The Perception is a Prism: body, presence, and technologies

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ABSTRACT – The Perception is a Prism: body, presence and technologies[1] – Starting from an interdisciplinary perspective of the concepts of body, perception, and technologies in the contemporary scene, this text will attempt to define the general aesthetic notion as *bodyscape* as an extension of the performer's perception. Through a survey of some key practices from the contemporary scene such as choreographic compositions by Myriam Gourfink, Isabelle Choinière, and the project of *motion signature* by Martine Époque and Denis Poulin, the impact of technologies on redefining the process of the performer's perception in the composition of the movement and the change of the notion of *presence* will be analysed. In this sense, a series of modifications that influence also the spectator's perception is presented. Therefore, the notion of empathy is discussed, and an attempt to find out how this applies in the context of a digital image of the body is made.
Keywords: **Body. Perception. Movement. Presence. Technologies.**

RÉSUMÉ – La Perception est un Prisme: corps, présence, technologies – En partant d'une perspective interdisciplinaire autour du corps, de la perception et de l'intervention des technologies sur la scène contemporaine, ce texte définit la notion de *bodyscape* comme forme d'extension de la perception du performeur. En analysant des processus de composition chorégraphiques contemporains – Myriam Gourfink, Isabelle Chonière, et le projet *signature motrice* conçu et dirigé par Martine Époque et Denis Paulin – nous discuterons l'intervention des technologies sur la redéfinition de la perception des performeurs, pendant la composition du mouvement en redefinissant la notion de *présence*. Le cadre de cette réflexion mène aussi à interroger les modifications de la perception concernant le spectateur en nous permettant d'introduire la notion d'empathie pour comprendre si cela s'applique face à l'image numérique du corps.
Mots-clés: **Corps. Perception. Mouvement. Présence. Technologies.**

RESUMO - A Percepção é um Prisma: corpo, presença e tecnologias – Ao partir de uma perspectiva interdisciplinar acerca dos conceitos de corpo, percepção e tecnologias na cena contemporânea, este texto tentará definir a noção estética geral de *bodyscape* como uma extensão da percepção do performer. Por meio de um exame de algumas práticas chave da cena contemporânea, como as composições coreográficas de Myriam Gourfink, Isabelle Choinière e o projeto de *assinatura do movimento* de Martine Époque e Denis Poulin, analisa-se o impacto das tecnologias sobre a redefinição do processo da percepção do performer na composição do movimento e a mudança da noção de *presença*. Nesse sentido, tem-se uma série das modificações que também influenciam a percepção do espectador. Portanto, discute-se a noção de empatia e tenta-se descobrir como ela se aplica ao contexto de uma imagem digital do corpo.
Palavras-chave: **Corpo. Percepção. Movimento. Presença. Tecnologias.**
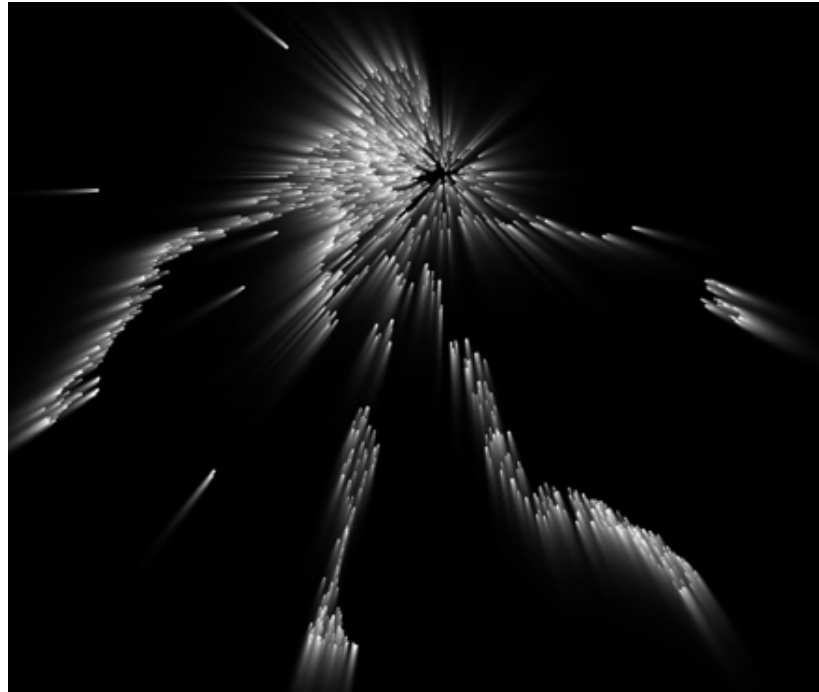
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Image 1 – Martin Époque and Denis Poulin (LARTech), *No Body Dance*: *the prototype*, 2009. Photo: Denis Poluin/LARTech.

What does it mean to perceive something?

To sense the consistency of things. To feel the idea of space. To experience near and distant sounds. By sharpening your attention, you can become aware of an entire range of subtle details: marginal elements seen as vague presences at the corner of your eyes. You can feel, for example, the air pressure and the presence of light reverberation in a room; the sound of the nervous system. Thus we act almost unconsciously. In a similar way, perception – the set of the body cognitive functions – plays a fundamental role: *perception is an action* (Berthoz, 1997). Starting from this simple proposition, it is possible to define the quality of the presence of the body.

This perspective is a departure for my analysis.

From the point of view of choreographic composition, that is to say physiologically, it is firstly necessary to define *what is* the body we are talking about and what is its potential. In such a case we have to deal with an analysis of perception, and consequently to highlight how the brain works[2]. From a methodological point of view, we can recognise essentially two ways of interpreting brain functions accordingly to the two main philosophical trends of the past century.

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On the one hand we find the idea of the brain as a *calculator*, a central system which stores and re-elaborates information coming from different sensorial stimuli, based on an innate or acquired programme. The model is that of language and this conception can be connected to the tradition of analytical philosophy. On the other hand, the brain is understood as a simulator of the outer world, and actions are performed on the basis of inner models (Bernstein, 1967; Berthoz, 1997; Berthoz; Petit, 2006). In this framework, the brain projects its hypothetic actions on the world around – *feedforward* – and it uses the information captured from the senses (sensorial captors) as a *feedback* to verify the coherence of a prediction (Jeannerod, 2009, p. 84-85). In other words, the outer world is seen as a laboratory to verify mental hypotheses[3]. Such an understanding has to be considered in a phenomenological framework.

