

Choreographic Objects

Abstractions, Transductions, Expressions

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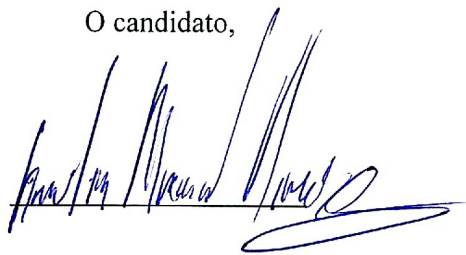
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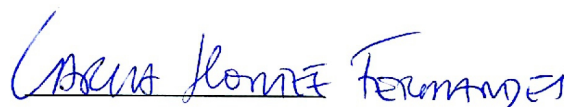
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A orientadora,



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*This work is dedicated to the infinity of potentials reserved in life,
and to all those who committedly resist becoming disconnected from it.*

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CHOREOGRAPHIC OBJECTS

ABSTRACTIONS, TRANSDUCTIONS, EXPRESSIONS

CARLOS MANUEL CARVALHO SANTOS OLIVEIRA

ABSTRACT

KEYWORDS: Expanded Choreography, Process Philosophy, Dance and Technology, Choreographic Knowledge, Digital Media, Transductive Thought.

The present text attests a speculative tentative to define choreographic objects. Not only is this to be done by looking into a series of study cases, but also by looking so with a major concern: if such are the objects of choreographic knowledge, how can they be created anew? On the one hand, since all the cases discussed express knowledge by digital means, this question of novelty is to be framed by the “encounter between dance and technology”. On the other hand, since novelty is a potential outcome of process, this question is to be framed by the ontogenetic concerns of process philosophy.

The method of inquiry here essayed can therefore be said to be an encounter in itself. To bring the encounter between dance and technology into contact with the conceptual framework of process philosophy is to problematize their potential relation and, in this way, to create conditions for resolving such problems into the form of propositional cases of solution. According to this, the encounter between dance and technology is itself a field of problematic relations. In the cases discussed, it attests the resolution of problems between dancing bodies and digital machines with each novel expression of choreographic knowledge. When looked upon by the ontogenetic concerns of process philosophy, these choreographic expressions are but particular cases of solution with regard to problems between potentials. Potentiality is therefore understood to be not only a fundamental condition of novelty but also the general field of relatedness in regard to which determinate cases stand as particular solutions. As such, to resolve a problem is always to propose one of its many potential solutions. To resolve the general question of novelty in the encounter between dance and technology is to express its potentials in the form of propositions. This is neither induction nor deduction, but rather transduction.

As a mode of thought, transduction will also be argued to be characteristic of choreographic transmission. If a choreographic object is to be created anew, it needs to be transduced from the milieu of potentials wherein the knowledge of dance has formed. Transduction operates the passage between states of knowledge by moving the milieu and affecting in this way what is known with what is not (i.e. undetermined potentials). In this sense, choreography cannot be but an encounter between dance and technology: it structures the knowledge (*logos*) of dancing (*tekhné*) in determinate and transmittable ways. Because of this, it will be here contended that choreographic objects are both diagrammatic and algorithmic. Even before being expressed, they are structured in abstraction, i.e. diagrammatically. And they can only be expressed in different milieus because their structure is resumable, i.e. algorithmic. For this reason, the digital milieu presents itself as a most adequate medium to express choreographic knowledge. Notwithstanding, here, the question of novelty remains: how should the potentials of digital choreography be thought? By following such problem, this study will propose that the algorithmic computation of choreographic ideas is necessarily pervaded by incomputabilities and that novelty can be prompted by saturating the relationship between structures and potentials or, in other words, between what is known and the unknowable.

OBJECTOS COREOGRÁFICOS

ABSTRACÇÕES, TRANSDUÇÕES, EXPRESSÕES

CARLOS MANUEL CARVALHO SANTOS OLIVEIRA

RESUMO

PALAVRAS CHAVE: Coreografia Expandida, Filosofia do Processo, Dança e Tecnologia, Conhecimento Coreográfico, Media Digitais, Pensamento Transdutivo.

Esta tese tem por fim não só definir as principais características dos objectos coreográficos, mas também determinar como pode o conhecimento coreográfico ser expresso com novidade. Por um lado, porque todos os casos aqui estudados expressam conhecimento por meios digitais, tais especulações serão enquadradas pelo “encontro entre a dança e a tecnologia”. Por outro lado, porque a novidade resulta necessariamente do desenvolvimento de processos, tais especulações serão enquadradas por uma série de questões fundamentais da filosofia do processo.

O método de pesquisa aqui seguido é, sucintamente, um encontro em si mesmo. Ao colocar a filosofia do processo em contacto com o encontro entre a dança e a tecnologia este método problematiza as relações que potencialmente daqui resultam e, com isto, estabelece as condições necessárias para que tais problemas sejam resolvidos na forma de proposições. Neste sentido, o próprio encontro entre a dança e a tecnologia é problemático. Nos casos aqui estudados, cada nova expressão de conhecimento afirma a resolução de problemas na relação entre corpos dançantes e máquinas digitais. Da perspectiva da filosofia de processo, tais expressões são soluções particulares relativas aos problemas potenciais. A potência é assim entendida tanto enquanto condição fundamental da novidade como enquanto capacidade geral de relação. Com isto, a resolução de um problema corresponde sempre à expressão da sua potência na forma de uma proposição. Isto não é nem indução nem dedução. É transdução.

Enquanto modo de pensamento, a transdução será aqui afirmada como característica fundamental da transmissão coreográfica. Ou seja, para um objecto coreográfico ser novo, necessita de ser transduzido juntamente com o meio em que o seu conhecimento se formou. A transdução opera assim a passagem de um estado de conhecimento a outro, mobilizando um meio potencial que afecta o que é sabido com o que não se pode saber (i.e. as potências, porque são indeterminadas). Neste sentido, a coreografia em si mesma não pode senão resultar de um encontro entre dança e tecnologia. A coreografia estrutura o conhecimento (*logos*) do dançar (*tekhné*) de maneira determinada e transmissível. Por isto mesmo, será proposto que os objectos coreográficos são tanto diagramáticos como algorítmicos. Ou seja, mesmo antes de serem expressos, estes objectos são estruturados em abstracto, i.e. diagramaticamente. E podem apenas ser expressos em diferentes meios devido à iterabilidade da sua estrutura (i.e. são algorítmicos). O digital coloca-se então como meio optimamente adequado à expressão do conhecimento coreográfico. Não obstante, aqui, a questão da novidade permanece: como entender as potências da coreografia digital? Ao seguir tal problema, este estudo proporá que a computação algorítmica de ideias coreográficas é necessariamente infectada por incomputabilidades, e que a novidade pode ser facilitada com a saturação das relações entre estrutura e potência ou, por outras palavras, entre o cognoscível e o incognoscível.

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LIST OF ABBREVIATIONS

CD-ROM	Compact Disk Read-Only Memory
CLA	Choreographic Language Agent
CT	Creation Tool
DS DM	Double Skin Double Mind
ECHO	Enhancing Choreographic Objects
EM PC	Emio Greco Pieter Scholten
GF	Gesture Follower
GUI	Graphical User Interface
HMM	Hidden Markov Models
IMK	Inside Movement Knowledge
IT	Improvisation Technologies: A Tool for the Analytical Eye
KB	Knowledge Base
MB	Motion Bank
NRP	Notation Research Project
NTTF	No Time to Fly
OFT _r	One Flat Thing, reproduced
RAM	Reactor for Awareness in Motion
SO _f OFT _r	Synchronous Objects for “One Flat Thing, reproduced”
TKB	Transmedia Knowledge-Base for the Performing Arts
VAT	Video Abstraction Tool

CHOREOGRAPHIC OBJECTS

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INTRODUCTION

The recent years have witnessed a growing number of research projects that, either stemming from the side of academic and scholarly work or from the side of artistic practices and the various types of economy in which these exist, strive for asserting choreographic knowledge in yet unexplored ways.¹ This is a growth that can be said to manifest a general intent of proliferation, an expansion towards a larger diversity in practices, knowledge and networks, and towards a better adequacy of all of these to the fast-paced changing economic environment. Together with the establishment of a globalized, distributed and networked cognitive capitalism, the production of choreographic knowledge has been changing towards novel forms of expression. With this, not only have these projects been contributing to the overall and ongoing expansion of choreographic practices, but they have also been expanding the very notion of choreography.

One exemplary assertion of this expansion was the conference “*Expanded Choreography: Situations, Movements, Objects ...*”, which occurred on the occasion of the exhibition “*Retrospective*” by French choreographer Xavier Le Roy at the Fundació Antoni Tàpies, in Barcelona, March 2012. Devised by Mårten Spångberg and co-organized by the University of Dance and Circus Stockholm, the Museu d'Art Contemporani de Barcelona (MACBA), the Fundació Antoni Tàpies, and the Mercat de les Flors, with the support of the Swedish Research Council and the Swedish Arts Grants Committee, this conference was intended to “introduce different perspectives and locate a departure point for a discourse particular to choreography as an expanded practice, away from artistic research and into other worlds”. Following from the diagnosis that choreography is already “turning away from established notions of dance and its strong association with skill and craft, to instead establish autonomous discourses that override causalities among conceptualization, production, expression and representation”, this conference strived to affirm how choreography exceeds, on the one hand, being just “a set of protocols or tools used in order to produce something predetermined, i.e. a dance” and, on the other hand, being “*a priori* performative, [...] bound to expression and reiteration of subjectivity”. In contrast to these perspectives, the conference served as a platform to affirm choreography both as an “an open cluster

1 A list of paradigmatic examples can be found at the online knowledge-base of the “*Motion Bank*” (<http://motionbank.org/en/content/knowledge-base>), a project which will be discussed in Section 5.2.

of tools that can be used in a generic capacity for both analysis and production” and as “an expanded practice, a practice that is political in and of itself”. A statement made against a background of knowledge fields², which were summoned to set the conference off to explore how “Situations, Movements, Objects ...”, and all the more that the ellipsis holds in potential, can express choreography beyond what choreographers traditionally do.³

It is from the equation made here between choreography's expansion and its politics that this study has proceeded. And not just in any way. For it is its contention that such equation problematizes the affective conditions of knowledge production and the effects of its circulation. Despite expanded choreography's proffered disassociation from skill and craft, its instantiations necessarily implicate an epistemological dimension in process. The assertion that choreography is no longer bounded to the expression and reiteration of subjectivity can therefore be understood from the viewpoint of knowledge's political dimension. A knowledge that is neither a stable reality nor an immutable set of axioms, but rather an intricate dynamism of affects and effects in the political realm of the social. A knowledge that, in sum, is the trans-subjective resolution of a series of problems constitutive, in this case, of choreography.

