When looking at objects in performance, color is perceived before form that in turn is perceived before motion (Zeki 1999, 66).The consequence of this is that the brain over very short periods of time is unable to combine what happens in real time; instead, it unifies the results of its own processing systems though not in real time. Nevertheless all visual attributes are combined to provide us with an integrated experience. Palindrome's shadows performances, as a result of their multilayered, distorted, and delayed effects, challenge this 'integrated experience', at the same time they ensure the audience's active participation in the production of meaning. The

shadows shift seamlessly between what is '*known*' and what is '*surprising*' making 'the piece fascinating to watch' (Dowling, Wechsler, and Weiss, 2004, 5).

Prominent aesthetic features within the digital are heterogeneity, indeterminacy, fragmentation, hybridization, and repetition. Due to the hybridization of these practices and the diversity of media employed, various intensities are at play. It is these imperceptible intensities, together with their ontological status that give rise to new modes of perception and consciousness. Central to becoming and making new connections is the body without organs or BwO. It is 'the field of immanence of desire' (Deleuze and Guattari 1999, 191) and an 'intense and intensive body' (Deleuze 2003, 44). Desiring machines and the body without organs can be seen as two sides of the same coin, or 'two states of the same 'thing', a functioning multiplicity one moment, a pure, unextended zero-intensity the next' (Bogue 1989, 93). For instance, in Troika Ranch's performances, the ebb and flow between the organic and electronic is in a continual process of becoming and making new connections.

Within digital practices, 'defamiliarizing' devices are also employed such as, the juxtaposition of disparate elements that in creating a distancing effect, causes the audience to actively participate in the activity of producing meaning. The employment of wide, jarring metaphors is another central characteristic of the digital. The colorful and figurative use of aural and visual imagery and the juxtaposition of metaphors evoke surreal dreamscapes. The interaction of the physical and virtual also creates inclusive, jarring metaphors. This mixture produces an aesthetic effect caused by the interplay of various mental sense-impressions, which unsettle the audience by frustrating their expectations of any simple interpretation and in turn produce a new type of synesthetic effect that is analogous to the experience caused by cross-wiring

or cross-activation of discrete areas of the brain in certain perceptual conditions (Ramachandran and Hubbard 2001, 9).

Recent studies have suggested links between synesthesia and creativity. An important effect is that it improves memory and recall. According to Ramachandran, 'synesthesia is more common among artists, poets, and novelists than the general population' (Ramachandran 2004). However for Jamie Ward, synesthesia may affect us all to a certain extent since 'beneath the surface we all have mechanisms that link together sound and vision, and the mechanisms seem to be pretty much the same in both synesthetes and other members of the population' (Ward 2004).

Troika Ranch's *The Future of Memory* (2003) explores memory and the act of remembering - 'how memories are created, stored, romanticized, repressed and lost' - by means of a multi-layered collage of imagery and sound; the technology acting as a 'metaphor for memory' itself (Coniglio and Stoppiello 2005).

Fig 6: The Company in *Future of Memory* (2003). Photo: Richard Termine

Whilst in *16 [R]evolutions* (2005), the body literally writes itself:

Fig 7: Traces of the performer's hands and feet leave multiple curved white traces, a development of the white line seen earlier in *16 [R]evolutions* (2005), Performer: Lucia Tong – Photo: Richard Termine.

Metaphor has been identified with the Freudian notion of 'condensation' and metonymy with 'displacement' (Lyotard 1989). However, for Jean-François Lyotard, there is a certain futility in bring everything back to the linguistic 'as the model for all semiology', when it is 'clear that language, at least in its poetic usage, is possessed … by the figure' (30). The figural, is not the figuration of representational art but is instead that of creativity and elusiveness, and it is important since it mirrors many digital practices, placing the performance within the context of a libidinal economy.

Paradoxically, films that use a plethora of visual and aural imagery, such as, *The Matrix* trilogy (Wachowski and Wachowski 1999, 2003a, 2003b) and *Star Wars* prequels (Lucas 1999, 2002, 2005) fetishize technology while at the same time treating technology as the enemy. For example, within *The Matrix* films, the city of Zion, together with the post-apocalyptic earth landscape, is created with the aid of virtual cinematography and computer imagery, whilst the supposedly simulated world of the matrix, set in 1999, is far less dependent on technology and special effects for its representation. An important technical effect created for *The Matrix* (1999) was 'Bullet time' or 'Flo-Mo' that has the ability to capture both super-slow and high speed motions at the same time on film. Likewise, in the *Star Wars* films, technology is associated with the Empire whose machinic world is bereft of vegetation and whose spaceships are enormously destructive. In contrast, the rebels are associated with the forest, the colour green, and with the organic 'force' that defeats the machines. Blue and green screen technologies were widely used in all the *Star Wars* prequels. The compositing process, whether photographic or electronic, replaces all the blue or green in a picture with another image. However, actors, in particular, have problems with this technology since on many occasions they are required to act solely to and in front of a blank screen. This is especially true for *Episode 11l: Revenge of the Sith* (2005), where many of the characters and environments were computer generated.