In this regard, we are going to consider the relationship between the perception of movement and its composition, taking Michel Bernard's concept of *fiction* as a starting point (Bernard, 2001; Godard, 2002, p. 236). This concept concerns the imagination of a body in a particular space before the actual action takes place. This process makes visible a former, internal and hidden, *virtual* dimension of the body, where the term *virtual* is not opposed to what is real (it doesn't suggest a de-materialisation of the body) but to what is *actual*, its *embodied* form, so to speak. In these terms, perception is nothing but an internal simulation of the action based on a *perceptive categorisation* of space. Here space is conceived of as a combined exchange of information between the outside world and the posture of the *pre-movement* as the actualization of an anatomy imagined by the system of gravity muscles[4]. In such a view, pre-movement is a background (invisible and involuntary) on which movement is drawn (visible and voluntary) as the result of the simulation (Goldman, 2008). So, the brain works differently from what one expects; it formulates hypotheses coming from a set of possible tasks, and looks for elements that can confirm or deny predictions based on the decisions actually taken in the real world: "[...] it is the body state that precedes the act, not the other way around" (Jeannerod, 2011, p. 18). In this perspective, through the analysis of work by choreographers such as Myriam Gourfink, Isabelle Choinière or Martine Époque and Denis Poulin (the LARTech project), we are

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going to point out a *vectoriality of the body* emerging in their scenic compositions. Perception renews itself in order to achieve new gestures and, consequently, to define innovative forms of presence involving anatomy on the basis of physiological processes (Pitozzi, 2011a; 2011b; 2012a). To change the way we perceive is to change the *referents* of the imaginative construction of movement (to stoke the *fiction*): to change the way in which the body is *felt* in order to vary its *form* and create more and more articulated levels of presence. Nevertheless, if it is desirable to characterize a presence of the body in motion, in this way we must consider the effects it produces. Thus, the effects of presence testify to the passage of a body as perceived by the spectator: the trace of a movement that is no longer there, but once was. This effect of the performer's body motion can be considered as a new sort of *survival*, something persisting in the form of *impression* and which affects, in an empathic way, the muscles of the observer.

The Perception is a Prism

The object at the centre of this investigation, and common to different disciplinary perspectives converging here – from theoretical-practical skills about performing arts, to the frame of neuroaesthetic supported by recent findings in neurophysiology – is the body movement along with its expressive possibilities. From the viewpoint of the studies about performing arts, this correlation of disciplinary layers is an important focus crossing the whole 20th century, although it has never been seen as a dominant aspect in it.

The main interest is the role that different technological devices of capture had in this frame. Starting from experiments conducted by Etienne-Jules Marey and Edward Muybridge about human and animals movement at the end of 19th century (regarding the development of photography and mainly of cinema), passing through the experimentations made in the same years by Wilhem Braune and Otto Fischer in Germany, to arrive to recent motion capture (*MoCap*) experimentations[5], it seems to be clearly detectable a parallel process essentially moving on two layers: the study of the human movement for scientific purposes, and, at the same time, aesthetic and autistics ones (Marey, 2002 [1894]; Mannoni, 2003; Johansson, 1973, p. 201-211; Manning, 2009). It is interesting to notice that these aspects, mainly concentrated on the research area

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of the studies about human locomotion, intersect the attention that important figures of the theatrical and choreographic scene in the 20ᵗʰ century turned to *physical actions* and to physiological elements of the movement; their experimentations in this field still endure even nowadays. Let's think, as an example, to the notion of *biomechanics* as it was practiced by Mejerchol'd in the Soviet Union during the 1920s (Picon-Vallin, 2003); this aspect – that apparently can be considered as an actor *technique* – stated a close relation with the physiological researches carried out by Nicolaj Bernstein in the laboratory of physiology of the Gastiev Institute in Moscow during those same years (Bernstein, 1967).

According to this frame, the development of technological instruments to support the physiological research about human movement, the philosophical inquiry of phenomenology (Merleau-Ponty, 1942; 1945), as well as the analysis of theatrical and choreographic scene of the 20ᵗʰ century, elaborates cognitive strategies converging in a common horizon that regards the knowledge of body functioning as a base of expression. What changes is the final aim, not the object to be considered. These points of convergence are the basis of the idea presented here and they justify evidently all the interdisciplinary collaborations that have to find a common field in our intention (Calvo-Merino, 2005, p. 1243-1249).

From the viewpoint of the performance studies, that is our main field of interest, there is an important notion that seems to be able to summarize the aspects mentioned before: we are talking about the concept of *fiction* as it has been elaborated by philosopher and scholar of performing arts Michel Bernard. The notion of *fiction* refers to the imaginative attitude that the performer uses for the composition of the action. According to Bernard's hypothesis, the performer, in order to move his body, has to imagine and project its anatomy into the space before acting. He has to simulate an action. In order to do this, he must activate all his proprioceptive channels: he must feel the space, categorise it, establish an active relation with the outside environment before placing the movement in that same space defined through his projection – this is the notion of *feedforward* (Jeannerod, 2009, p. 84-85). According to this interpretation, in an operation that we may define the perspective categorisation of space, the brain does not only generate responses to stimuli, nor does it simply organise

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sensation passively, but it also formulates hypotheses on movement using an inner repertory of memorised actions. This knowledge turns the brain into a simulator capable of making the interactions work *internally*, between the action projected (prediction) and its possible consequences (Berthoz, 1997; 2009).

In other terms, as physiologist Alain Berthoz underlined, the brain is an action simulator, a generator of hypotheses that pre-selects information coming from the senses (therefore it guides and arranges the senses in collecting information from the environment, it does not solely register passively) according to the purpose of the action in course (Berthoz, 1997; Berthoz; Petit, 2006). To activate this process it uses memory to foresee or predict the future, the outcome of the action and any possible variants. From this viewpoint therefore, the brain is not a *reactive* but a *proactive* machine that invests the world with its queries. This process of *action forecasting* is at the basis of the action (Berthoz, 1997, p. 45; Decety, 2004, p. 73-74; Jeannerod, 1994; Rosenblum, 2010). Berthoz also noted that the motion intention exerts on the neuromuscular spindles activity – muscular captors on which kinaesthesia (the sixth sense) is based – a modulation that allows to regulate the muscles stiffness by anticipating the tension that they undergo during the execution of the action. In a very similar direction, physiologist Marc Jeannerod stated that an imaginative action implies the same duration required by the task to be performed. The thing to be taken into account is that Jeannerod underlines that the same brain structures are activated both in the case of the projected action and in the case of the real execution[6] (Jeannerod, 2009, p. 108). This means that the brain foresees the consequences of the action but also the place where a sensory captor must be in a particular moment during the execution of the gesture. It is in consequence of this passage that we can state that senses are verifiers: the brain is a hypothesis generator that uses senses to verify its own predictions (Berthoz, 1997, p. 78).

