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Dancing the digital age: a survey of the new technologies in the choreographic process

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Abstract

This article considers fifty-eight selected dance works created during the time period of 2000-2018. In doing so the work of renown artists Wayne McGregor, Garry Stewart, Dawn Stopiello and Bill T. Jones have been used as case studies to highlight how the eminence of these choreographers has engaged dance as a meeting point and merging point for humanity and 'New technology'. The article reviews the impact of new technologies as an essential tool in the creative processes of dance and exploration of the moving-body. Innovative technologies in the 21st Century have offered choreographers new capacities for the creation of movement. These explorations into the performance space advance insights into broader questions of the human body at the intersection of arts and science. The choreographers' exploration of the dancing form cultivates questions about how the human body extends, begins, ends and is present. As the digital age proposes new ways to (re) imagine the communication and impact of the human body we suggest these artistic collaborations also offer insights into commonalities and places of exchange across notions of art versus science. These choreographers inter-disciplinary artistic endeavors, into how the moving body transacts and is harnessed as a mode of expression reveal deeper possibilities of the ontology of the lived-experience.

Keywords: Choreography, Collaboration, Dance, Digital Age, New Technology, Place

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The question of where the human body ends and begins is renegotiated through the interplay of choreographic work engaging with new technology. Dance movement comes from an intension or expression that creates corporeal repercussions in the physicality of the dancer. However, dance also goes beyond the dancer's skin, engaging with the assemblage that is the dance costume, stage, video, code, projection even engaging with the body of the computer operator or lighting technician. Performers move the spaces, lighting, and aesthetic of the performance as much as they move the muscle and bone of their physical body. As choreographers engage with the creative process, new technology connects us in barely explored ways across geographic and temporal plains only imagined as traversable a few years ago. During these kinds of collaborations between choreographer and technologists the performer exemplifies the provocative concept of the *Body Without Organ* (Deleuze & Guattari, 1983, 1987) originally introduced in the fields of philosopher (Gilles Deleuze) and psychoanalyst (Félix Guattari) (Buchanan, 2010). Dance moves within, through, and beyond the skin of the dancer as the form creates shapes, rhythms, and relationships. Following the 20th Century pioneering work of artists such as eminent choreographers Merce Cunningham (Brown, 2007; Cunningham et al., 1998) and William Forsythe (Respini et al., 2018), the 21st Century technology and the internet bring further opportunity for choreographers to explore how, where, and when dance can happen.

The mechanisms of how the moving body responds to change and is harnessed as a mode of expression to reveal deeper understanding of the ontology of the lived-experience is the muse of both the artist and the scientist (Root-Bernstein, 1989). Although the intersection of art and science, that is the dancing body, have been long interwoven in Western philosophy, new technologies in sciences currently offer artists an absorbing scientific and technological creative playfulness (Wilson, 2010). The notion of *creativity* has been interwoven across artistic and scientific endeavors but the word itself has not existed

in English until quite recently (Runco & Jaeger, 2012). In dance, our understanding of creativity as maker-making is challenged and progressed by the digital age. Part of the revolution in the choreographic process that new technologies offer is the relationship performers have with audience. The experience of and literacy in new technologies that audiences bring to dance performances offers new collaborations and intersections between art, artist and onlooker. The role of audience is no-longer static. The audience becomes a part of the immediate creation of the art work in front of them. Audiences can be physically thousands of miles away or spread apart and yet through new technology, be connected in the moment of the dance 'happening'. The choreographer has the ability to draw in or reference experiences, knowledges, and objects of our unconscious personal and collective everyday through interactions with images, actions, and sounds of personalized social media or personal technological devices. Thus, the dance performance is at once public and yet private. Throughout the last three decades, dance practices have witnessed a great acceleration through technological progress. This article reflects on how new technologies have been used in the work of four choreographers to pursue creative goals in 21st Century Professional Dance (Corazza 2016, pp. 263). In doing this, an initial effort has been made to map the lexis of ideas that the partnership of choreography and technologist can navigate.