In parallel to the conference's activities, Xavier le Roy's “*Retrospective*” stood as an example of what an expanded choreography can be like.⁴ Perhaps unavoidably, the whole exhibition revolved around the transmission of knowledge and its political conditions. Meaning that, by bringing choreography into the art gallery, Le Roy conveyed the necessary conditions for his work to be presented not only as performance, but more fundamentally as an interface for the transmission of

2 Some of the conference's speakers were: performance theorist and practitioner Bojana Cvejić, art historian Dorothea von Hantelmann, philosopher Graham Harman, curator Ana Janevski, dance scholar and performance theorist André Lepecki, choreographer and performer Xavier Le Roy, curator and theorist Maria Lind, dance researcher Isabel de Naverán, media theorist Luciana Parisi, dramaturge and performer Goran Sergej Pristaš, choreographer and theoretician Mårten Spångberg, sociologist Francisco Tirado, and curator and dance researcher Christophe Wavelet.

3 All quotes retrieved 24/03/2014, from the conference's webpage, at the Museu d'Art Contemporani de Barcelona's website (www.macba.cat/en/expanded-choreography-situations).

4 At the choreographer's website one can read the following description of this exhibition: “*Retrospective*’ by Xavier Le Roy is an exhibition conceived as a choreography of actions that will be carried out by performers for the duration of the exhibition. These actions will compose situations that inquire into various experiences about how we use, consume or produce time. This exhibition employs retrospective as a mode of production rather than aiming to show the development of an artist’s work over a period of time. It seeks to recast the material from the solo choreographies in situations with live actions where the apparatuses of the theatre performance and the museum exhibition intersect. Based on solo works by Xavier Le Roy created between 1994 and 2010, the work unfolds in three time axes: the duration of the visit composed by each visitor, the daily basis of labor time of 16 performers and the time of the growth of a new composition during the length of the exhibition.” Retrieved 14/02/2014, from www.xavierleroy.com.

choreographic knowledge. In this sense, “*Retrospective*” can be said to be a sort of performative knowledge base, one that is charged with potentials belonging to the choreographer's work and that, instead of foreclosing the experience of the work with a predetermined set of definitions, allows for these potentials to resolve into expressions explicitly determined by the political conditions of their context of occurrence.

With “*Retrospective*”, Le Roy proposes different ways for the memory of some of his previous works (notably, a series of solos) to be reactivated. Not for re-enacting any sort of identity proper to each work, but for allowing these works to be rediscovered and, ultimately, known anew. In “*Retrospective*”, what is exhibited together with some documental registers of Le Roy's first performances, are sixteen performers to whom the knowledge of these works has been transmitted. Each of them is then capable of re-enacting the potentials of what they know and, together with the visitors, discover what choreography can do.⁵ For the duration of the exhibition, the performers' remember Le Roy's works by conversing with visitors, by re-enacting scores and performing dances, by showing artifacts related with the work, and other actions of this kind. Perhaps precisely because of being like a performative knowledge base, “*Retrospective*” has been argued by dance and technology scholar Johannes Birringer to be an exhibition that epitomizes the principles of expanded choreography. In his words: “this exhibition proposed to investigate new discourses specific to dance/choreography, but also to the curatorial remit, challenging us to connect a body of work to research processes and reinterpretation-as-production, i.e. approaching specific structures and strategies of performance disconnected from subjectivist bodily expression, style and representation – re-transforming them from a set of protocols or tools used in order to produce something predetermined (a dance) to an open cluster of tools that can be used in a

5 This question, “What can choreography do?”, was taken up by choreographer and theoretician Petra Sabisch as a guideline to write the book “*Choreographing Relations: Practical Philosophy and Contemporary Choreography, in the Works of Antonia Baehr, Gilles Deleuze, Juan Dominguez, Félix Guattari, Xavier Le Roy and Eszter Salamon*”. “Rather than delimiting the field of choreography to a definition of what choreography is – definition which then functions as prescriptive exclusion of that which choreography can also be, this book attempts to stretch ontology to the capacity of choreography, which is expressed in the practical question: *what can choreography do?* By shifting the focus from an inventory of the empirically given to the potential of choreography, a potential which encompasses the capacity of creating new relations, a stable demarcation of the object of choreography can be deviated from. This is a key aspect to an onto-ethical agenda of choreography: to unfold with precision that which choreography actually *does* as a *can-do*-determination of what choreography *is*. The question what can choreography do thus opposes the predetermination of choreographic operations and their generalization into a static and merely actual image of choreography's ontology. A consideration of the ontological modes of existence of choreography requires an analysis of the specific procedures of choreographies whilst encompassing, simultaneously, the genetic conditions through which their 'doing' comes into being and provides new options. Depriving the ontology of choreography of the ethical aspect of what can choreography do means to subtract from choreography the power to let new relations emerge and to divest from philosophy the capacity to explain the conditions of the new.” (2011, p. 8).

generic capacity for both public observation/analysis and production” (2013, p. 10).

That for Birringer the generic capacity of choreography for analysis and production is public should be understood as a recognition of this exhibition's capacity to individuate knowledge in a trans-subjective and processual way. In other words, it individuated instances of knowledge that were not given in advance, but which instead resulted from potentials and possibilities that could only be activated under the condition of a political relationship between all implicated agents (including, of course, choreographer, performers and visitors). Together with expanded choreography's disconnection “from subjectivist bodily expression, style and representation”, what is put at stake is the very substance of choreography. As with the question “What can choreography do?”, the focus here moves from a substantialist and ontologically deterministic approach to choreography (i.e. choreography being this or that closed set of unchanging attributes) to an exploration of how, with each event, choreography can become not only what is known to be capable of becoming but also what cannot be known in advance.

Implicitly, it is here being suggested that the political dimension of any technical process whatsoever—including choreographic ones—is a necessary condition for the constitution of knowledge. In other words, it is being suggested that the political dimension of affect and relation precludes knowledge from being only individual (i.e. subjective or objective) and instead introduces at its very definition a transindividual (i.e. trans-subjective and transobjective) dimension. The political should thus be here understood as corresponding to conditions which allow for the formation of a transindividual whose knowledge is characteristically processual. A knowledge that is not given in advance, completely, but that corresponds instead to a collective field of potentials from which both reactivations and novel experiences can emerge.

From this standpoint, it matters to indicate that it is precisely from the perspective of the transindividual character of knowledge that this study will approach choreography and its potentials to expand, i.e. to become something else than what it already is or has been. If a political non-subjectivity can be said to characterize expanded choreography, it is because the political can be conceived without recourse to constituted subjects and objects. Or, which amounts to the same, it is because the political is constitutively transindividual, always in process and exceeding any perspective standpoint that from it and in it might emerge. Transindividuation cannot be conceived but from a political point of view, one that in turn must be conceived as the

affective reality of relation. This reality does not require pre-constituted subjects and objects, for it corresponds to process itself. Process, here defined as a dynamic whole where virtuality verges towards actuality and actuality towards virtuality, can very well occur without any sort of cognitive apprehension. The emergence of correlated subjects and objects in a process of transindividuation is but one way for the latter to be realized. In this one way, knowledge individuates amidst the excess of process's creative potentials. It cannot but be embedded in the field of creative potentials from which it results and in relation to which it remains; not as an unchanging reality, but rather as the dynamic unity of subjective and objective standpoints. Once this unity is disrupted by the excessive forces of process, knowledge transforms. And, together with it, so do its subjects and objects (which are just circumstantial perspectives of one particular relationship attained by the ongoing dynamisms of process). Hence, it is from process's perspective that both subjects and objects must be tackled. For they are in process, embedded in it, rather than the opposite. This is their political reality.

Regarding process's excess of potentials over constituted individuals, it was Gilbert Simondon (1969, 2005)—the French philosopher who in the fifties and sixties engaged in reactivating the philosophy of individuation, in order to deal with contemporary issues such as the rise of machines and the relationship between culture and nature—who consistently developed not only a theory of transindividuation but also a conflation of ontology and epistemology, positing that knowledge can only form by means of that same process. Knowledge is therefore said to result from the same relation from which individuals derive, a transindividual relation with the capacity to generate and connect different perspective standpoints.

Simondon's philosophy has been a guideline for the inquiry synthesized in this text. It has offered a conceptual framework to approach choreography as a system of potentials and to inquire into the processes by means of which choreographic knowledge is constituted. In contrast to other theoretical standpoints, such as idealism and realism, Simondon's theory of individuation offers the possibility of taking that which most fundamentally defines expanded choreography—i.e. potentiality as such—to be a necessary condition for the constitution of knowledge (which is also the transindividual co-constitution of its subjects and objects). As such, it will be argued here that the political transindividuation of choreographic knowledge can only be understood together with a constitutive field of potentials, i.e. a field that pervades individuals to the point of being the very ground of their relation.