The anticipation is anchored to what – in the wake of Edward Reed and Hubert Godard – we can define *pre-movement*: the instant in which the simulation is embodied in the deep muscles – thus envisaging the relation of the body with the weight and gravity necessary to achieve the projected action – to prepare the movement (Reed, 1982; Godard, 2002, p. 236). The *pre-movement* thus, acts on

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the organization of gravity, on the way the acting subject organises his posture to remain upright and to respond adequately to the laws of gravity his body undergo. Moreover, *pre-movement* at the same time puts into game the movement plan and the affective level of its organisation: perception produces a series of affectively-coloured movement hypotheses which activate a selection of pre-movements to be realized, in order to support the imagined action (through the definition of an appropriate posture). Only successively we can have the execution of the movement as a consistent *verification* of the action project as formulated by the perception. It is exactly at this stage that we find technologies, as considered here, like a support able to offer an amplification of the effect produced by the gesture. In this sense, acoustic *feedbacks* produced thanks to new technologies help the dancer in creating their movement, and this will be a central aspect in our discussion. It is important to see that this idea, developed in a neuroscientific environment, finds a deep interest in the contemporary performance scene, especially concerning an investigation about the body that refers to some notions from the somatic. One of the most important notions is exactly that of *motor anticipation* or *pre-movement*, as we have seen, as a key concept to understand how a movement is composed, so that it shows us unequivocally that the result of the action (and the calculation of the margins of error) is already contained in the perceptive process on which it was founded.

Following this assumption, we can thus state that the body exists, and its presence with it, only in a tension between a *projection* (simulation) and a *retention* (pre-movement). The presence of the performer – target object in theatrology and also one of the focuses that this article aims to re-skill and deepen – derives from the capacity of a performer to enter this pattern and give a form to this tension. That means to materialize the space around before moving into it: to imagine it, to occupy it by giving volume to it, a consistence.

In this sense, then, starting from this basis, the intervention of motion capture technologies, that we consider as a technical evolution to support the knowledge of movement and its neurophysiological elements, becomes of a crucial importance. This aspect is very important to our perspective because it represents a central point concerning the role of technologies in the analysis of Gourfink and

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Choinière's works. In the same horizon, we also find the LARTech's work by Martine Époque and Denis Poulin, where motion capture technologies originate two parallel research areas: on one hand, they allow to examine the digital representation of the body, working on the relation between the physical body and its reproduction as an image; on the other hand, they investigate the motor aspects of the performer, using technologies for a deep research about the mechanisms that regulate human locomotion and compositional processes of movement (Époque; Paulin, 2013; Mercy, 2013, p. 253-254).

Precisely starting from these examples, where a perspective related to the composition of movement in performing arts joins physiological aspects and a technological elaboration, we believe that it is possible to visualize and study the *motor features* of a body thanks to the use of motion capture. At the same time, it represents an interesting way to understand how the process of simulations works. A better knowledge of these aspects could allow a progress on some key points of the parallel research between neurosciences and performing arts: by deepening the knowledge of movement and its correlations with the brain functioning, as well as by providing the performer with a *biofeedback* to be used in order to innovate and investigate his perception and, consequently, to vary the movement without repeating the same motor mechanisms and the same pattern of dispositions into the space.

Technological Devices

Hypotheses on movement developed by brain and displayed into nerves and muscles are based on a perceptive conception of the space around, to which the body reacts in order to compose the action. Following this, we can state that, by converting this movement in perceivable data made of sound or light, the performer can reach a deepest knowledge of his perceptive faculties, in order to extend them or just control them thanks to this *biofeedback*. This means that performers are able to operate their entirely innovative gestures passing through different levels of presence. We would like to point out that movements captured thanks to motion capture devices – based on captors attached to the performer's body in order to analyse their pathetic and muscular activity – can enable an analysis of

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the involuntary muscles that is very similar to that produced by a manipulation or a visualisation of the moment in which the mentally projected movement affects the muscles.

Let's see more in detail the operations on which the process of conversion is based: the *interface* and the *digital*. The interface is a function able to separate and connect, at the same time, two heterogeneous systems, defining them by differences (Poissant, 1995; Quinz, 2006). In other words, the technological system doesn't only respond to an input, but it also elaborates information. This process is possible thanks to a *digitalization* of the signals, so that they can be transformed and re-elaborated: a single *input* datum can produce different *output* data. By this operation, digitalization allows to translate images, sounds, texts, and even movements, into information stored and ready to be processed by a computer. Exactly like the solid, liquid or gaseous state, the digital can be considered as a *matter state*, for it permits to process any type of information. Just as a liquid can turn into ice through a process of solidification, so too the contraction of a muscle within a movement can, through a process of digitization, become a sound or produce an image (Hansen, 2006, p. 25-104; 2006, p. 221-252).

Digitalization as a transforming factor will be at the centre of the following pages. We will see how this process can operate to produce and compose a scenic *soundscape*, starting from the performer corporeality and movements synthesized by technologies. A key element is to understand *how* this process is manifested, in order to see and underline the way technologies operate on the scene. Operations like those described above imply a radical transformation of the body *state*, from an organic state to a digital state, and the employment of technologies creates two main operations: *computer simulation* and *dislocation*. The *computer simulation* deals with the creation of models; from a physical reality it is possible to create a reality based on mathematical algorithms. Interfaces used in this process are mainly circuits that made the conversion between the two dimensions possible. On the contrary, *dislocation* determines a kind of detachment, and physical corporeality, being converted in sounds and visual elements, undergoes a different transformation than that produced by simulation. In this case we can see the development of forms of presence mediated through technology.

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The Logic of a Micro-movement

A figure to the fore of the choreographic generation appearing last century in the 1990s, Myriam Gourfink thinks of the body as an investigation into the slow pace and linearity of movement. *Contraindre* (2004) and *This is my House* (2005), as well as her recent projects, *Les Temps Tiraillés* (2009) and *Choisir le Moment de la Morsure* (2010) – the latter developed at the French Royaumont centre – can be analysed from this slant (Lesauvage; Pietre, 2012). In all these works, the whole articulation of movement is played out on the dynamics of a regular shifting in body segments in a slow circuit of weights and balances that hover in space.