Manifestations of New technologies in contemporary choreography

It would not be possible to survey across the many communities of dancers working on a global level. Choreographers working in USA, UK, and Australia were sampled. Therefore, these are the dance-cultural landscapes and sociocultural environments that are present in the research. To overview the field of dance's engagement with new technology across these locations, four case studies have been taken: Wayne

McGregor in the United Kingdom, Dawn Stapiello and Bill T. Jones in the United States, and Garry Stewart in Australia. To analyze/explore the choreographers' employ of technology in dance creations we began by determining typologies. Thirteen categories of new technologies (see Table 1) were identified. Reflecting on the traditional expectation of the dance emanating from the dancers' body the thirteen categories in Table 1 were ordered as they extend the skin of the dancer's human body. That is costumes primarily being close to the tactile act of the body moving, while projection, for instance, has the possibility of being thousands of miles away from the physical body of the dancer it is interacting with. Of course, what is exciting about the possibilities of choreographing with new technologies is how this partnership can disrupt and challenge the limits of human activity, and dance happens beyond the dancer's body.

Table 1

Classification of New Technologies used in the selected choreographies

Relationship with the Body	New Technology		Description	Examples of choreographies where it had been used
Nearby	CD	Costume Design	The creation and integration of lights into the piece to develop further its atmosphere. It has been used in the majority of the works to enhance certain aspects of the dancer's body for a better development of the choreography	The majority of the choreographies by Bill T. Jones such as *Black Suzanne* (Jones, 2002), as well as in *Dyad 1909* (McGregor, 2009) & MOVEment (McGregor, 2015)
	ME	Mechanical Extensions	The artificial tools and artefacts designed to increase the adaptation of our specie to the environment that surround us. It has been used in Nemesis to enhance the choreographic vocabulary of the dancer´s limbs.	Nemesis (McGregor, 2001)
Median	LD	Lighting Design	The creation and integration of lights into the piece to develop further its atmosphere. It has been used in all works to enhance certain choreographic aspects	It has been used in all the choreographies analysed such as *Tree of Codes* (McGregor, 2015) *Multiverse* (Stewart, 2014), *Loopdiver* (Stopiello, 2009) & *Chapel/Chapter* (Jones, 2006)
	VD	Video Design	The creation and integration of film and motion graphics into the piece. It has been used in the majority of the works to enhance certain choreographic aspects	The majority of the choreographies such as *Tree of Codes* (McGregor, 2015) *Multiverse* (Stewart, 2014), *Loopdiver* (Stopiello, 2009) & *Chapel/Chapter* (Jones, 2006)
	SoD	Sound Design	The creation and integration of sounds into the piece It has been used in the several Jones´s works such as *A Quarreling Pair* as a complement to music	*A Quarreling Pair* (Jones, 2007)

Relationship with the Body (Continued)	New Technology		Description	Examples of choreographies where it had been used
Distant	SD	Set Design	The creation of the theatrical scenery to support the artistic goals of the production. It has been used in the majority of the work as an essential element of it and even as part of the choreography as well	The majority of the choreographies such as *Tree of Codes* (McGregor, 2015) *Multiverse* (Stewart, 2014), *Loopdiver* (Stopiello, 2009) & *Chapel/Chapter* (Jones, 2006)
	3D-MS	3D Moving Set	A three dimensional set design that has been created to move in certain pre-established parts of the stage. It has been used in *Entity* both as part of the set and the choreography as well, since the dancers interact with them throughout the work	*Entity* (McGregor, 2008)
Distant	Rob	Robotics	The technologies that are used to develop machines that can substitute for humans and replicate human actions. It has been used in *Devolution* to perform certain choreographic aspects that could not be performed by the dancers themselves	*Devolution* (Stewart, 2006)
	3D-CTI	3D Creative Informatic Tool	A computer program designed to develop and create three dimensional products, following some pre-established guidelines. It has been used in *Atomos* as a source of inspiration for the creation of the movement by the dancers	*Atomos* (McGregor, 2013)
	3D-G	3D Graphics	Graphics that use a three dimensional representation of geometric data to perform calculations and to render 2D images. It has been used in *Multiverse* both as part of the set and the choreography as well, since the dancers interact with them throughout the work	*Multiverse* (Stewart, 2014)
	LI	Light Installation	An applied art form in which light is the main medium of expression in which a sculpture produces light or vice versa. It has been used in *Future Self* as an essential element of this work, in fact as another performer more	*Future Self* (McGregor, 2012)
	AI	Art Installation	An artistic genre of three dimensional works that often are site-specific and designed to transform the perception of a space. It has been used in *Azimuth* as an essential element of this work, in fact as another performer more	*Azimuth* (McGregor, 2013)
	MI	Multimedia Installation	A variant of an Art Installation that uses the multimedia technologies as its main medium of expression. It will be used in *Swarn* as an essential element of this work, in fact as another performer more	*Swarn* (Under development) (Stopiello, 2018)