In both the *Star Wars* prequels and sequels, George Lucas, heavily influenced by Joseph Campbell, has admitted to using the 'force' as a representation of God, and the 'dark side' as a metaphor for evil that exists within all humans. However, for Deleuze, orthodox tools of philosophy such as dualisms are replaced by the concepts of planes, becoming, intensities, flows, and connections. Rigid binary oppositions, such as the above, are avoided in favor of a 'continuum of interacting embodied

subjectivities', and 'machinic assemblage of bodies, of actions and passions' (Deleuze and Guattari 1999, 88), notions that prove useful in theorizing the *Star Wars* films with their blurring of the borders in actuality between good and evil, and between light and dark.

Other forms of digital practices are those that incorporate biotechnology within their creative experimentation. Such art works are commonly referred to as 'Bioart'. The Tissue, Culture and Arts Project are such a group, Oron Catts and Ionat Zurr, whose tissue engineering exploration, exemplified by Stelarc's *Extra Ear* (2004), is integral to their art installations, resulting in works of varying geometrical complexity thereby creating a living 'artistic palette'.

Fig 8: *Extra Ear – ¼ Scale* (2003) - The Tissue Culture & Art (Oron Catts & Ionat Zurr) in collaboration with Stelarc (Biodegradable polymer and human chondrocytes cells, 3cm x 1.5cm x 1.5cm). Photo by Ionat Zurr

There are of course many ethical concerns related to this particular form of digital practices. However, the practitioners themselves believe their work draws

attention to practices that already occur within science laboratories and which are usually hidden from the public

Critical Art Ensemble (CAE.), through their 'recombinant theatre', have made technology, wetware, and transgenics, the focus of their work.

Fig 9: *GenTerra* (2001-3), a transgenic performance/exhibition from Critical Art Ensemble. *Genterra* technician in dialogue with participants about issues regarding transgenic production and distribution

Their recent performance *Free Range Grain* (2004) has added another unplanned dimension to their intention of creating a 'theatre of everyday life', in as much as they have found themselves in the midst of an aggressive investigation launched under the United States' bioterrorism laws when seemingly suspicious materials were found during a search. Although it was soon realized that the sequestered materials were harmless, charges were still brought. It remains unclear

what charges if any will ultimately be laid as a result of a certain State implemented

paranoia. However, what is certain in this instance is that CAE have blurred the

distinction between performance and everyday life and in keeping with all their

projects have also endeavoured to open up dubious government practices to public

scrutiny.

Another bioartist is Marta de Menezes. For her project *Nature?* (1999), she

reprogrammed patterns on butterfly wings by injecting the pupa in development.

These pattern transformations relate only to the phenotype and not genotype and

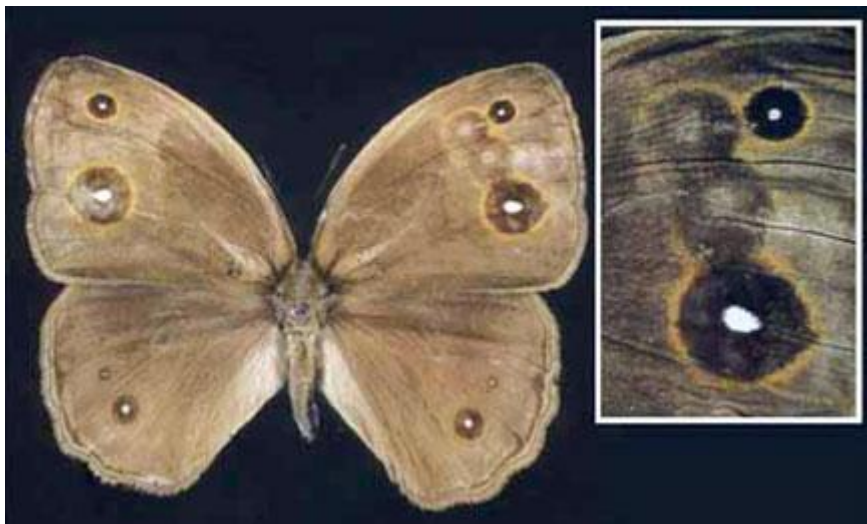disappear at the end of the life cycle.