To think the expansion of choreography potentially corresponds to thinking how the different contexts where knowledge is produced and transmitted condition these same processes. It is to think how a field of relations transports potentials that, though undetermined, allow for knowledge to emerge in determinate ways. Xavier Le Roy's "*Retrospective*" can be situated at the intersection of different contexts where choreography has been expanding. There is the context for which re-enactment is only one possible designation—the re-enactment of previous performance art works—, there is the context of the encounter between dance and the museum—by means of which dance is brought into spaces traditionally dedicated to the visual arts—, and there is the context of remediation⁶—the one making use of media other than performance to convey choreographic knowledge. In each of these contexts, choreography is reaching beyond what is known to be and towards the constitution of novel instances of knowledge. In many cases these contexts overlap: re-enactments have occurred at art galleries but they also have occurred at theatres; theatres on their turn have received the occurrence of durational events, the character of which is closer to art exhibitions than to traditional theatrical formats; the remediation of choreographic knowledge has been used both to set up exhibitions and to create theatrical performances; in turn, both exhibitions and theatrical performances have sourced the creation of remediated archives and transmedia knowledge-bases. It is against this background that this study must be situated. It is in relation to this variety of expansions that it must be thought. For if it can be read as a thesis, then it is one about the transformative capacities of choreography. In order to facilitate this, a commentary on each of these contexts will now follow.

If seen as a context that has been growing throughout the last ten to fifteen years, the wave of re-enactments in dance and choreography can be pinpointed as having had a marking beginning when, in 1994, the French constellation of dance-related artists designated as Quatuor Albrecht Knust⁷ performed what were by then somewhat forgotten choreographies, notably by Doris Humphrey and Kurt Jooss. In this particular case, there were scores written in Labanotation⁸ that allowed for the works to be re-

6 To name this context in such a way is to frame it under the auspices of new media theory, as this has been formulated by Jay David Bolter and Richard Grusin in their famous book "*Remediation: understanding new media*" (1998).

7 The Quatuor Albrecht Knust included, at different moments of its life span, artists such as Christophe Wavelet, Jerome Bel, Xavier LeRoy, Boris Charmatz, Emmanuelle Hyunh, Anne Collod, Dominique Brun, Simon Hecquet, Martha Moore, Matthieu Doze and Alain Buffard. Notably, Albrecht Knust is the name of a renowned German dancer, choreographer and Labanotation specialist, who lived between 1896 and 1978.

8 As explained by Labanotation specialist Ann Hutchinson Guest, "Labanotation, or Kinetography Laban, is the system of recording movement originated by Rudolf Laban in the 1920's. By this

incarnated and performed again (Burt, 2004). By the same token, the Quatuor reconstructed, in 1996, both Steve Paxton's "*Satisfyin' Lover*" (1967) and Yvonne Rainer's "*Continuous Project Altered Daily*" (1970), and finally, in 2000, three versions of "*L'Après midi d'un faune*", outsourced from Vaslav Nijinsky's choreographic notations of the piece, in a single work titled "*...d'un Faune (éclats)*". From this moment onwards, a series of seminal examples engaged in reactivating iconic choreographic works from dance's history can be found. Drawing from Quatuor Albrecht Knust's experience, the French choreographer and dancer Boris Charmatz has curated, in 2000, an open air event at Annency, in the French Alps, named "*Ouvrée – artistes en alpage*" (in the guise, it could be said, of the same kind of event that Rudolf Von Laban used to organize at Monte Verita). Here, pieces such as "*Feierlicher Kanon*" (1933) by Grete and Harry Pierenkämper, and "*Die Welle*" (1935) by Albrecht Knust, were too reinterpreted with the aid of Labanotation scores. In 2001, dancer and by now most influential British-German artist Tino Sehgal, performed an "*Untitled*"⁹ piece that, while being announced as a "museum of dance", instead of artifacts and concrete objects, exhibited movements and gestures from iconic western dance styles of the twentieth century. More recently, in 2008, French dancer Anne Collod, one of the members of the Quatuor Albrecht Knust, dedicated herself to the remaking of "*Parades and Changes*", a 1965's piece by Anna Halprin. From the same year, two other pieces produced in Germany are worth noting: one is Ecuadorian dancer Fabian Barba's "*Schwingende Landschaft*", a reinterpretation of Mary Wigman's seven solo pieces from 1929; the other is German dancer and choreographer Martin Nachbar's "*Urheben Aufheben*", a revival of Dore Hoyer 1962-64's dance series "*Affectos Humanos*". Even more recently, in 2012, Spanish dancer and choreographer Olga de Soto realized a

scientific method all forms of movement, ranging from the simplest to the most complex, can be accurately written. Its usefulness to dancers is obvious. The system has also been successfully applied to every field in which there is the need to record motions of the human body – anthropology, athletics, and physiotherapy, to name just a few." (1977, p. 6). Further, scholar Natalie Lehoux has recently described it in the following way: "Labanotation is documented on vertical staffs that are read from bottom to top [...]. The staffs are made up of three lines that are divided by a centreline, to indicate the left and right side of the body. This results in a visual representation of the symmetry of the body in which each column of the staff is reserved for a specific body part. Information pertaining to the time, direction, level and specific body part, which perform movement, are contained within a single Labanotation symbol [...]. This is identified by the particular shape, shading and size of each symbol. Hutchinson Guest (1977) tells us that such an economy of information cannot be found in other notation systems. Labanotation represents the duration of movement through the length of its symbols that is proportional to the time it takes to perform. The design of a system that embodies elements of time in this manner eliminates the need for a visual reference to a musical score alongside the movement notation." (2013, p. 162).

9 It is worth noting that this was the last work Tino Sehgal created for theatre before he moved into visual arts. Moreover, recently (twelve years after), this piece was presented in the form of three different solos performed by dancers Andrew Hardwidge, Frank Willens and Boris Charmatz.

research-creation titled “*Débords: Reflections on The Green Table*”, which, as the name indicates, took Kurt Jooss's piece as its focus of concern.

The engagement with the re-enactment of canonic choreographies is not exclusive of artists. Institutions have been, to a large extent, responsible for creating the conditions for them to do so. One very good example of this is the recent Tanzfonds Erbe, a funding initiative by the German Federal Cultural Foundation that, running since 2011, has been intending to “support the reconstruction and restaging of classic [German] dance works from the 20th century and making them available to audiences.”¹⁰ Olga de Soto's “*Débords ...*” has been one such piece.¹¹ By staging video recordings where different interviewees talk about their experience of the piece, from its creation in 1934 up to today, “*Débords ...*” demonstrates how much the revisitation and restaging of historical works does not need to reproduce what they looked like, but can instead render a creative archaeology of mnemonic instances. In fact, all the works mentioned so far do this. None of them is a simple function of reproduction. Rather, they are critical archaeologies of the memories at stake. And it is precisely to this kind of critical approaches to memory and history that funding initiatives such as the Tanzfonds Erbe have been dedicated.

Other curatorial initiatives of this sort, such as conferences and symposia, but also theatrical programmes dedicated to the general themes of re-enactment and the archive in contemporary dance and performance, can be listed as follows: the “*re.act.feminism*” curatorial project, which started in 2009 with an exhibition at the Akademie der Künste, in Berlin, and continued as a “performing archive, a growing archive and exhibition project on feminism and performance art travelling through Europe, from 2011 to 2013”¹²; the symposium “*Archive/Practice*”, which took place at the Dance Archive in Leipzig, in 2009; also in the same year, the “*Re-constructions and Re-imaginings*” event at the Performance Space in New York; the research project “*Performing the Archive: The Future of the Past*”, hosted from 2009 to 2012 by the University of Bristol Theatre Collection's Live Art and focused on developing “the interrelationship and interactivity between the archives and the communities of practitioners and scholars: to extend how academics and artists use documents of performance to inflect and inspire their own particular concerns”¹³; the 2010's

10 Retrieved 25/10/2014, from <http://www.tanzfonds.de/en/projekte/geofoerderte-projekte-erbe>.

11 A list of projects supported by the Tanzfonds Erbe can be found at the following web address: www.tanzfonds.de/en/projekte/geofoerderte-projekte-erbe.

12 Retrieved 25/10/2014, from www.reactfeminism.org.

13 Retrieved 25/10/2014, from http://www.bris.ac.uk/theatrecollecton/liveart/liveart_GWR_project.html

“*Re:Move*” festival at the Kaai Theater in Brussels, dedicated to “presenting performers who make transmitting or reconstructing dance the subject of their production”¹⁴; the “*Re-mix*” cycle, at the Komuna Warszawa, in Warsaw, which ran from 2010 to 2012, and which “consisted of new productions that refer to classic works, primarily of theatre and dance, but also literature and film”¹⁵; and more recently, in 2013, the “*Sacre 100*” festival, at the Hebbel am Ufer theatre, in Berlin, exclusively dedicated to restagings of Les Ballets Russes' production “*The Rite of Spring*”.

Some of the works presented at the “*Re:Move*” festival are as marking to the context of choreographic re-enactments as the ones already listed. Some notable works are: Xavier Le Roy's restaging of Igor Stravinski's orchestral work “*The Rite of Spring*”, which instead of reviving Nijinsky's choreography, allowed for the choreographer himself to dance to the music as if he was conducting an orchestra; Boris Charmatz's “*Flip Book*”, a dance performance made from a series of photos included in the book “*Merce Cunningham: Fifty Years*”, by David Vaughn; British dancer and choreographer Rachel Krische's re-adaptation of a solo by Deborah Hay; and French choreographer Jérôme Bel's biographical staging of dancer Lutz Förster's experiences while working with Pina Bausch.

As these references suggest, some choreographers have been busy with dance repertoires in a consistent and iterative way. Beyond the already mentioned projects by Xavier Le Roy and Boris Charmatz, Jerome Bel has been an important figure in what regards the staging of dance history. In a series of pieces dedicated to the self-presentation of remarkable performers, Bel has managed to provide the audiences with insights into the singular life of dancers. Notable examples are: “*Véronique Doisneau*”, commissioned from Bel by the Paris Opera in 2004 (where the ballet dancer with the same name tells the audience stories from her dance career); “*Isabel Torres*”, a show in the guise of the previous one, but with the Brazilian dancer; “*Pichet Klunchun & Myself*”, a dialogue between Bel and the traditional Thai dancer Pichet Klunchun; the already mentioned “*Lutz Forster*” show; and “*Cédric Andrieux*”, a solo piece for and with Lyon Opera's dancer Cédric Andrieux, who danced for a long time with the Merce Cunningham's dance company.