The intension of movement, its repercussions and its effect all inhabit the physical body of the dancers, but also create, change, and respond to the aesthetic, temporality, exhibit, and position of the performance. The muscle and bone of the physical dancing body and the code, or mechanics of the technology bring opportunity for choreographers to explore how, where and when dance can happen. For instance, costume design (CD) has been used remarkably by Bill T. Jones in fourteen choreographies to enhance certain aspects of the dancer's body, whilst mechanical extensions (ME) have been used by Wayne McGregor in *Nemesis* (2001) as an augmentation of the choreographic vocabulary of the dancers' limbs. In contrast, the more 'distant' from the physical body, new technologies such as robotics (Rob), 3D graphics (3D-G) create installations that become environments for dance to happen, such as the ones in *Devolution* (2006) and *The Beginning of Nature* (2018) by Garry Stewart. An attempt was made to quantify the frequency and variety of the new technologies to have an idea of the impact of technological advances over the two past decades. Fifty-eight choreographies were analyzed: twenty made by Wayne McGregor, ten by Garry Stewart, eight by Dawn Stopiello, and twenty by Bill T. Jones (see Table 2).

Table 2

Dance creations made in the XXI century included in the analysis

Abbreviation	Title	Choreographer	Company	City & Country	Year
Stopiello (Rosenkruetz)	*The chemical wedding of Christian Rosenkruetz*	Dawn Stopiello	Troika Ranch	Lincoln (USA)	2000
Stopiello (DEVO)	*SUITE DEVO*	Dawn Stopiello	Troika Ranch	New York (USA)	2001
Stopiello (Rien)	*Reine Rien*	Dawn Stopiello	Troika Ranch	New York (USA)	2001
Stopiello (Memory)	*Future of Memory*	Dawn Stopiello	Troika Ranch	New York (USA)	2003
Stopiello (Surfacing)	*Surfacing*	Dawn Stopiello	Troika Ranch	New York (USA)	2004
Stopiello ([R]evolutions)	*16 [R]evolutions*	Dawn Stopiello	Troika Ranch	New York (USA)	2006
Stopiello (Loopdiver)	*Loopdiver*	Dawn Stopiello	Troika Ranch	Lincoln (USA)	2009
Stopiello (Swarm)	*Swarm (Under development)*	Dawn Stopiello	Troika Ranch	-	2018
Stewart (Birdbrain)	*Birdbrain*	Garry Stewart	Australian Dance Theatre	Adelaide (Australia)	2000
Stewart (Unbeauty)	*The Age of Unbeauty*	Garry Stewart	Australian Dance Theatre	Adelaide (Australia)	2002
Stewart (HELD)	*HELD*	Garry Stewart	Australian Dance Theatre	Adelaide (Australia)	2004
Stewart (Nascent)	*Nascent*	Garry Stewart	Australian Dance Theatre	Adelaide (Australia)	2005