The line of tension within the movements has no rhythmic breaks; it is radical in its linearity and tends to avoid variants; the resulting figure is like a shift within a cobweb: like the score itself. This concept of movement is achieved, moreover, through the use of a particular system of choreographic writing that uses the Laban Orienté Lisp software – LOL – partly deriving from the Laban notation and from Lisp, a computer language used for LOL (Fanti, 2001). This is a composition movement software made up, as to the graphics, by a window that dissects and indicates all the parts of the body, while in other windows it arranges all the dimensions of the dance: bending, rotation, support, distances, levels, and all the other parameters making up the choreographic writing of a work. Thanks to this procedure the body, envisaged and codified in a computer annotation system, becomes a physical entity that points to a radical reorganisation of composition methodology. A further important element to be underlined regarding the working potentials of this system is the division of space. LOL is able to give indications that divide the space for action infinitesimally. On the one hand this division exponentially enlarges the possible combinations within the composition, while on the other it alters the dancer's perception of space. Thanks to LOL, it is thus possible to multiply the indications given to the performers: categorical indications may be given, such as *forwards* or *sideways*, but more exact indications of another type may be envisaged, such as *move three degrees to the right*. This is possible because space is categorised and parameterised, therefore the performer is quite able to recognise such precise indications and will then modify his kinaesthetic perception as well, going on to occupy

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previously unexplored portions of space. It is therefore evident that the use of technology, in this case, creates a radical modification on the performer's perception. This investigation of space and perception triggers the micro-movement that is central to Myriam Gourfink's choreographic composition (Gourfink; Marthouret; Voisin, 2000-2001).

Image 2 – Myriam Gourfink, *Contraindre*, 2004. Photo: Françoise Rognerud.

Thanks to technological mediation, the micro-movement logic determines slow and very exact timing in the execution of the choreographic score. The slow pace thus makes it possible to prolong – and therefore make visible – those passages in the score which would otherwise not be perceptible: in other words, it acts as a magnifying glass focusing on the micro-variations of the body.

> Focus attention on the toenail, find a trajectory in the arm, move to go above the head. Or, again, find a pathway in the body to move again and stop on the right heel, on the skin, or listen to the weight flowing up inside the leg, enter into the flesh, into the pelvis and rotate to the greatest extent possible, find a precise point, or else a large surface. [...] These passages are totally sustained by breathing [...] (Pitozzi, 2005, p. 45).

This approach implies an inner visualisation process and a certain degree of attention even to the slightest modification in body form. The quality of time achieved is elastic; the duration of each

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sequence is more or less unspecified and is subject to the time of the action which, on the contrary, is exactly defined: if a sequence is to last three minutes, the interpreter is free to manage that time, without changes in rhythm or breaks.

> Exploration of weight, slowness, breathing: these three factors regard pre-movement, i.e. our most deeply hidden motor resources; these pre-movements make micromovements possible, microchanges in direction generating a number of gestures that take every millimetre of space into consideration, every millimetre of body, skin, cells. This is work on posture that micromovements gradually deform and modify in time through shifts. Actions fuel the passage from one posture to another. Everything is played at this level, when continuous interaction among the elements (weight, slowness, breathing) becomes exploration within the body and within space (Pitozzi, 2005, p. 42-43).

Movement therefore unfolds in this stretching of muscles, without seeking a stable form, without trying to define and specify the outline of the body. It is a work on dynamics rather than on forms. The body is not positioned: in Gourfink's work there are in fact no positions, rather postures or attitudes. While position refers to development and unfolding, in posture (which concerns pre-movement) we see a spiralling of the body around itself. The model of this articulation is the bend, the curve. To achieve this modulation the choreographer makes movement flow from the pelvis: most convergence and management supports of weight effectively pivot on the perineum. The body therefore tends towards a permanent state of tension in which the flow of movement makes time pliable, elastic and flexible. For Myriam Gourfink the point is to analyse how a body can make time fluctuate in space: *making time visible*.

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Image 3 – Myriam Gourfink, *Le Temps Tiraillés*, 2009. Photo: Jérôme Delatour.

Collective Body: the soundscape of the skin

Among the most interesting figures on the international circuit, the Canadian choreographer Isabelle Choinière has been developing a journey connected to sound qualities in relation to movement for many years. She founded and currently directs the company in Montréal (Canada), a company with which she develops research projects on the relationships between dance and technologies. In 2007, she began to develop a new project called *Meat Paradoxe* and another called *The Flesh Waves* (2013), which is last till today. Collaborating for the first time with the French composer Dominique Besson for *Meat Paradoxe* and, presently, with Ricardo Dal Farra for *The Flesh Waves*, Choinière explores in these projects the concept of a collective resounding body.

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Image 4 – Isabelle Choinière, *La Démence des Anges*, 2002. Photo: Frédérique Bolté.

To come close to an initial manifestation of this relationship between body and sound, we will start by considering one of her earlier works – *La Démence des Anges* (2002) – where, thanks to technological means, the presence of the body is extended to include a different place than the one where the performance is physically taking place. Two different bodies live in these two different spaces. Thus, two dimensions of presence are in relation with each other inside the same physical space: the concrete body of the performer, and a *synthesis* body that is present as a projection. In this way, the dancer who is physically present perceives her performance as replicated in the image and in the sound track of a virtual dancer (spatially located in another place, or even in a different continent, if necessary), transmitted by a MIDI data system via the internet.

In this case, then, the resounding body is the result of an encounter between two spatially distant material bodies, with the help of a reciprocal projection (Pitozzi; Choinière, 2010; Boisclair, 2007). The voices and gestures of the performers are captured by a series of microphones and sensors that are positioned directly on their

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bodies. This data are transferred simultaneously into the space of the performance and the distant space via the internet, to form what could be defined a long distance duo. It is as if the two performers generate and exchange sound and images in real time, which come from the composition of movements, producing a sort of net-like persistence of their image in the spectator. We can, therefore, see and hear each of the two performers as *present* in the space of the other.

Image 5 – Isabelle Choinière, *La Démence des Anges*, 2002. Photo: Frédérique Bolté.