Another remarkable project focused on choreographic transmission was the “*Solo Performance Commissioning Project*”, by American choreographer and dancer Deborah Hay, running from 1999 to 2012. In this project, “[d]ancers commissioned a

14 Retrieved 25/10/2014, from www.kaaitheater.be/en/f17/re-move?p=extra&lang=en.

15 Retrieved 25/10/2014, from <http://komuna.warszawa.pl/1998/12/12/re-mix-cycle-20102011>.

solo dance from Deborah Hay. She guided and coached them in the performance of the solo during an 11-day period in a residency setting. At the conclusion of the residency each participant signed a contractual agreement to a daily solo practice of the new piece, for a minimum of three months before their first public performance.”¹⁶ Rachel Krische was one of these dancers. She learned from Hay the solo “*The Swimmer*”, which she presented at the “*Re:Move*” festival.¹⁷

This list of initiatives, from artistic projects to curatorial ones, is not intended to be comprehensive of the context of choreographic re-enactments. It has the sole purpose of demonstrating the large investments that have been recently made by the dance community to deal with its own history. Another perspective that reflects this great investment regards theoretical practices and scholarly work. The context of re-enactments has been extensively discussed by scholars such as Gabriela Brandstatter (2000), Diana Taylor (2003), Myriam van Imschoot (2005), Rebecca Schneider (2011), Inge Baxmann (2007), André Lepecki (2010) Amelia Jones and Adrian Heathfield (2012), amongst others. Both from this perspective and from the perspective of artistic research, re-enactment is only one possible designation for this context. In fact, the variety of procedures used by artists to activate past choreographies is great and many different approaches can be depicted in them. Reactivation, re-performance, reinterpretation, revisitation, remaking, revival, restaging, reformulation, resetting, reappropriation, retrospective, retransmission, retranslation, reconstruction, reimagination, reactualization, reproduction, remix, and so on, are all possible notions for understanding what these artists and initiatives have been doing and how. Importantly, all these notions can be said to share an archaeological character. All of them perform the archaeology of choreographic sites, a methodological umbrella that allows for artists, theoreticians and institutions to not only bring into the present what has been generated in the past, but also to assure that such reactivation is to some extent performative.

The second context mentioned above regards the encounter between dance and the museum. In a way, many of the examples already mentioned fit into this category. The fact that Tino Sehgal conceived his 2001's “*Untitled*” piece as a “museum of dance” can be seen as corresponding to the same approach that later took him to develop an

¹⁶ Retrieved 25/10/2014, from <http://www.deborahhay.com/about.html>.

¹⁷ The “*Re:Move*” festival has shown other examples engaged in the transmission of choreographic principles between artists. American choreographer and dancer DD Dorvillier has reformulated the work of German artists deufert+plischke, Vincent Dunoyer has transmitted to five dancers repertoire that he himself had once performed, and Jonathan Burrows has also worked on the theme of translating dance.

influential series of “situations” for art galleries. Sehgal, who studied dance and economy, has not ceased imprinting in his own artistic work the mark of a choreographic thought. Furthermore, the fact that the context of re-enactments is fundamentally based on an archaeological drive, one that is engaged in creating the necessary tools, methods and dispositifs for transducing choreographic knowledge from the past into the present, attests its museological character. It attests its attunement to methods of excavation and exhibition, which are proper to the museological drive.¹⁸ Insofar as the encounter between dance and the museum shows in the latter are the re-enactments of the former, both this context and the one of re-enactments are to a large extent inextricable from one another.

A most outstanding example of how these two contexts conflate with one another can be found not in a museum of dance but in a “*Dancing Museum*”, the project initiated with Boris Charmatz's uptaking of Rennes's Choreographic Centre, in France. This is not a museum where artifacts are exhibited. It is rather one that exhibits the movements of dance, to the point of itself dancing. The character of this project, and of what is being here designated as the encounter between dance and the museum, is well conveyed in some passages Charmatz's “*Manifesto for a Dancing Museum*”. In it, the choreographer and curator writes: “We are in an exciting era in which museography is opening itself up to ways of thinking and technologies which are enabling something completely different to emerge rather than simply having exhibitions of remnants, faded costumes, models of stage settings, and rare photographs of productions. We are at a time in history where a museum can be alive and inhabited as much as a theatre, can include a virtual space, and offer a contact with dance that can be at the same time practical, aesthetic and spectacular. We are at a time in history where a museum in no way excludes precarious movements, nor nomadic, ephemeral, instantaneous ones. We are at a time in history where a museum can modify BOTH preconceived ideas about museums AND one's ideas about dance. Because we haven't the slightest intention of creating a dead museum, it will be a living museum of dance. The dead will have their place, but among the living. They will be held by the living, brandished at arm's length.”¹⁹

All in all, this is a plea for the potentials of knowledge, i.e. for the conditional

18 Here, I'm thinking of this museological drive as an archival drive—the museum as archive—, a dynamic dispositif of enunciation whereby specific regimes of visibility are conveyed. For more on the archive as a dispositif of enunciation see page 91.

19 The full Manifesto can be downloaded from www.borischarmatz.org/sites/borischarmatz.org/files/images/manifesto_dancing_museum100401.pdf.

basis of novelty in the shared ground of the political. The “*Dancing Museum*” is a site of transindividuation. It is a site where the subjects and the objects of knowledge emerge from processual and political conditions. It is a site where knowledge can emerge without being predetermined by a given model or by images of what it could possibly be like. The very conflation of dance with the museum, in the processual project of the “*Dancing Museum*”, blurs the distinction between the two to the point that dance cannot result but from an archaeological endeavour and the museum cannot be but the very process by means of which the memory of the past is made active in the present. The conflation of the two puts things into movement. By mobilizing the politics of dance, it makes of the “*Dancing Museum*” a political movement for dancing knowledge.

Recently (June-July, 2014), the “*Dancing Museum*” was a focus at the festival “*Foreign Affairs*”, in Berlin. In its program featured some examples of how the “*Dancing Museum*” is realizing its manifesto. It is enough mentioning two: the “*Expo Zéro*” and the “*20 Dancers for the XX Century*”. The latter, as the name indicates, consists of twenty dancers who, individually, “perform, recall, appropriate, and transmit solo works of the last century that were originally conceived or performed by some of the most significant modernist and postmodernist artists, dancers, and choreographers. Each performer presents his or her own museum of sorts, wherein the body becomes the primary museological container and object.”²⁰ On its turn, the “*Expo Zéro*” “is an exhibition without works: there are no photos, no sculptures, no videos, and no installations. Zero things, no stable object. There are, instead, artists. Spaces occupied by the gestures, by the bodies, by the stories and by the dances that each artist might think of.”²¹ Both projects not only exhibit dance but, like LeRoy's “*Retrospective*”, act as performative knowledge bases. They convey the necessary conditions for choreographic knowledge to be discovered anew, time and again.

The encounter between dance and the museum can be traced back to a series of exhibitions that, in contrast to Charmatz's “*Dancing Museum*”, have shown performance by means of objects. Notable examples are the exhibition “*Outside the Frame: Performance and the Object*”, at the Cleveland Centre for Contemporary Art in Ohio, in 1994, and the exhibition “*Out of Actions: Between Performance and the Object, 1949–1979*”, at the Museum of Contemporary Arts in Los Angeles, in 1998. The emphasis on

20 Retrieved 24/10/2014, from the website of the Museum of Modern Art of New York, where this exhibition has also been hosted (<http://www.moma.org/visit/calendar/events/18898>).

21 Retrieved 24/10/2014, from the “*Dancing Museum's*” website (<http://www.museedeladanse.org/fr/articles/expo-zero>).

the relation between performance and objects that these exhibitions' names indicate is somewhat telling. For if one considers the transient character of performative events and its resistance to the requirements of traditional museological exhibitions, according to which, for anything to be exhibited, it must persist throughout the exhibition's duration, then performance itself must become permanent, that is, it must be expressed in ways determined not by its own bias but rather by the bias of the context of its presentation. It is, of course, in reaction to this exercise of power of the museum over performance that a project such as the “*Dancing Museum*” stands up as an alternative. Notwithstanding, these exhibitions are a link between the conflation of dance with the museum and the context previously referred to as the one of remediation.

A recent example of choreographic remediations at the art gallery is the exhibition “*Move: Choreographing You*”, which took place in 2010 at the Hayward Gallery, in London. In order to explore “how dance has been a driving force in the development of contemporary art since the 1960s”, this exhibition presented a series of installations, sculptures, objects and scores by seminal artists in dance and the visual arts.²² Here, the visitor was invited to “become a participant – or even a dancer –” in the “choreographic objects” being exhibited.²³ The visitor could, for example, handle Lygia Clark’s “*Relational Objects*”, play around in Mike Kelley’s “*Test Room Containing Multiple Stimuli Known to Elicit Curiosity and Manipulatory Responses*”, move through the suspended rings of William Forsythe’s installation “*The Fact of Matter*”, amongst other things. To say that these objects are choreographic, even those belonging to visual artists, pinpoints their capacity to elicit movement. Not just any movement, but the movement that their own structure implies. As this study will contend, such capacity corresponds to the propositional character of choreographic objects. Objects that propose possibilities of movement as the conditional basis for the exploration of potentials and the learning of processes.

From this standpoint, the subject of this study can be now clarified: “*Choreographic Objects*” correspond to the potentials that certain political conditions have to individuate choreographic knowledge. This individuation can result from learning how to move across a room full of suspended rings (the very disposition and size of which limits the possibilities of movement and its quantitative range) or from learning a complex choreographic pattern by means of a choreographic score. In any

22 Namely, Tania Bruguera, Rosemary Butcher, William Forsythe, Dan Graham, Isaac Julien, Mike Kelley, Xavier le Roy, Mårten Spångberg, Wayne McGregor, Robert Morris, Bruce Nauman, La Ribot, Franz West, Lygia Clark, and the OpenEnded Group with Wayne McGregor.