Fig 10: Marta de Menezes, *Nature?,* 2000. Live *Bicyclus Anynana* butterfly

with modified wing pattern. Part of Genes and Genius: The Inheritance of

Gregor Mendel, The Mendel Museum, 2005 (© Marta de Menezes)

She has also applied various colors to elementary parts of brain cells and

through projections in 3D has created live sculptures. Her work *Functional Portraits*

(2002) employs functional magnetic resonance (fMRI), which visualizes in real time

the operation of the brain. In so doing de Menezes attempts to demonstrate the

'neuronal correlate of consciousness', which generally refers to the correlation between neuronal activity and the sensation, thought, or action that relates to that mental activity (Crick 1994, 208).

Artworks such as De Menezes' can also be seen as critical deconstructive practices since 'metaphysical complicity' cannot be given up without also giving up the critique of the complicity that is being argued against (Derrida, 1978, 281). These performances whilst apparently complicit with dominant means of digital representation, attempt at the same time to destabilize those dominant structures by focusing on areas of concern relating to the commodification and consumerism of such technology.

Finally, for Philip Auslander 'technology cannot take the place of human presence at the heart of performance … it is best used to extend the capabilities of human performers, to express humanistic themes more fully, and to allow performance to explore or evoke responses from realms of human physical and psychological experience not directly accessible otherwise' (Auslander 2006, 299). Thus, although much interest is directed toward new technologies, it is my belief that technology's most important contribution to art is the enhancement and reconfiguration of an aesthetic creative potential that consists of interacting with and reacting to a physical body not an abandonment of that body. For, it is within these tension filled (liminal) spaces of physical and virtual interface that opportunities arise for new experimental forms and practice.

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[1] A significatory practice which involves such non-linguistic modes as those provided by the semiotics of corporeal gesture. See (Broadhurst 1999a, 1999b, 2002, 2004a, 2004b).

[2] Liminality, from *limen* (Latin: literally threshold) is a term most notably linked to Victor Turner who writes of a no-man's-land betwixt-and-between, a site of a 'fructile chaos ... a storehouse of possibilities, not by any means a random assemblage but a striving after new forms (Turner 1990, 11-12). My own use of the term includes

certain aesthetic features described by Turner, but emphasizes the corporeal, technological, and chthonic (Greek: back to the earth) or primordial Other quintessential features are heterogeneity, the experimental, and the marginalized. Therefore, *liminal* performance can be described as being located at the edge of what is possible (Broadhurst 1999a, 12).

[3] 'The term alone suggests a field of study that is pregnant and full of promise. It is a large field of study uniting concepts and techniques from many disciplines … At the heart of cognitive neuroscience … lies the fundamental question of knowledge and its representation by the brain … Cognitive neuroscience is thus a science of information processing … one can identify key experimental questions … How is information acquired (sensation), interpreted to confer meaning (perception and recognition), stored or modified (learning and memory) … and to communicate (language)?' (Albrecht and Neville 2001, li).

[4] For a more detailed discussion of the concepts of 'differentiation' and 'de differentiation', see Scott Lash (1990, 5-15). See also Broadhurst (1999a, 177).

[5] For a more detailed account of MIDI technology see Rossing, Moore, and Wheeler (2002, 677-79)

[6] Open Sound Control was created by the Center for New Media and Audio Technologies (CNMAT) at the University of California, Berkeley in the 1990s.

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director: Rob Coleman, digital matte sequence supervisors: Jonathan Harb, Paul

Huston, and Yusei Uesugi, Pre-Visualization/Effects Supervisors: Daniel D. Gregoire

and David Dozoretz, music: John Williams, costume designer Trisha Biggar. Special

visual effects and animation by Industrial, Light & Magic. LucasFilm Ltd – Twentieth

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George Lucas, produced by Rick McCallum, visual effects supervisors: John Knoll

and Roger Guyet, animation director: Rob Coleman, digital matte sequence

supervisor: Jonathan Harb, Pre-Visualization/Effects Supervisor: Daniel D. Gregoire, music: John Williams, costume designer Trisha Biggar. Special visual effects and animation by Industrial, Light & Magic. LucasFilm Ltd – Twentieth Century Fox.

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