This process is an invitation for performers to reconfigure their perception of action, while creating an overlap of real dimensions and confusing them. In order to achieve this outcome, the two dancers wear a net of receptors, able to capture the sound qualities of their gestures, and attribute a sonorous equivalent to these through a synthesizer. To the aim of this research, the choreographer had to develop a series of particular sensors to be applied to the body. The need was to elaborate receptors that restored the possibility of composing and capturing a movement in a decisively more subtle and slow way, and at the same time to allow intervening on the opposite diametrical quality. In other words, according to a dynamic of acceleration or fragmentation of the movement flux, it is possible to compose a real-time auditory space that interrogates the performer's

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perceptive organisation in action, as well as the audience's capability of perception.

The resounding body transpires from the real body, but it is not a double of it. Rather, it represents a manifestation of it, a new sensorial organisation deriving from a technological integration. Technology, then, becomes a way to develop a deeper perception of physical knowledge, in order to act on it so as to modify the score of movement constantly. In this case, it is evident that we are beyond a pure instrumental use of technology, which rather it is understood as a way of thinking about the body and expanding its potential. This particular use of technology enables the choreographer to really integrate the sound dimension in her creative process and its result.

By exploiting this process of work in connection to sound, it is in the *Meat Paradoxe* project (2007-2010) and the *The Flesh Waves* (2013) that Isabelle Choinière developed a concrete and radical vision of the idea of resounding body. This project is inscribed in a context of broadened choreography that the choreographer has been developing for some years now.

For *The Flesh Waves*, thanks to the collaboration with Dal Farra, Choinière developed an organised system to capture the sound of five dancers together[7]. Composing their movement in the space of action like a real sound mass, the dancers produce what we could define a collective resounding body, inside which they share a sensorial experience in real time, both on the level of movement and on the level of sound production. The elaboration of the soundscape responds to the mass-movement of the performers on stage, and generates an intense graininess that seems like a cloud of sound, a dense and articulated atmosphere of sound particles.

Here, the resounding body recalls a dimension of the body (or of its movement) that originates from the movement of the dancers on scene. The resounding body is, in other words, an emanation, a dilation of the real body into a vibrating shape of sound. The body comes to be understood as an eardrum, a resonator of sensorial dimensions, which becomes a scenic sonority; it is almost molecularised, subdivided into elementary particles and recomposed in a sound form. Once again, we are away from a purely logical formality in gazing at the body; its intensities – its articulation in movement-particles – are part of the choreography and of the research

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on sound at the same time, thanks to the alteration and modification of different frequencies.

What is extremely interesting in this perspective is that, by working on the resounding body, it is possible to intervene in the sensorial aspects and in the perceptive arrangement of the performers in space, so to renovate them. This leads to the abandonment of compositional processes that have already been experimented, and opens up the way to a kind of movement subjected to a continuous transformation; it produces, therefore, a scenic sonority enriched and redefined each time. Here, the sensorial aspect is reorganised, and the internal part of the body behaves like a medium. It is as if sound, in this project, plays the role of an added dancer: it participates in the organisation of the collective resounding body.

Thanks to the spatial placement of sound, obtained by means of a device consisting of eight speakers placed around the hall, the spectator is almost projected inside the body of the performers, and induced into a radical rethinking of his own sensorial arrangement at the same time. In other words, the spectator feels very close to the performers' body, to a degree that induces him to a *tactile vision* of their movements. Thanks to the sound that moves around him, crossing the space, the viewer is immersed inside this living form, inside the flesh, being in contact with the intensities that animate and sustain it. In that way, there are two forms of perception here that the spectator is not used to, and that must be redefined.

This tactile quality of the soundscape composition results from the moleculerisation and spatial disposition of the sound itself – strategies that operate with very high and very low frequencies. The sound tends to articulate itself through continuous wavelengths that install a constant relationship with the listening bodies of the performers and the spectators. However, this proximity does not take the audience into an extreme experience of sound. Rather, the communication passes thanks to the use of different chromatic levels of sound, different levels of vibration. The spectator is immersed into a scale of distinct sound segments, distinct gestures of continuous vibration, in an inherent connection with the global movement of the figures. This audio-visual organic system affirms that the perceptive operations the spectator must put into action are not the optical and the auditory, separately. The compositional process of the choreographer Isabelle Choinière requires a synaesthetic glance

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and mode of listening: an active and simultaneous relationship of all the senses.

The Digital Collection of *Motion Signature* by LARTech

In December 2010, LARTech of Montréal – under the direction of Martine Époque and Denis Poulin at the dance department of the Université du Québec à Montréal (UQAM) – launched the project CHK *Dancers Motion Signature Collection*[8]. This project is based on different aspects, such as: a) to make some dancers known by their kinetic imprint; b) aiming, through research, to enhance *MoCap* processes and develop tools to widen the scope of human movement digitalization technologies; c) to record digital data of the dance movements and make them available for scientific study in order to develop more knowledge about them; d) to collect dancers' motion signatures for archival purposes; e) to make those data available to a large amount of people via web, through the project of a playful interface.
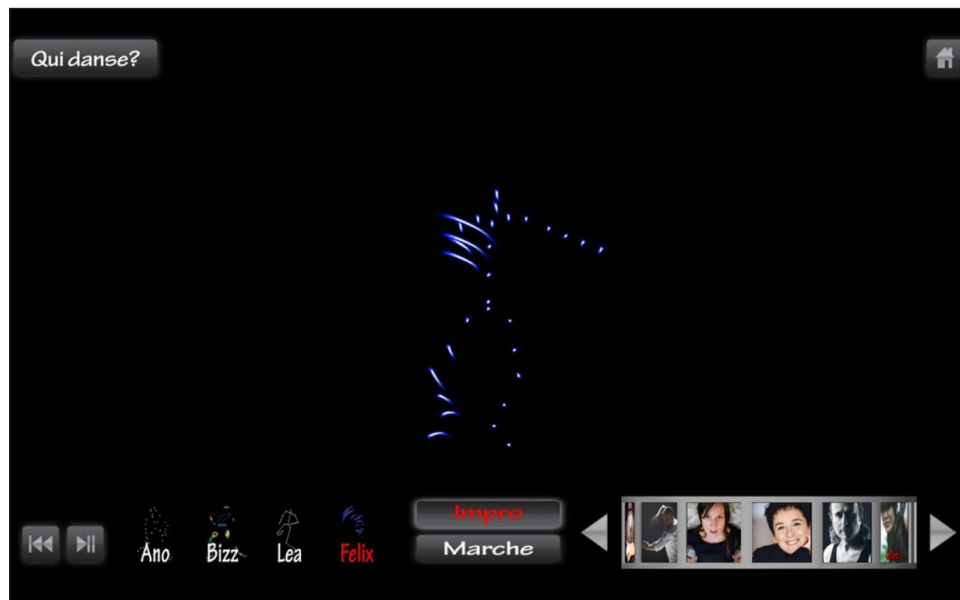

Image 6 – Martin Époque and Denis Poulin (LARTech), *Galerie de Signature Motrice*, 2012. Photo: Denis Poluin/Lartech.