23 Retrieved 24/10/2014, from <http://move.southbankcentre.co.uk/microsite>.

case, the individuation of choreographic knowledge corresponds here to the transmission of potentials and possibilities of movement. Choreographic objects allow both for a choreographer to express thoughts and for a dancer to learn how to move accordingly. Choreographic objects will thus be argued to correspond to the vectorial arrangement of forces by means of which what is potential in thought, i.e. in a choreographic thought, is transmitted to bodies capable of learning anew how they can move.

Here implied is the fact that an object can be both concrete, such as the ones exhibited at the art gallery, and abstract, such as the virtual image of a choreographed dance. Inasmuch as a choreographic object must be imagined before being expressed, its expressions necessarily implicate its abstractions. The actual determination of a choreographic object requires that the concepts of the understanding regarding a determinate arrangement of ideas are transposed, from their virtual and abstract reality, to the concrete reality of material expressions. Notwithstanding, in order to exist, the choreographic object does not require concretization, it can exist solely in abstraction. The fact that one can remember a dance without recourse to external supports attests the abstract autonomy of a choreographic object. But insofar as expression brings the fuzziness of ideas into a higher degree of determination, it is a fundamental condition for the transmission of choreographic ideas between bodies. From abstraction to abstraction, necessarily through expression.

The process of choreographic transmission will be here tackled through the notion of transduction, an important concept in Simondon's philosophy of transindividuation. Simply put, transduction concerns the operation by means of which abstractions are expressed and expressions abstracted, i.e. a transfer and reconfiguration of potentials in a process of transindividuation. As this study will contend, the transmission of choreographic knowledge cannot truly occur but by means of a transductive process. Transduction informs the individuation of choreographic objects with the transindividual relation of knowledge. It allows for understanding choreographic objects as processes, rather than as finalized forms. Neither exclusively abstract nor exclusively concrete, but a processual structuration of potentials.

It is from the perspective of process itself that this study will approach the excessive and transindividual character of choreographic objects. Choreography will be considered as a system of individuation where abstractions and expressions dynamically relate to one another, i.e. where what most fundamentally defines it is both its

processual character and its transductive potential. Following from this definition, this study will proceed by inquiring into the dynamisms of choreography. It will explore how transduction operates in particular choreographies and how in fact both abstractions and expressions exist in such dynamic system of transindividuation. The whole study can be said to consist in various approaches to the processual character of choreographic objects. It both iterates the concern with the ingression of undetermined potentials into determinate instances of knowledge and follows the relation between abstract and concrete structures in order to provide a means of understanding how the transduction of potentials is conditioned by what is given in process. All in all, it tries to tackle in different rounds how novelty exists in process and how it exceeds the determination of any object whatsoever.

The concern with novelty in choreographic processes has been here approached under the general frame of process philosophy, of which some of the main references are the works of Henri Bergson, Alfred N. Whitehead, Gilbert Simondon, Gilles Deleuze, Felix Guattari, Brian Massumi, Erin Manning, Stamatia Portanova and Luciana Parisi. It should be noted that the novelty here at stake does not concern the one that the art markets came to praise as the very substance of their capitalistic development. Instead of being understood as what result from a theological capacity that the artist performs in the process of making art, it should be viewed as what results from a process that, far from being under control or serving artistic intents, manifests the very powers of its more-than-human dimensions. Therefore, it is not the novelty that comes to be recognized as such according to a set of historically situated values, but the novelty that allows for any development to occur, be this the development of processes that only create what is already known or the development of processes from which the unrecognisable itself emerges. Novelty is only another name for potentiality and creativity. This study should be viewed in accordance with such equation. Novelty doesn't regard the result of artistic production, but rather the infection of processes by undetermined potentials. It is the manifestation of an immanent capacity of processes to drive change and continuously reconfigure the conditions of their own development. Novelty as such is the antithesis of commodification. It is the anarchy within all that doesn't rest. Many writings of the authors just mentioned conform to this. This is the ground that this work shares with them.

To say that this study iterates concerns or that it inquires in different rounds is saying that it proceeds by trials where what is at stake is the encounter between some key notions of process philosophy and a series of choreographic examples. All the

choreographic objects discussed in this study resulted from interdisciplinary research projects. All of them correspond to the individual resolution of problems in technical individuations committed to assert choreography in the form of objects. Throughout this study, the references to the research projects in case will help to provide glimpses into the conditions of emergence of the choreographic objects discussed. For now, it matters only to indicate that the latter are: “*Improvisation Technologies, a Tool for the Analytical Dance Eye*”, a collection of choreographic objects meant to be used as modular tools for the composition of choreographed dances, devised by choreographer William Forsythe and published in the form of a CD-ROM (1999) by the Centre for Art and Media (ZKM) in Karlsruhe; “*Double Skin | Double Mind*” (2004-2010), a choreographic object devised by choreographer Emio Greco together with dramaturge Pieter C. Scholten and expressed in different ways, such as a dance workshop, an interactive installation and a CD-ROM; the choreographic objects of the “*Motion Bank*” project (2009-2013), namely, “*Synchronous Objects, for One Flat Thing Reproduced*” by William Forsythe, “*No Time to Fly*” by Debora Hay, “*Seven Duets*” by Jonathan Burrows and Matteo Fargion, and “*Two*” by Bebe Miller and Thomas Hauert; and finally the choreographic objects of the “*Reactor for Awareness in Motion*” (2011-...), a research project of the Yamaguchi Centre for the Arts intended to develop software and hardware tools for dance creation and education.

The encounter between some key notions of process philosophy and a series of choreographic objects is not here intended to provide an interpretation of the latter with the notions of the former. It is rather intended to create a field of tensions by means of which a whole other level of individuation is to be attained. In this sense, this text is a synthetic resolution of the tensions that this encounter has engendered. It is by confronting the ideas of process philosophy with a series of choreographic ideas that this study will proceed. It will strive to posit the problems of this encounter and bring them into some sort of resolute determination, i.e. into the point at which possible cases of solution can be proposed, if not as definite answers, at least as indicative orientations.

All the choreographic objects discussed here participate in the context of remediation. As the other two, this context is characteristically driven by archival and archaeological tendencies. Some of the examples already mentioned attest how the remediation of choreographic knowledge has been used both in the context of reenactments—of which Olga de Soto's “*Débords ...*” is a good example—and in the context of the encounter between dance and the museum—of which exhibitions such as “*Move: Choreographing You*” are good examples. But what is perhaps most determinant

in its regard is its history. For if choreography can be, to a great extent, equated with the encounter between dance and writing,²⁴ then it can be said that, since the moment in which it appeared as an “apparatus of capture” (Lepecki, 2007), choreography didn't stop making use of technological modes of retention, creating mnemonic artifacts for the transmission and remembrance of dances. Out of the three, it is perhaps this one context that is most endemic to choreography. But despite its historical character, it matters here to approach it as a specific mode of expanding choreography. This is not to say that choreography's history doesn't matter. It is in contrast to and in relation with its history that choreography's expansion can be best tackled. For this reason, choreography's history will be briefly discussed throughout this study, specially in regard to the problematic relation between the excess of the dancing body and the limitations of writing. The expansive remediations of choreography should be thought as relaying this relation and as striving to deal with its problematic structure in new ways, i.e. to explore novel solutions for an old problem. Such capacity does not come without an activation of technology's potentials. The remediated expansion of choreography proceeds by interweaving its technological potentials with the potentials of a broader field of technical transindividuation. The very notion of choreographic expansion finds in this interweaving its fundament. It is in relation to the potentials of technology at large that choreography enhances its capacity to transform and differ from itself.

The particular cases approached in this study are not the only examples of choreography's remediated expansion. In order to provide a glimpse into the contemporary context of research-creation where the remediation of choreographic knowledge is a main focus, it is worth mentioning a series of other projects. One of these projects is the “*Enhancing Choreographic Objects*” (EChO). Co-directed by social anthropologist James Leach and dance and new media scholar Scott DeLahunta at the University of Aberdeen, this was a research-creation project running in between 2012 and 2013 and intending to bring into collaboration scholars from various fields, digital artists, exhibition and performance venues, and the Wayne McGregor | Random Dance Company (WM|RD). This collaboration resulted in a variety of things: the dance performance “*Atomos*”, which premièred at Sadler's Wells in London; the exhibition “*Thinking with the body: Mind and movement in the work of Wayne McGregor | Random Dance*”, which took place at the Wellcome Collection, in London as well; the construction of a choreographic software named “*Choreographic Language Agent*”

24 See reference to the beginnings of choreography in the European Renaissance on page 89.

(CLA); the digital installation “*Becoming*”, which was created with the *CLA* software and featured at the afore mentioned exhibition; and the “*Mind and Movement – Choreographic Thinking Tools*” publication, a “choreographic resource [...] designed to develop students' personal imagination skills in order to enhance the creation of new and original dance movement”²⁵. All of these outcomes can be seen as choreographic objects. But specially those expressed with writing, be this digital or not, were said to provide “insights into the valuable knowledge that choreographers and dancers create when they investigate form and structure through movement in the context of making dances. The result is that 'choreographic thinking' is becoming available not only for the purpose of educating audiences, but also in ways that scientists and philosophers can study, architects and designers can utilize, and other artists can draw upon.”²⁶

The *EChO* project draw on a previous one, called “*Choreographic Objects: traces and artifacts of physical intelligence*”, also coordinated by Leach. This latter project consisted of three workshops, occurring throughout 2008 and 2009, and it was intended to engage theories of knowledge production and knowledge transfer, as established in the social sciences, with the choreographic work of Wayne McGregor, Siobhan Davies, William Forsythe and Emio Greco | Pieter Scholten. Attesting the transindividual character of knowledge production involved in the individuation of choreographic objects, “social scientists were able to show how the social relations involved in the production of Choreographic Objects were important in shaping them, highlighting both positive and negative potentials generated by the context and process of their construction. The social scientists were able to draw on theories of embodied, skilled and practiced-based knowing, and of its translation into representational media to illuminating effect. This project demonstrated that social science has a key role in enhancing the awareness of the makers of Choreographic Objects and thereby ensuring more effective outcomes from their endeavours.”²⁷ All the results of the *EChO* project attest precisely this: they attest how the exchange between contexts of research (academic, artistic, technological and social) informs the technical process of transindividuation with potentials that belong to neither one of the parts exclusively, but that are activated only on the condition of their singular relation.