Abbreviation (Continued)	Title	Choreographer	Company	City & Country	Year
Stewart (Birdbrain)	*Devolution*	Garry Stewart	Australian Dance Theatre	Adelaide (Australia)	2006
Stewart (Devolution)	*Worldhood*	Garry Stewart	Australian Dance Theatre	Adelaide (Australia)	2011
Stewart (Self)	*Be Your Self*	Garry Stewart	Australian Dance Theatre	Adelaide (Australia)	2013
Stewart (Proximity)	*Proximity*	Garry Stewart	Australian Dance Theatre	Adelaide (Australia)	2013
Stewart (Multiverse)	*Multiverse*	Garry Stewart	Australian Dance Theatre	Adelaide (Australia)	2014
Stewart (Nature)	*The Beginning of Nature*	Garry Stewart	Australian Dance Theatre	Adelaide (Australia)	2018
McGregor (Aeon)	*Aeon*	Wayne McGregor	Studio Wayne McGregor	London (UK)	2000
McGregor (Nemesis)	*Nemesis*	Wayne McGregor	Studio Wayne McGregor	London (UK)	2001
McGregor (Sequences)	*Polar Sequences*	Wayne McGregor	Studio Wayne McGregor	London (UK)	2003
McGregor (AtaXia)	*AtaXia*	Wayne McGregor	Studio Wayne McGregor	London (UK)	2004
McGregor (Amu)	*Amu*	Wayne McGregor	Studio Wayne McGregor	London (UK)	2005
McGregor (Erazor)	*Erazor*	Wayne McGregor	Studio Wayne McGregor	London (UK)	2006
McGregor (Entity)	*Entity*	Wayne McGregor	Studio Wayne McGregor	London (UK)	2008
McGregor (1909)	*Dyad 1909*	Wayne McGregor	Studio Wayne McGregor	London (UK)	2009
McGregor (FAR)	*FAR*	Wayne McGregor	Studio Wayne McGregor	London (UK)	2010
McGregor (UNDANCE)	*UNDANCE*	Wayne McGregor	Studio Wayne McGregor	London (UK)	2011
McGregor (Self)	*Future Self*	Wayne McGregor	Studio Wayne McGregor	Berlin (Germany)	2012
McGregor (Room)	*Rain Room*	Wayne McGregor	Studio Wayne McGregor	London (UK)	2012
McGregor (Azimtuh)	*Azimuth*	Wayne McGregor	Studio Wayne McGregor	London (UK)	2013
McGregor (Atomos)	*Atomos*	Wayne McGregor	Studio Wayne McGregor	London (UK)	2013
McGregor (MOVEment)	*MOVEment*	Wayne McGregor	Studio Wayne McGregor	London (UK)	2015

Abbreviation (Continued)	Title	Choreographer	Company	City & Country	Year
McGregor (Codes)	*Tree of Codes*	Wayne McGregor	Studio Wayne McGregor	London (UK)	2015
McGregor (Autobiography)	*Autobiography*	Wayne McGregor	Studio Wayne McGregor	London (UK)	2017
McGregor (Collection)	*In Residence: Zabludowicz Collection*	Wayne McGregor	Studio Wayne McGregor	London (UK)	2017
McGregor (Case)	*Winged Bull in the Elephant Case*	Wayne McGregor	Studio Wayne McGregor	London (UK)	2018
McGregor (Forms)	*Bach Forrms*	Wayne McGregor	Studio Wayne McGregor	London (UK)	2018
Jones (Project)	*The Table Project*	Bill T. Jones	Bill T. Jones Arnie Zane Dance Company	Minneapolis (USA)	2001
Jones (Power/Full)	*Power/Full*	Bill T. Jones	Bill T. Jones Arnie Zane Dance Company	Ravenna (Italy)	2002
Jones (Were)	*There Were…*	Bill T. Jones	Bill T. Jones Arnie Zane Dance Company	-	2002
Jones (Kurtag)	*World II (18 Movements to Kurtag)*	Bill T. Jones	Bill T. Jones Arnie Zane Dance Company	Lee (USA)	2002
Jones (Suzanne)	*Black Suzanne*	Bill T. Jones	Bill T. Jones Arnie Zane Dance Company	Iowa (USA)	2002
Jones (WITHOUT/IN)	*WORLD WITHOUT/IN*	Bill T. Jones	Bill T. Jones Arnie Zane Dance Company	Iowa (USA)	2002
Jones (Verbum)	*Verbum*	Bill T. Jones	Bill T. Jones Arnie Zane Dance Company	Iowa (USA)	2002
Jones (Circle)	*Mercy 10x8 on a Circle*	Bill T. Jones	Bill T. Jones Arnie Zane Dance Company	New York City (USA)	2003
Jones (Evening)	*Another Evening*	Bill T. Jones	Bill T. Jones Arnie Zane Dance Company	New York City (USA)	2003
Jones (Saying)	*As I Was Saying*	Bill T. Jones	Bill T. Jones Arnie Zane Dance Company	Minneapolis (USA)	2005
Jones (Date)	*Blind Date*	Bill T. Jones	Bill T. Jones Arnie Zane Dance Company	New York City (USA)	2005
Jones (Down)	*Another Evening: I Bow Down*	Bill T. Jones	Bill T. Jones Arnie Zane Dance Company	New York City (USA)	2006
Jones (Chapel/Chapter)	*Chapel/Chapter*	Bill T. Jones	Bill T. Jones Arnie Zane Dance Company	New York City (USA)	2006
Jones (Pair)	*A Quarreling Pair*	Bill T. Jones	Bill T. Jones Arnie Zane Dance Company	Montclair (USA)	2007
Jones (Migrations)	*100 Migrations*	Bill T. Jones	Bill T. Jones Arnie Zane Dance Company	Virginia (USA)	2008