With the help of Frédérick Gravel and Normand Marcy, who work at LARTech, about twenty Québecois performers of different ages, styles and performance techniques have been selected. Among them, thirteen took part in the creation of the CHK *Collection*[9] (Époque; Paulin, 2013, p. 233-252; Mercy, 2013, p. 253-266). In

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this way Époque and Paulin have collected a set of data based on several *MoCap* sessions. The aim was to capture dancers' movements during their performances as precisely as possible. To do so, it was important that gestures came directly and spontaneously from them and not from an external choreographic source. The project's protocol consisted mainly of walking and improvisation; guidelines were transmitted to the participants orally, or by mean of writing at the moment. The gesture dictation sequences – a total of four – were developed without music. The first one was based on moves taken from the technical vocabulary of classical dance; instructions were read to a dancer, who performed the moves immediately. The point was that each different dancer performed the same moves. After two training sessions, the series was recorded on video by means of *MoCap* devices. The second sequence was composed of words and actions written and drawn on a sheet of paper, like a score, and given to the dancers. It consisted of three short sentences that allowed the dancer to create three different movements on the basis of their interpretation. The third sequence was based on the same idea except that it was longer, and thus more difficult to memorize. In this case the point was to create a level of insecurity in the dancer in order to record the impact of this state on their personal *motion signature*. Finally, the last task was given orally: the dancers were required to perform the movements of their choice for one minute and ten seconds. In this case the aim was opposite to the previous sequence, for the dancers could completely lose themselves in the movements. Once all these aspects were recorded, the session ended with three improvisations of two minutes each, with three different genres of music (romantic, rock, and techno), thus allowing the performer freedom to interpret the music instinctively.

In order to obtain a series of precise data, it is necessary to create the best conditions for capturing the *natural* motion of the dancer, with all its *repetitions* and *imperfections*. In other words, it is necessary to prevent the dancer from creating a formally perfect performance. What is important, in fact, is a sort of direct way of dancing; the interest is in the imprecision rather than in the precision of the performance. In order to do so, a strategy must be used: the dancers have to be taken by surprise when asked to perform the movements, so that they can concentrate only on the very moment of the action.

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From these sessions, LARTech has obtained a large amount of data and many hours of video ready to be used for different purposes, from a study of a specific dancer to the analysis of movement and choreographic composition. Anyway, only a selection of data have been used to create the archive, so to concentrate mainly on the essential element that is the motion signature of a body in movement (Époque; Poulin, 2013, p. 249).
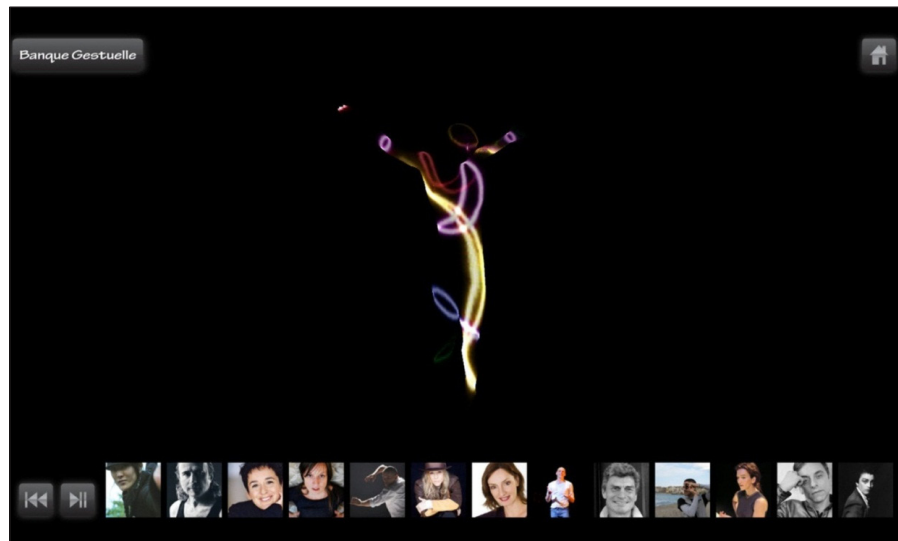

Image 7 – Martin Époque and Denis Poulin (LARTech), *Galerie de Signature Motrice*, 2012. Photo: Denis Poluin/Lartech.

On the representational side, Époque and Paulin decided that the dancers should use abstract figures in order to make their identification more direct and clear. These figures could also be seen as *characters* so as to allow a great variety of interpretations: a) *Ano* is graphically realised by means of a series of spheres, so to highlight the bodily volume; b) *Bizz* is composed of a series of colour stains so as to reinforce the perception of a central alignment of the body; c) *Léa* is a figure realised using axes that emphasize the bone alignment; d) *Félix* is composed of a blue-point texture that traces, on a screen, the flux of the movement.

Following a sort of mathematical conversion of the choreographic gesture, dance no longer copies reality, and it also departs from a formal representation of the body. In this sense, what remains is a formal objectification of the body, dealing more with the human's pure motion presence rather than with its subjective and recognizable form.

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(Re)-oriented Perception: about a new movement composition

In analysing the above examples it is clear that we are facing new ways of composing the gesture, ways coming from the elaboration of a profound strategy of perceptive renewal: renewing perception, let us recall, means altering the modes, colours, temperatures, and degrees of intensity through which the simulation of action (*fiction*) is structured. This means that in order to produce a new gesture, it is necessary to act first of all on the fiction process, exactly where this gesture is programmed. For the performer therefore, reorganising perception means to find suitable strategies to offer the brain the necessary stimuli to process new hypotheses of movement, new anatomical configurations, new trajectories through space and hence new forms of presence. However, the problem of virtualisation – imagining space, conferring it topological features and rendering it dynamic by projecting hypotheses of a new movement – arises from the inability to feel. As Hubert Godard correctly pointed out, we find it hard to go back to the subject and renewal of sensations, a particular anatomy, an unknown gesture or a fluid space (Kuypers, 2006, p. 80).