Another relevant project in what regards bringing different disciplines together is

25 Retrieved 12/10/2014, from http://www.randomdance.org/creative_learning/mind_and_movement_choreographic_thinking_tools.

26 Retrieved 12/10/2014, from <http://gtr.rcuk.ac.uk/project/EF772A21-502F-4A7E-B105-A7B35407485C>.

27 Retrieved 12/10/2014, from <http://gtr.rcuk.ac.uk/project/EF772A21-502F-4A7E-B105-A7B35407485C>.

the “*Transmedia Knowledge Base for Performing Arts*” (TKB). Coordinated by cognitive linguist Carla Fernandes at the New University of Lisbon, from 2010 to 2013, the *TKB* was “a transdisciplinary project at the crossings of cognitive linguistics, video annotation, performing arts documentation and new media technologies, [aimed] at building a dynamic “*Knowledge-Base*” (KB) to host different kinds of working materials, annotated documents and complete pieces of all interested authors in sharing their creative processes [...]”²⁸ With such intent, two software tools were developed: a video annotation software for tablet computers called “*Creation Tool*” (CT) and the *KB*, a web based platform conceived to host contents of various sorts and specially those created with annotation softwares such as the *CT* or the *ELAN*²⁹. In the frame of this project, what is perhaps the closest expression to an object capable of conveying choreographic knowledge, is the annotation made on the video registers of Rui Horta's choreographic piece “*Set Up*” by a group of linguists.³⁰ This choreography has been dissected into sections and categories where each remarkable event is indexed and commented upon. In this way, the implicit knowledge of a complex choreographic work was meant to become more explicit.

In this guise, the “*Siobhan Davies Archive*” project, dedicated to the work of the choreographer and co-ordinated both by her and by dance scholar Sarah Whatley, in a collaboration between the Siobhan Davies Dance and the Coventry University, “began in January 2007, with the aim of bringing together all of the materials and documentation associated with Davies' choreographies into a single collection.” In regard to the transmission of choreographic knowledge, this archive holds what have been called “*Kitchens*”—“prototyped new presentations of the digital objects”—for Davies' choreographies “*Bird Song*” and “*In Plain Clothes*”. These are digital objects that bring together the “'ingredients' organised according to their role in the making or the 'cooking' of a work”.³¹

Perhaps it is not by chance that all these projects, and the ones to be further discussed, have explored in unprecedented ways the possibilities that digital programming offers to the creation of choreographic objects. On the one hand, the multimedia capacities of the digital domain allow for hosting and interrelating the different knowledge fields brought together by these projects. On the other hand,

28 Retrieved 12/10/2014, from tkb.fcsh.unl.pt/.

29 <https://tla.mpi.nl/tools/tla-tools/elan/>.

30 Which can be accessed at: <http://img.di.fct.unl.pt/tkb/content/setup-part-1-0>.

31 Retrieved 12/10/2014, from <http://www.siobhandaviesreplay.com/index.php?view=sddd>. The “*Kitchens*” of both choreographies can be accessed at <http://www.siobhandavies.com/thekitchen/>.

inasmuch as digital programming is capable of automating procedures, it can simulate creative processes, being as such a most suitable platform for conveying the transduction of choreographic knowledge and stimulating learning. The coincidence between the capacities of both choreographic and digital objects has been a guideline for this study. Because, if in a first approach the two can be said to be fundamentally different, at a closer look the transductive capacities of choreographic objects can be addressed to the determination of ideas, in the same way as the algorithms of digital programming can. In fact, to say that the coincidence between choreographic objects and digital objects has guided this study is to say that its main problem resulted from bringing into relation the notion of diagrammatic ideas and the notion of algorithmic procedures. Both these notions can be said to characterize choreographic objects: for a dance to become choreographed, an idea of coordinated movement needs to acquire determination, i.e. to acquire a structure that is both knowable and transmittable. The structure of an idea is its diagram, it “maps the interrelation of relations” (Massumi, 1992, p. 16) necessary for a determinate field of potentials to participate in the individuation of a corresponding expression. As it will be argued here, the choreographic object itself cannot be considered without the dynamic processes by means of which an idea and its expressions are related. And precisely because of this, i.e. because of the fact that the same diagrammatic arrangement of ideas can give birth to a series of different expressions (such as the many results of the *EChO* project, all of which express differently the same choreographic object or, in other words, the same assemblage of choreographic ideas), the choreographic object must be acknowledged to have an iterative character, i.e. to be capable of resuming itself in accordance with a determinate model of transduction. Which brings us to one of the definitions of choreographic objects used throughout this study: a choreographic object is a “model of potential transition from one state to another in any space imaginable” (Forsythe, 2008, pp. 5 – 6). The fact that this definition was proffered by choreographer William Forsythe to define all the objects of his choreographic work (i.e. installations, performances and digital objects) attests not only the general potentials of choreographic objects but also their iterability. Saying that a model is iterative corresponds to saying that it is algorithmic, i.e. that it can be repeated automatically or not for generating a series of expressions. In sum, it will be the contention of this study that the choreographic object is both diagrammatic and algorithmic. Or, in other words, that it is because of the algorithmic character of its diagrammatic ideas that the choreographic object can acquire a technological status, i.e. that it can be said to

correspond to a knowledge (logos) pertaining to a way of dancing (tekhné).

In order to pursue such thesis, this study will start by laying out the fundamental concerns to any thought of choreographic knowledge. It will inquire into the ontology of bodies and movement because they are fundamental for the constitution of choreographic objects. But instead of asking “what is a body?” and “what is movement?”, the initial questions here posed are processual, such as “how does a body move?” and “what happens to a body when it moves?”. Such concerns are expressly addressed throughout Chapters 1 and 2. The first Chapter will discuss the relationship between time and space in the movement of bodies via the philosophy of Henry Bergson (Section 1.1). It will specifically address the philosopher's take on the theory of multiplicities and, with this, discuss the relationship between intensity and extension. This will serve to make the case that bodies in movement are irreducible to positions and that, therefore, they must be granted to implicate undetermined potentials, which are unaccountable only in terms of extension. Moreover, this first Chapter will also introduce the encounter between dance and technology as a problematic field of potentials (Section 1.2). It will argue that such encounter is only capable of creating novel instances of choreographic knowledge if the indetermination of its constitutive potentials is not only acknowledged but also inclusively mobilized. How can this be done and, in particular, how can it be done when choreographic knowledge is to be expressed by digital means, will be the question posed here. In a sense, this study's remaining Chapters will build upon one another to answer such question. In relation to the hypothesis that choreographic objects are necessarily diagrammatic and algorithmic, such question can be understood in the following way: a diagram is a structure of potentials that can be resumed algorithmically. Hence, it is the question of how to create choreographic objects that express novel instances of knowledge.

This question has been formulated by philosopher Erin Manning (2009, pp. 61–76) in terms of how to create a truly “technogenetic body” by means of the encounter between dance and technology. The answer she essays by drawing from Simondon's philosophy is somewhat expectable: the virtuality of movement must be tapped into, by the encounter itself. Even when the case regards the digital computation of gestural data, the encountering parts must be made to affect one another beyond what is given by each of them. Only in this way are the potentials of the encounter between dance and technology to be mobilized beyond what is known and knowable. Only this will allow for the encounter to be truly technogenetic, i.e. technically creative, and individuate novel instances of knowledge. In this argument, one question remains problematic: how

do digital media and potentials relate? Manning's approximation to this question is short: "Techniques for technogenetic emergence must become part of the technology's interface: we must develop techniques that create new associated milieus never distinct from the ontogenetic body. Technological recomposition must no longer be inserted into a body-system: it must be emergent with it." (Ibid., p. 75). In fact, this does not really answer the question. Rather, it is a corollary that expresses how the encounter between dance and technology must be thought and developed in order to be creative. From this standpoint, this study will follow Manning's direction in drawing from Simondon's philosophy in order to develop it further. As already mentioned, this will allow for defining choreographic objects in terms of potentiality, i.e. as processes that implicate the potentials mobilized by the encounter between dance and technology. Since all the choreographic objects here studied express knowledge by digital means, such definition brings to the fore the question of a digital potential, i.e. does the digital domain have potentials of its own? A question to be addressed in Chapter 6.

Chapter 2 will expound Simondon's philosophy of individuation. This will allow for justifying the substitution afore mentioned of an ontological concern (i.e. "what is?") by an ontogenetic one (i.e. "how is?"). Simondon's argument that "being is becoming" postulates the primacy of difference over identity in a way tantamount to the excess of being over itself. In a sense, this coincides with Bergson's understanding that, for a body to be in movement, it must move as a whole, i.e. as a dynamic system of potentials constantly moving in between abstraction and expression. Beyond this, Simondon's philosophy will also allow for the understanding that movement can be in fact creative, out of mobilizing a system's potentials. Such understanding will provide the means to think movement not only in relation to one single body, but also in relation to processes of individuation, i.e. in relation to any kind of system that is capable of constituting novel individuals. Of the many domains approached by Simondon's philosophy—the physical, the vital, the psychic, the social and technical—, the concern here is with the latter. It matters to understand the implications that Simondon's thought has in regard to technical systems, so that the encounter between dance and technology can be approached in terms of the relationship between creativity and potentiality.