Abbreviation (Continued)	Title	Choreographer	Company	City & Country	Year
Jones (Proposition)	*Serenade/The Proposition*	Bill T. Jones	Bill T. Jones Arnie Zane Dance Company	Durham (USA)	2008
Jones (Pray)	*Fondly Do We Hope… Fervently Do We Pray*	Bill T. Jones	Bill T. Jones Arnie Zane Dance Company	Highland Parks (USA)	2009
Jones (Venice/Arsenale)	*Another Evening: Venice/Arsenale*	Bill T. Jones	Bill T. Jones Arnie Zane Dance Company	Venice (Italy)	2010
Jones (Story/Time)	*Story/Time*	Bill T. Jones	Bill T. Jones Arnie Zane Dance Company	Montclair (USA)	2014
Jones (Nephew)	*A Letter to my Nephew*	Bill T. Jones	Bill T. Jones Arnie Zane Dance Company	New York City (USA)	2017

The focus was on works these choreographers made for their own companies. The study period was from 2000 to 2018, during this period all four choreographers also guest composed works for international companies beyond their own. Therefore, this survey of fifty-eight works is possibly representative of creative processes engaged with by professional dance companies more generally during this period. Video documentation was used, photographs of performances, and reviews of the four choreographers web-sites. The survey scheme was revised a few times to obtain empirical data as detailed as possible. (Table 3 compiles the new technologies used within each choreography. While Table 4 overviews use of new technologies by year.)

Table 3

Survey of the new technologies used in the analyzed dance creations made in the XXI century among the cases of study. Abbreviations according to Table 2, the order follows the new technologies from most to least used

Choreography	LD	SD	VD	CD	SoD	Rob	ME	3D-MS	3D-CIT	3D-G	LI	AI	MI	Total
Stopiello (Rosenkruetz)	X		X											2
Stopiello (DEVO)	X		X											2
Stopiello (Rien)	X		X											2
Stopiello (Memory)	X	X	X											3
Stopiello (Surfacing)	X	X	X											3
Stopiello ([R]evolutions)	X	X	X											3
Stopiello (Loopdiver)	X	X	X											3
Stopiello (Swarm)	X	X	X										X	4
Dawn Stopiello	8	5	8	0	0	0	0	0	0	0	0	0	1	
Stewart (Birdbrain)	X		X											2
Stewart (Unbeauty)	X	X	X											3

Choreography (Continued)	LD	SD	VD	CD	SoD	Rob	ME	3D-MS	3D-CIT	3D-G	LI	AI	MI	Total
Stewart (HELD)	X		X					X						3
Stewart (Nascent)	X		X											2
Stewart (Birdbrain)	X	X				X								3
Stewart (Devolution)	X	X	X											3
Stewart (Self)	X	X												2
Stewart Proximity)	X	X	X											3
Stewart (Multiverse)	X	X	X							X				4
Stewart (Nature)	X													1
Garry Stewart	10	6	7	0	0	1	0	1	0	1	0	0	0	
McGregor (Aeon)	X		X											2
McGregor (Nemesis)	X		X				X							3
McGregor (Sequences)	X	X												2
McGregor (AtaXia)	X	X												2
McGregor (Amu)	X													1
McGregor (Erazor)	X	X	X											3
McGregor (Entity)	X		X					X						3
McGregor (1909)	X		X	X										3
McGregor (FAR)	X	X												2
McGregor (UN-DANCE)	X		X											2
McGregor (Self)	X	X									X			3
McGregor (Room)	X											X		2
McGregor (Azimtuh)	X	X										X		3
McGregor (Atomos)	X	X							X					3
McGregor (MOVEment)	X			X										2
McGregor (Codes)	X	X	X											3
McGregor (Autobiography)	X		X											2
McGregor (Collection)	X	X												2
McGregor (Case)	X		X											2