What makes this operation difficult is not so much the complexity in the commands that activate muscles, but rather the inability to renew our way of organising perception. If our way is always the same, the projections of the body in space as elaborated by the brain will also always be the same. Thus the body enters a vortex; it continually repeats the same ways of composing gestures, the same spatial dynamics. The body literally rotates upon itself in vain: it loses efficacy in the eyes of the spectator, it is predictable, it loses tension, it loses presence. Bringing about a change in how to perceive therefore means varying the ways of imagining movement; imagining space from another point of view – exactly as in Myriam Gourfink or Isabelle Choinière – means forming a chain of new movements from an equally new starting-point for the composition. Experiencing space differently, crossing it according to other coordinates. In other words, it means to re-actualise the orientation of the body. It is here that technologies, whether Choinière's sonorous body device or Gourfink's LOL, play an essential role: aiding the reorganisation of perception and, at the same time, stimulating the innate imaginative (and therefore motor) potential within the body.

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It is in this direction that a profound integration takes shape between body and technologies, exactly at the point where the latter offer the performer real prospects of cognitive investigation on the organisation of his corporeity, while enabling him to correct what Hubert Godard defined the repetition sclerosis concerning the constant, unvarying call on the same pre-movement and, therefore, the use of the same composition strategies as the gesture (Menicacci; Quinz, 2006, p. 76; Broadhurst, 2007, p. 54).

With the introduction of technologies the performer finds he can integrate information from different channels into the composition project: at a *proprioceptive* level, through data from the senses, and at an *exteroceptive* level, meaning through a string of information that returns to the body in the form of visual and sound data, as in Gourfink's *This is my House* and Choinière's *The Flesh Waves*. This co-presence of signals works on the performer's imagination giving him a widespread, complex, sensorial geography with which he can operate a radical change in perception orientation; this allows him to access new movement configurations. That explains the passage introduced above that leads from physiology to composition: to compose means to configure a counter-intuitive, unpredictable body.

We can summarize, in this context, some technological features as follows: 1) the *MoCap* is, first of all, a knowing tool that allows a new perception of the body and its sensory geography thanks to what is called a *biofeedback*. By means of a visual or acoustic signal the performer is able to control their gesture/s as well as the effect that it produces. In this way, *MoCap* is similar to the possibilities offered by the Functional Magnetic Resonance Imaging (MRI) in the study of the brain[10] (Bihan, 2012, p. 89); 2) technologies, thus, could help to determine the quality and the characteristics of a movement; 3) the presence of a body is something indeterminate. Its charm seems to emanate from an elusive *something special*, from something circulating and irradiating in every parts without being located in a specific source. Presence, thus, escapes any stable, precise and definable shape, but rather originates throughout a change of state projected beyond the body limits. Presence, thus, doesn't correspond to the body, but rather it is *carried* by a body, it is its *irradiation*. In this context, technologies produce the figurations of

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the body through the light or sound; 4) finally, empathy is considered as an *embodied simulation* (Gallese, 1997, p. 13-37; Sofia, 2013). It concerns, in the relationship between bodies, the mental simulation of the subjective perspective of the other who you're acting with, or – for the viewer – of the one who is being observed. This means to temporarily be located within the reference points of the other. Thanks to this temporary shift, we have access to their *intentions* and imagination. It is through this mechanism of anticipation that we can understand the gesture. In this scheme, empathy is not a photograph, rather it is quite an adventure; an exploration that a subject performs temporarily in kinaesthetic, and therefore in the intention, of the other entity with which they act or observe. As for the relation with the audience, if empathy is a process that concerns the body *in presence* – meaning, physically present in front of the spectator's eyes – we could imagine that this same relation between bodies would be possible even *in the absence* of the physical body – in front of the pure digital track (*motion signature*), so to speak. But we will tackle this aspect in the following section.

The Logic of Empathy: notes about the role of the spectator

It is precisely in this context that the body's manifestation through composition of movement produces an effect on the receiver, the spectator. We may speak of it in terms of an incarnate simulation, using the expression of Gallese and Rizzolatti from the Parma University team who discovered the working of the mirror neurons according to which, in terms of neuron activation, there is an empathic correspondence between the person carrying out the action and the observer (Rizzolatti; Sinigaglia, 2008). In other terms the same neurons discharge both when we make a movement and when we see someone else performing the same movement. However, this may happen because we are under an inhibition – as Berthoz would say – of the corporal pattern of the subject (spectator), which temporarily suspends his imaginative world to enter into the action project of the other (the performer). The spectator integrates the other's motor experience into his own flow of awareness. Therefore, within the context of studies on live arts (even when mediated technologically), we are facing an important passage: the neurosciences offer us indications – evidently not models, just as

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physiology was not a model to define movement – on the ways the spectator receives the experience (Sofia, 2013, p. 34-45).

From the spectator's outlook, therefore, empathy is the manipulation that operates on their viewpoint from the observation of the performer's body in movement. As Berthoz and Jorland recall in the volume they edited, empathy takes shape according to a gradation principle that mainly concerns two closely connected operations (Berthoz; Jorland, 2005): a) the mental simulation of the subjective perspective of the other person under observation; in other words, this means temporarily placing oneself within the other's sphere of reference. Due to this shift, we gain access to his intentions, the world of his imagination. It is through this mechanism of anticipation that we can understand how the activation of the performer's gesture or the pulsation of his muscle points towards the execution of a certain type of movement rather than another; b) consequently, this implies a movement resonance: observation unintentionally produces in the spectator various anticipatory postural adjustments (pre-movements). The spectator finds himself simulating the performer's movements inscribing in his own muscles the trajectory that the latter is impressing on his muscles, in a kind of gravitational contagion. Following up this principle, we can say that, on the basis of recent neurophysiologic discoveries, we have empathy exclusively where the movements executed are a biomechanical possibility.

This aspect is very important because it takes issue with the possibility of empathy receipt towards synthesis bodies whose resolution is given on the basis of mathematical algorithms obtained from the process of motion capture (*MoCap*) – i.e., through the capture of a performer's physical movement given in terms of computer data. This leads us to a further observation: having before his eyes only kinematic information on a biological body in movement (a track obtained through motion capture or, in the vocabulary of Martine Époque and Denis Poulin from LARTech in Montreal, the *signature motrice*), the spectator is led to recognise it, but also to live it as an experience; an exploration carried out by the spectator in the kinaesthesia – and therefore in the intention – of the performer observed. It means to enter literally into the *fiction* of the other, into his capacity to imagine and project the action: the spectator looks and what he sees echoes all through his corporeity (Époque; Poulin, 2013, p. 249-250).