Chapter 3 will develop concepts with regard to choreography that can only be properly understood under the light of Simondon's philosophy. Or, better yet, it is not that choreography is here to be thought in accordance with this one philosophical system of thought. Rather, it will be argued that, insofar as choreography can be creative, the fundamental concerns of Simondon's philosophy are most apt to

conceptualize it. Hence, this philosophy will be used to approach choreography and inquire into the dynamisms by means of which it comes to express itself in novel ways. Throughout this chapter, the notion that choreography is not tied to the performance of dance will serve both the assertion that one same choreographic object can be expressed in many different ways and the argument that, in order for this to be so, the object must be topological, that is, it must be a continuum of potentials capable of expressing itself differently while remaining the same (Section 3.2 will discuss such definition). The first case to be discussed is the generic relationship between dancing and writing, constitutive of Western choreography (Section 3.1). It will be shown that, when these different domains express one same object, such expressions necessarily derive from one same structure of potentials. They express identical instances of choreographic knowledge, according to the limits of the matters in individuation. The second case to be discussed is William Forsythe's seminal collection of choreographic objects: *“Improvisation Technologies: A Tool for the Analytical Eye”* (Section 3.3). By looking into one of this technologies' topological character, the choreographic object will be defined as being, first and foremost, an abstract system of potential transductions. The choreographic object will be shown to be apt to transfer its potentials across domains and, with this, not only express itself differently but also instantiate the individuation of knowledge. For such reasons, it will be contended that the choreographic object is irreducible both to its expressions and to its abstractions. It is as an open whole that always exceeds its own determinations.

What is here being called a structure of potentials will be also designated as “diagram”. This notion will not only be addressed in Chapter 2 with Simondon's concept of “technicity”, i.e. the diagram of technical individuation, but it will also be approached in different ways throughout Chapters 4 and 6. The former Chapter will start by discussing philosopher Gilles Deleuze's theory of ideas in order to layout how choreographic ideas exist in between abstraction and expression (Section 4.1). It will be shown how, according to this theory, ideas are diagrammatic in the same way that choreographic objects are: they relate virtuality with actuality according to a topological structure of potentials. Deleuze's postulate that such structure is inherently problematic and that the highest degree of an idea's determination corresponds to actual cases of solution for the problems in case will facilitate the understanding that, in the case of choreographic transduction, the transmission of movement principles between domains is necessarily accompanied by a transmission of concepts. To exemplify the conceptual structuration of choreographic ideas, Section 4.2 will discuss Emio Greco and Pieter

Scholten's Double Skin/DoubleMind choreographic object. Since this is expressed in different domains, the relationships between its topology, its problematic potentials, its conceptual structure and its expressions will be tackled via the notion of diagram. Section 4.3 will continue developing this notion, still in relation to Deleuze's philosophy, but also in relation to its use by philosophers such as Charles S. Peirce, Michel Foucault, Deleuze & Guattari, Brian Massumi and Manuel DeLanda. Such discussion is intended to provide the means for better understanding how, in the encounter between dance and technology, that which cannot be known is determinant with regard to the emergence of individuals. The unconscious diagram of ideas—designated here as “abstract machine”, cf. Deleuze & Guattari (1987)—will in this way be argued to be not only a fundament of choreography, but also the very ground of novelty as such.

The expression of novel cases of solution with regard to the problematic ideas of choreographic objects will be addressed from the perspective already posed (Section 3.1) of the asymmetry between dancing and writing. In order to do so, Chapter 5 will discuss a series of choreographic objects, which were programmed as digital algorithms. This will allow both for defining gesture as the representation of movement and for discussing these examples as cases of solution for the problematic relation between the dancing body and what will be here designated as gestural body. It will also allow for a better understanding of how different choreographic ideas can be computed and digitally expressed. Throughout Sections 5.1 and 5.2 the choreographic objects to be discussed are the “*Gesture Follower*”—a software built into the digital expressions of the “*Double Skin/Double Mind*”—, the already mentioned “*Motion Bank's*” online scores and the “*Reactor for Awareness in Motion's*” motion capture and animation software. Since these choreographic objects' have been transduced into automations of the digital domain, their diagrammatic ideas will be posited as being characteristically algorithmic and, therefore, resumable across domains. Hence, in accordance with William Forsythe's definition, choreographic objects can be seen as diagrammatic algorithms capable of transducing problematic ideas (of movement).

If such capacity is to be granted to digital choreography itself, then the question is: how to conceive of potentiality within the binary possibilities of the digital domain? In this study's final Chapter, the understanding that the encounter between dance and technology is capable of creating novel instances of knowledge will be furthered by coming to terms with the hypothesis that the digital domain has potentials of its own. Beyond the argument that, in order for technogenesis to occur, the digital domain must

be embedded in a milieu of potentials other than its own, i.e. in an analog milieu, Chapter 6 will pursue the notion that there is more to digital computation than itself can compute. As it will be shown, this is tantamount to the hypothesis that digital computation is infected by random quantities of data and that, precisely because of this, it is open to an infinity of quantitative potentials that grant it the very status of thought. In contrast to reductionist perspectives of the digital domain, the algorithmic computation of data will be argued to be always excessive in relation to itself. Such notion will be supported by Andrew Goffey's conception of algorithms, Gregory Chaitin's theory of algorithmic complexity and Luciana Parisi notion of "soft(ware) thought". Such perspectives will be contrasted upon two different approaches to objects: Graham Harman's object-oriented ontology and Alfred N. Whitehead's process-oriented ontology. With this, it will not only be shown that digital potentials must be conceived as random and irreducible quantities of data, but also that algorithmic objects must be defined as the physical and conceptual prehension of these same quantities. Even if choreographic objects are digitally expressed, this will make the case that they are capable of more than what, at any moment, might have been determined as a case of solution for the problems of their ideas. In short, choreographic objects as the excessive but yet structured potential to individuate novel instances of knowledge with regard to the movement of bodies.

Finally, this study will conclude with a proposition regarding the necessary conditions for activating potentials in processes of technical individuation. It will be argued that, inasmuch as potentiality is a conditional force of technogenesis, the latter can only come about by means of a constitutive, yet subjectable to enhancement, openness to infinity. This infinity is none other than the one of the undetermined potentials of ideas existing amidst, immanently, the actual possibilities of technical individuation. The more this indetermination is made to ingress, affectively, into the technical resolution of the problems of ideas, the more novelty will appear and the more the overall development of a system of individuation will become infected with its creative potentials. Hence, it will be argued that, though novelty as such is, by definition, not predictable and thus not subjectable to direct regulation, there are actual conditions that can intensify its occurrence and amplify the technical system's capacity to be truly creative and evolutive.

Chapter 1 - A TOPOLOGICAL ENCOUNTER

This first Chapter will open this study not only by inquiring into the relationship between movement and bodies, but also by doing so in a speculative manner. Speculation can be said to have marked much of this study's writings, mostly because it is a characteristic mode of thought in process philosophy.³² Not only has this study inherited this mark from such tradition, but it has also used it as a means to discuss a reality of movement and bodies that cannot be tackled otherwise, i.e. their incorporeal reality. The purpose of inquiring into the relationship between the incorporeal and the corporeal realities of movement and bodies is here twofold: on the one hand, it aims at establishing a first approach to ontology (Section 1.1); on the other, it aims at establishing a conceptual ground to better tackle what will be here designated as “the encounter between dance and technology” (Section 1.2). The ontology of movement and bodies will be explored via French philosopher Henry Bergson's work on movement, space and duration. His take on the theory of multiplicities, according to which bodies must be acknowledged to comprise potentials that are, not only irreducible to stationary perspectives of extension, but also fundamental to their very movement, will serve the purpose of conceiving the incorporeal reality of moving bodies precisely in terms of potentiality. From this standpoint, this Chapter's second section will be dedicated to positing the problem of creativity in the encounter between dance and technology. Inasmuch as this encounter can and will be defined as the constitution of choreographic knowledge, the question of how can knowledge be created anew will be posited in terms of the potentials that such encounter can mobilize.

32 In this regard, it should be noted that philosopher Alfred N. Whitehead's series of lectures on “Speculative Philosophy”, published under the title “Process and Reality” (1978), not only are, still today, a canonical landmark in process philosophy, as they also define what, in this tradition, means to think speculatively. In the philosopher's words: “Speculative Philosophy is the endeavour to frame a coherent, logical, necessary system of general ideas in terms of which every element of our experience can be interpreted. [...] It is the ideal of speculative philosophy that its fundamental notions shall not seem capable of abstraction from each other. In other words, it is presupposed that no entity can be conceived in complete abstraction from the system of the universe, and that it is the business of speculative philosophy to exhibit this truth. [...] Thus the philosophic scheme should be necessary, in the sense of bearing in itself its own warrant of universality throughout an experience, provided that we confine ourselves to that which communicates with immediate matter of fact. But what does not so communicate is unknowable, and the unknowable is unknown; and so this universality defined by 'communication' can suffice. This doctrine of necessity in universality means that there is an essence to the universe which forbids relationships beyond itself, as a violation of its rationality. Speculative philosophy seeks that essence.” (Ibid., p. 3).

1.1 - Multiplicities in Movement

Movement cannot be reduced to the positions it connects. A grid of positions does not encompass the reality of change occurring in the in-betweenness of the interval. When subsuming movement to positions one can only get a static world where only beginnings and endings coincide with bodies. Potentiality lacks. To be in movement means to coincide with a potential to vary, to be in transit. It is a matter of including forces in the world. From them, change unfolds. (Massumi, 2002, pp. 3–6).

Displacement, the non-transitional leap from one position to the next, discontinues the world in immobilities, leaving the in-betweenness of which only to be construed as an infinite succession of positional instants. In displacement movement does not take place. Each intervening point in the intervalic succession between two other points remains identical to itself, arresting movement in a motionless grid where no differentiation can occur, i.e. where nothing can vary from itself. As French philosopher Henri Bergson rightly argued, such view of the world can only result from excluding what, imperceptibly, forces movement to occur and processes to unfold. “Just because we close our eyes to the unceasing variation of every physical state, we are obliged when the change has become so formidable as to force itself on our attention, to speak as if a new state were placed alongside the previous one. Of this new state we assume that it remains unvarying in its turn and so on endlessly.” But in fact, “there is no essential difference between passing from one state to another and persisting in the same state. If the state which 'remains the same' is more varied than we think, on the other hand the passing from one state to another resembles, more than we imagine, a single state being prolonged; the transition is continuous”. (1944, pp. 4–5).