Choreography (Continued)	LD	SD	VD	CD	SoD	Rob	ME	3D-MS	3D-CIT	3D-G	LI	AI	MI	Total
McGregor (Forms)	X	X		X										3
Wayne Mcgregor	20	10	9	3	0	0	1	1	1	0	1	2	0	
Jones (Project)	X	X												2
Jones (Power/Full)	X													1
Jones (Were)	X	X		X										3
Jones (Kurtag)	X			X										2
Jones (Suzanne)	X	X		X										3
Jones (WITHOUT/IN)	X	X		X										3
Jones (Verbum)	X	X		X										3
Jones (Circle)	X			X										2
Jones (Evening)	X													1
Jones (Saying)	X	X		X										3
Jones (Date)	X	X	X	X										4
Jones (Down)	X	X		X										3
Jones (Chapel/Chapter)	X	X	X											3
Jones (Pair)	X	X	X	X	X									5
Jones (Migrations)	X	X			X									3
Jones (Proposition)	X	X	X	X	X									5
Jones (Pray)	X		X	X	X									4
Jones (Venice/Arsenale)	X	X		X	X									4
Jones (Story/Time)	X	X		X										3
Jones (Nephew)	X		X											2
Bill T. Jones	20	14	6	14	5	0	0	0	0	0	0	0	0	

Table 4

Survey of the new technologies used in the analyzed dance creations made in the XXI century over the study period of time. The order follows the new technologies from most to least used

Year	LD	SD	VD	CD	SoD	Rob	ME	3D-MS	3D-CIT	3D-G	LI	AI	MI	Total
2000	3	0	3	0	0	0	0	0	0	0	0	0	0	6
2001	4	1	3	0	0	0	1	0	0	0	0	0	0	9

Chore-ography (Contin-ued)	LD	SD	VD	CD	SoD	Rob	ME	3D-MS	3D-CIT	3D-G	LI	AI	MI	Total
2002	7	5	1	5	0	0	0	0	0	0	0	0	0	18
2003	4	2	1	1	0	0	0	0	0	0	0	0	0	8
2004	3	2	2	0	0	0	0	1	0	0	0	0	0	8
2005	4	2	2	2	0	0	0	0	0	0	0	0	0	10
2006	5	5	3	1	0	1	0	0	0	0	0	0	0	15
2007	1	1	1	1	1	0	0	0	0	0	0	0	0	5
2008	3	2	2	1	2	0	0	1	0	0	0	0	0	11
2009	3	1	3	2	1	0	0	0	0	0	0	0	0	10
2010	2	2	0	1	1	0	0	0	0	0	0	0	0	6
2011	2	1	2	0	0	0	0	0	0	0	0	0	0	5
2012	2	1	0	0	0	0	0	0	0	0	1	1	0	5
2013	4	4	1	0	0	0	0	0	1	0	0	1	0	11
2014	2	2	1	1	0	0	0	0	0	1	0	0	0	7
2015	2	1	1	1	0	0	0	0	0	0	0	0	0	5
2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	3	1	2	0	0	0	0	0	0	0	0	0	0	6
2018	4	2	2	1	0	0	0	0	0	0	0	0	1	10
Total	58	35	30	16	5	1	1	2	1	1	1	2	1	

Reflections on the survey

The survey process revealed the impact of new technologies in the creative process and exploration of the moving-body through choreography. The combination of new technology and dance embodied an ontological challenge to what it means to *Be* in *Place* (Akinleye, 2019). Where the dance/dancer ends and begins is a choreographic statement but also an orientation to describing Being-in-environment, as explored in pragmatism (Dewey & Boydston, 2008) or phenomenology (Merleau-Ponty, 2002)[1]. We have taken the ontological standpoint that the dancer's body is a structure that is porous to dance, thus dance happens within through and beyond the dancer´s body (from a phenomenological perspective see Merleau-Ponty, 2002; from a pragmatist perspective see Dewey, 1958).

> '…They live, that is, as much in processes across and "through" skins as in processes "within" skins.' (Dewey and Boydston, 2008 p. 119)

[1] It is beyond the scope of this article to discuss here however reflections drawn from the survey have indicated the direction for our own deliberation and choreographic exploration currently.