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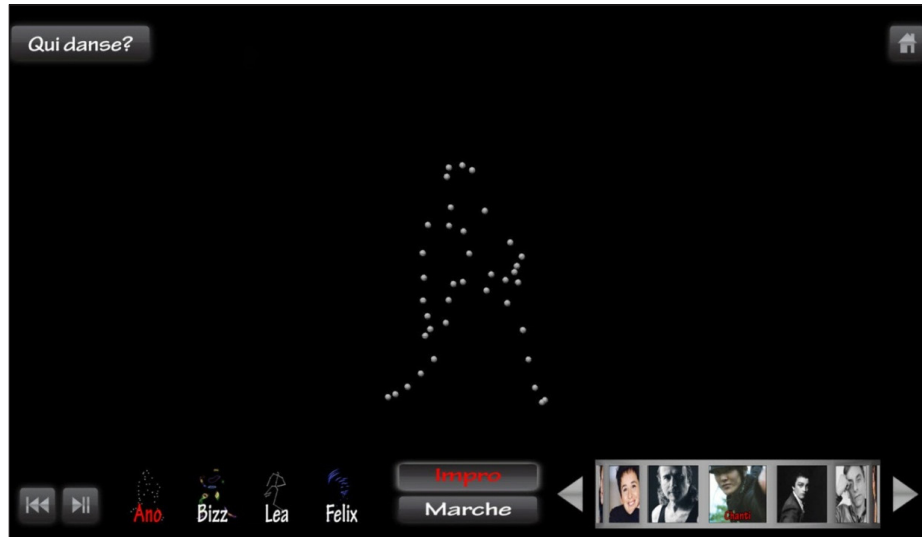Available at: <http://www.seer.ufrgs.br/presenca>

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Image 8 – Martin Époque and Denis Poulin (LARTech), *Galerie de Signature Motrice*, 2012.
Photo: Denis Poluin/Lartech.

We are moving along a narrow pathway, through an unexplored territory that leads us to reflect on a phenomenon making the observer's kinaesthesia consistent with the performer's kinaesthesia, through the recognition of his bodily movement, of his trajectories: this passes through a form of simulation (*recognition*) of the gesture enacted, which activates a survival on the level of the spectator's motility (Sofia, 2013).

Within this framework we can conclude by stating that observation is a form of mental translation of the other's – the performer's in this case – project that depends on a simulation – such as the incarnate simulation Gallese mentions – of the action under observation. In this transfer, in this temporarily taking the place of the other, the understanding founded on observation of reality becomes the motor for recognition founded on simulation (Gallese, 2007, p. 2011). It is through this passage that the survival of the body perceived becomes an effect of presence that comes into being in the spectator's body: in a new perceptive disposition and in his muscular memory.

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Notes

[1] This is an Italian original and unpublished text, the English translation by Andrea Pitozzi.

[2] In an interdisciplinary perspective we can identify some key aspects of the relationship between performance studies and neuroscience, and summarize them as follows: a) to investigate the body: true principle of knowledge; b) to highlight the way perception works and, consequently, its role in defining the gesture from a physiological standpoint; c) to introduce the movement from physiology to choreography; d) to redefine strategies that consider perception differently; e) neurophysiology, along with cosmology, mathematics or even computer engineering adopted to analyse movement, allows both for the choreographer and the performer to explore new fields of research, and to imagine innovative strategies for their work (what we will call *choreo-intuitive movement*); f) as for the audience, this interdisciplinary approach represents a starting point to analyse the way reception works.

[3] We already know that to be *attentive* means to adopt a mechanism where the action is anticipated, a mechanism starting from our actions and intentions, and able to shape the world.

[4] *Posture* indicates a potential action, it prepares for action: it is a geometry of consequences. If perception can change posture, so posture modifies perception in a *feedback* circuit.

[5] Regarding *motion capture* devices, we can summarise their main purposes as follows: a) capturing the movement into a room with twenty-five infrared cameras; b) captors positioning on dancer's body; c) movements recording by means of a computer; d) conversion of obtained data to an *avatar* composed on the basis of the human anatomy; e) composition of a graphic trace based on the conversion of data into a dance score. Tension between the two dimensions is very clear: the more the movement is complex and articulated on the physical side, the more accurate will be the set of data to compose the performer's digital movement. To have further information about these elements see physiological experiments by Johansson (1973; 1975).

[6] This aspect is similar to the *mental training* that means to *imagine* the performed gesture. This prepares the brain to the actual execution of elementary actions. A research group has proved that muscles involved in this imaginative act develop through this training, which is a sort of physical training through the mind. Simulation, thus, already holds *rules* and *instructions* that anticipate the cinematic of the action itself (Jeannerod, 2009, p. 108; 2009, p. 113).

[7] This process work has found a development with the residence, in November 2013, with the *Flesh Waves, phase #4* at the project *Collective Body – Corps Collectif* at the festival of electronic arts CYNETART of Dresden; see <http://creationcollectivebo.wix.com/corpscollectif>. Accessed on: 03 aug. 2013.

[8] To consult the archive, go to: <http://www.lartech.uqam.ca/collection.htm>. The project has been financed by the Fond Québécois de Recherche sur la Société et la Culture (FQRSC, 2006-2010).

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⁹ Marc Boivin, Sophie Corriveau, Sylvain Émard, Ginette Laurin, Louise Lecavalier, Manon Levac, Robert Meilleur, Ivana Milicevic, José Navas, Sylvie Pinard, Daniel Soulières, Philippe Vita, and Chanti Wadge.

¹⁰ Similarly to what happens for science, one can have a perceptive *feedback* through technology: it is possible to reorient the brain in *real time*, and the Functional magnetic resonance imaging (fMRI) can be successfully used in *biofeedback* practices. Thanks to an acoustic and visual feedback, the dancer is able to control the sensorial response, and consequently, to modulate the gesture (Bihan, 2012, p. 89). Such a statement shows that consciousness is slower than movement. Its specific aim – according to Jennerod – is that of ensure the identification of a self as the actual executer of the action. "The self minimal is a silent background for the control of a coherent development of events planned and determined on another level" (Jeannerod, 2009, p. 224). So, the operative role of consciousness is different: it is that to ensure the relation between an uncertain beginning of the action and its visible outcome. By this relation, the actors (the performers) can recognize themselves as actual executors of the action.

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This unpublished text, reviewed by Ananyr Porto Fajardo, is also published in Portuguese in this issue.

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