If 'they' are the choreographies and 'skins' are of the dancers, Pragmatist John Dewey suggested the poetics of the dances we observed. The offer of Self beyond oneSelf becomes a fragility, strength and confrontation across the choreographies in the study, mirroring 21st century questions of identity and networks of humanity that are global political challenges today.

Reflecting specifically on the technology used; light design (LD) is present in all the fifty-eight choreographies and has become an essential tool since Loie Fuller's pioneering Western creation of the *Serpentine Dance* (1891). Set design (SD) in thirty-five, as well as Video Design (VD) in thirty, are the new technologies most used, and therefore we considered these as key locations at this point in the development of the digital aesthetic on the dance staged space in the 21st century. However, the use of robotics (Rob) in *Devolution* (Stewart, 2006) or the 3D graphics (3D-G) in *Multiverse* (Stewart, 2014), indicate developments in how the dancer extends and is interactive out into the staged space. (see figure 1 - Bar charts of the Use of New Technologies used in the Dance creations made in the XXI century, a] By Cases of Study, b] By years through the study period of time. Abbreviations according to Table 2)

Figure 1
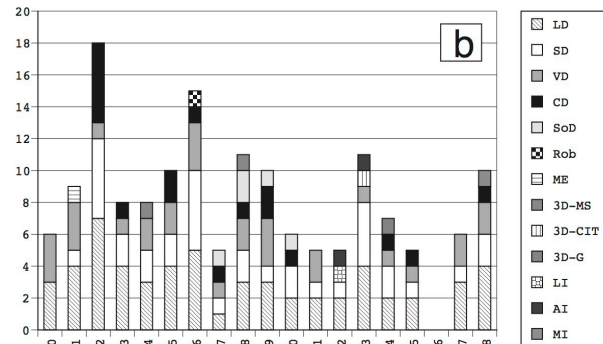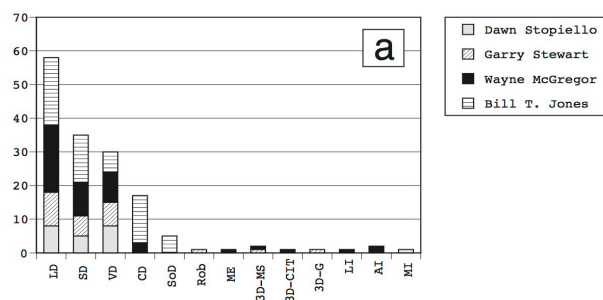
Eight pieces developed by Stopello between 2000 and 2018 were examined. Over this period, she has used four types of new technologies. Since 2003, LD, SD, VD, are present in all her choreographic works. However, her latest piece, Swarm, which Stopello's web-site describes as 'currently under development' (Troika Ranch, accessed 2019), includes a multimedia installation (MI). Stopello's creative process seems to be shaped by a progression in the use of new technologies, first two (LD, VD) between *The chemical wedding of Christian Rosenkruetz* (2000) and *Reine Rien* (2001) then three (LD, SD, VD) between *Future of Memory* (2003) and *Loopdiver* (2009), and currently four (LD, VD, SD, MI) in *Swarm* (2018).

Ten works created by Stewart over almost two decades (2000-2018) were viewed. Stewart used six from our typologies. He has been a pioneer in the use of robotics (Rob) in *Devolution* (2006), 3D moving set (3D-MS) in HELD (2002), which was used later also by McGregor (Entity, 2008) and 3D graphics (3D-G) in *Multiverse* (2014)[2], In terms of his choreographic process, Stewart, like Stopello, started with two different types (LD, VD in 2000), however since the opening of *The Age of Unbeauty* (2002), he began an intense research process, using an average of three new technologies for each piece. Unlike Stopiello, he has not had an upward progression of types of New Technology engagement.

[2] Multiverse is one of Stewart's most known pieces, having toured globally, with a great success both of critic and public (Australian Dance Theatre, 1999)

For instance, he only uses one (LD) in his most recent work *The Beginning of Nature* (2018).

Twenty pieces from Wayne McGregor were examined. His work engaged with nine typologies (see Table 1). McGregor has created pioneering collaborations between dance and costume design (CD) in Dyad 1909 (2009), mechanical extensions (ME) in *Nemesis* (2001), 3D creative informatic tool (3D-CIT) in *Atomos* (2013), light installation (LI) in *Future Self* (2012) and art installation in *Rain Room* (2012). Nonetheless, the survey gives an impression that currently McGregor is less interested in exploring beyond the new technologies he used at the beginning of this decade, since from *MOVEment* (2015), he has been working with the same four new technologies alternately (LD, SD, VD, CD). In his last piece, *Bach Forms* (2018), McGregor incorporated the concept of the mathematical equations within *The Art of Fugue* of J.S. Bach, as McGregor considered it a stimulus for the human condition and therefore, a starting point on which to create this work (Studio Wayne McGregor, accessed 2019).

Bill T. Jones is a pioneering artist with a longevity of works dating back to 1970s. we looked at twenty pieces created between 2000 and 2018. It should be noted not all Jones choreographic creations use 'new technology', for this research there was a focus on the works where New Technology is used. Of Jones's works that were surveyed his key uses are LD, SD, VD, he has also used remarkable costume design (CD) in the majority of his pieces, as well as being a pioneer in the use of sound design (SoD) in *A Quarreling Pair* (2007). In *Serenade/ The Proposition* (2008) and *A Quarreling Pair* (2007), Jones used LD, SD, VD, CD. As with Stapiello and Stewart, Jones started using only two different types (LD, SD) in *The Table Project* (2001). He explored more typologies in his following works using an average of four new technologies for each piece. The most recent creation looked at by Jones, *A Letter to my Nephew* (2017), he has only used two (LD, VD).

The four artists highlight that technological development can be seen as a fundamental motor of progress and stimuli in the geographical locations they create in. Technological inventions not only shape ways of life, but also change the mentality of millions of people, offering new understandings of what it is to be of the world. Dance is not disconnected from technological advances. Consequently, the type of transdisciplinary creative processes portrayed in the survey blur the lines between research and practice in the artistic process (Tornero, 2013). The development and exchange of ideas alongside these productive collaborations which bring scientists, engineers and artists together is reminiscent of Europe's *Renaissance* period. This was a time when what is to be human was redefined (Wynter, 2003), echoing ethical and ontological questions that new technologies solicit today. The artists' collaborations with laboratories such as the College of the Holy Cross in Worcester, Massachusetts (Stopello), the Motion Lab in Melbourne (Stewart) or the University of California in San Diego (McGregor) are tasked with how scientists and artists respond to the social political implications of creative knowledges, locations and resources as well as the performance art of originality and effectiveness (Runco & Jaeger, 2012).

Conclusion: New aesthetics & New Technologies

The great acceleration of scientific and technological progress in the 21st Century has permeated our society so deeply, that we have entered a new era: the digital era (Salter, 2010). Choreographers and dancers have played an essential role in the incorporation of new media such as software or interfaces on stage (Boerisch, 2006). The fifty-eight works in the survey illustrate that in the choreographic process the relationship between art and science is transactional. Creativity seems to make perceived borders between art and science permeable or even arbitrary. The genius of the choreographers in the study has made tangible,

through their work, the idea that the creative process is the product of our technology and imagination (Tornero, 2013). What makes these dance artists influential today is that their work is seen as innovative and visionary. The eminence of these choreographers is that they are simultaneously innovator, researcher, and body - fabricating new technologies through the aesthetic and felt experience of moving in space. This art/science involves the discovery of humanness (Simó, 2013), and the comprehensions of the ontology of the human being in universe that the performance work makes palpable in movement.

Within the dance field, the blurry unification of art/science challenges choreographers, dancers, and audiences to reimagine each other. McGregor, Stewart, Stapiello and Jones create dance and in so doing capture an aesthetic that is changing (Oikonomou, 2012) where the role of environment is alive and interactional, and the role of creator is across the witnessing and doing of the moment of the performance. Dance-artists in 21st Century are exploring the boundaries of new technologies, manifesting hybrid art forms that are wider, richer and more diverse (Brooks, 2008). The choreographer moves down a path that forces critics, scholars and dancers, themselves, to redefine their understanding of the art form. A place where the sciences, the arts and the humanities share a common space of exchange offers the possibility of encounters with each other that allow us to be reflective, hopeful and open to what we can create together. The global collaboration of how we move in new technology offers us the opportunity to dance together, to explore how 'I' can end and begin in the global 'we' that is the 21st century.

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