Positionality is thus a model of representation that overrides the variation within that which, at different scales, might be said to be static. In this way, it ignores what most fundamentally defines movement: the fact that it is always already there, expressing the qualitative change implicated in the passage from one physical state to another. Importantly, for such change to occur, space and time must as well evolve in ways that are irreducible to positions. In the continuous transitioning between states, neither time nor space can function as fixed coordinates. Rather, they cannot but result from movement's own qualitative development. In this regard, Bergson's work on duration has been a guiding precursor (2002, pp. 49–80). For it provides a full-fledged theory of virtuality, proffering that the experience of space and time results from

subtracting actual positions from virtual potentials. Or, in other words, that movement's expressions are subtracted from the infinity of potentials that implicates the virtual in the actual. Between virtuality and actuality, i.e. between the one's continuous potentials and the other's discontinuous extensions, movement is key. It is through movement that Bergson relates coordinated positions with the experience of continuous change. For him, only movement unites virtuality with actuality. Conversely, movement cannot be approached exclusively by either one of its poles. What can be said to correspond to the subjective experience of movement, i.e. to the durational experience of a non-spatial and virtual time, must be acknowledged to necessarily correspond to movement's objective expression. The unity between the one and the other, i.e. the implication of virtuality in actuality and the explication of virtuality by actuality, is realized in movement. Here, neither subjects nor objects can be said to be stable and unchanging unities, distinct from one another from the outset. Rather, they must be seen as resulting from movement's dual reality.

The point here is that movement can be neither reduced to emergent positions nor it can be fully abstracted from a physical ground. Their relation, i.e. the relation between actuality and virtuality, must be thought immanently. The force of movement must be granted to belong to movement itself. Movement must be understood as the common ground against which all forces can be considered. The principle of immanence can be also expressed in the following way: virtuality is immanent in actuality and actuality is immanent in virtuality. Which is to say that, in movement, there is one same “plane of immanence”³³ where actuality becomes virtual and virtuality becomes actual, simultaneously and interdependently. In order for virtual movements to occur, there must exist somewhere an actual ground conditioning them, coincident but disjunct. Likewise, for any displacement to take place there must exist somewhere an opening towards virtuality, towards the infinity that necessarily feeds the actuality of movement.³⁴ From this standpoint, movement's virtual-actual dynamisms can be

33 The “plane of immanence” is a concept developed by philosopher Gilles Deleuze in order to facilitate the understanding that movement, with its virtual-actual dynamisms, necessarily opens the world's finitude to an inexhaustible source of renewal and creativity. As the author himself explains: “The plane of immanence is the movement (the facet of movement) which is established between the parts of each system and between one system and another, which crosses them all, stirs them all up together and subjects them all to the condition which prevents them from being absolutely closed. It is therefore [...] a mobile section, a temporal section or perspective. It is a bloc of space-time, since the time of the movement which is at work within it is part of it every time. There is even an infinite series of such blocs or mobile sections which will be, as it were, so many presentations of the plane, corresponding to the succession of movements in the universe. And the plane is not distinct from this presentation of planes. This is not mechanism, it is machinism. The material universe, the plane of immanence, is the machine assemblage of movement-images.” (Deleuze, 1986, p. 59).

34 Though this study will not dwell upon the possibility of a radical reduction of virtuality to actuality

summarized as follows: whereas the virtual contributes to actuality, actuality constrains such contribution. Loops of feedback and feedforward are thus prevalent modes of affectivity between movement's multiple dimensions. Movement cannot be accounted for without this dynamic character, i.e. it cannot be properly understood if not with the virtual implications of actuality and the actual explications of virtuality.

How virtuality and actuality relate to one another when a body moves can be further understood by reading, with Bergson, Zeno's paradoxes of motion. Such paradoxes have been ascribed to pre-socratic philosopher Zeno of Elea, who hasn't left any known writings of his own, by Aristotle (1999). Though Bergson commented upon several of these paradoxes—four in total—, it is here enough to mention the “*Paradox of the Arrow*” (1944, pp. 335–338).³⁵ In Aristotle's “*Physics*” (Ibid., p. 161), this paradox is described as follows: “if everything when it occupies an equal space is at rest, and if that which is in locomotion is always occupying such a space at any moment, the flying arrow is therefore motionless”. With such formulation, it becomes clear why Zeno's paradoxes are designated as such. All of them equate the metric divisibility of space with the movement of bodies. An equation from which results, in a very straightforward way, the very impossibility of movement. Such impossibility can be further explained in the following terms: if space is given, then the arrow in flight can only reiterate it. Movement's impossibility therefore depends on the conflation of time with space. In Zeno's “*Paradox of the Arrow*”, space is given such prevalence over time that time itself cannot be thought but in spatial terms. By coinciding with a preformed and metric space, the flying arrow cannot but be static at any point of its transition between two other points (e.g. before being shot and after having hit the target). Here implied is the fact that, between any two given points of the arrow's trajectory, an infinite number of other points can be found. This is the infinitesimal divisibility of space after which only the transcendental image of a non-chronological time is to be found. But precisely

(for it assumes from the outset a holistic approach to process, bodies and the world), atomism will be briefly criticized when accounting for Gilbert Simondon's understanding of creativity (see Section 2.1). It will be argued that it is only by virtual means that actuality can partake movement, i.e. that extension can only unfold by means of intensive contributions. Moreover, a brief critique of idealism will also be posited from the perspective of immanence's principle. It will be argued that, for a movement of thought to occur, an immanent and actual ground is required. Actuality will thus be defined as the constraining order by means of which the virtual contributes in determinate ways to movements in extension. For such reasons, this study will take neither the side of a radical materialism nor the side of a radical idealism. Rather, it will make its stand based on the inextricable relation between virtuality and actuality, i.e. it will proceed with a focus on process.

35 It is worth noting that Alfred N. Whitehead (1978, pp. 68–69), the English mathematician and philosopher who would soon after Bergson set the agenda for thinking the world from a processual perspective, has also chosen to comment upon this one paradox. The differences between Bergson's theory of duration and Whitehead's conception of movement will be briefly discussed in Section 6.4.

because the flying arrow is not a transcendental object, it is said to coincide with the spatial discontinuities that it traverses. In this sense, whatever the magnitude considered, the unchanging self-coincidence of space determines all actuality as static reality. In which case, the arrow cannot really fly.

Zeno's equation of space with movement has been commented upon by Aristotle himself in the following way: “[t]his [equation] is false, for time is not composed of indivisible moments any more than any other magnitude is composed of indivisibles” (1999, p. 161). What is here at stake is therefore the relation between continuity and discontinuity, i.e. between qualities and quantities. For if movement is said to be discontinuous and thus impossible, then it is time itself that is said to not exist. After the infinitesimal division of space, nothing but space remains. Or, which amounts to the same thing, in between any two given points there is only a succession of restful, spatially self-coincident instants. The assertion that time is not composed of indivisible moments should therefore be understood in the sense that positions are gregarious with one another and, as such, inconsiderable in isolation. If they are gregarious, they are continuous with one another. For if movement is to occur, i.e. if change is to overcome the metric divisibility of space, then any instant whatsoever must be considered as being possibly continuous with any other instant in its vicinity. This continuity corresponds, of course, to the very indivisibility of time. But this shouldn't be understood as contradicting Aristotle's comprehension of a divisible time. Rather, this argument should be understood to assert both the metric character of magnitudes and the gregarious character of quantities. To say that time is not composed of indivisible moments is to argue for a necessary and reciprocal implication of quantities in one another. Precisely because of being divisible, quantities open the metric character of space to the non-metric character of time (granted that a function of gregariousness is applicable to the relation between discontinuous elements). From this, change unfolds. This might still appear to be a contradiction, for time is being said to be both divisible and indivisible. And it is true that, in order for positions to be gregarious (and not only non-communicating unities), divisibles must relate in some way with indivisibles. What is missing both from Zeno's account of motion, and from Aristotle's commentary upon it, is a conception of relation between quantities and qualities that includes change in space.

Bergson's philosophy in general and his theory of duration in particular have strived to account for this missing relation. In regard to Zeno's paradoxes of motion, the philosopher proposed to not think from the standpoint of a given space, but rather from

the standpoint of the variations undergone by the relation between time and space. As such, instead of the arrow's movement being equated with space's discontinuous invariability, it is to be thought as transitioning between states: from a null velocity (before being shot) to a positive one (when in flight) and back again to a stop (after having hit the target). In this way, movement is seen to result from the difference between a body's dimensions of space and time. As it will be argued below,³⁶ related terms cannot be said to preexist their relation. Inasmuch as any relation is processual, what it relates cannot be given in advance. Whatever is of the relation, necessarily emerges with it. Hence, space and time are here seen to result from the arrow's differential of movement. In other words, the arrow's movement is seen under the light of determinate ratios, such as velocity's rate of change (i.e. acceleration). According to this non-positional view, the flying arrow constitutes, with its differentials of movement, the spatio-temporal conditions of its own experience. A corollary that led Bergson to propose a different image for the traversing of space: "Suppose an elastic stretched from A to B, could you divide its extension? The course of the arrow is this very extension; it is equally simple and equally undivided. It is a single and unique bound." (1944, p. 335). Notably, this is also one of Bergson's definitions of "duration", a concept which he devised to account for what in movement is indivisible (2001, pp. 85–87). The unique bound of movement corresponds therefore to the durational becoming of an indecomposable mobile section of space and time.³⁷

Still in contrast to this, when considering that, in order for the arrow to go from A to B, it needs to cross two different halves of the total space traversed (or any number of parts resulting from the latter's division), it can be argued that a determinate articulation needs to be included in the elastic duration of the arrow's whole movement. From to this perspective (which is Zeno's), each mobile section resulting from the division of space needs to be articulated by some means with the mobile sections in its vicinity. From which it follows that, with articulation, the indivisible duration of movement is disrupted. Once again, the infinitesimal divisibility of space brings to the fore the realization that, if any mobile section is infinitely decomposable, what results

36 See pages 63-63.

37 Though the concept of duration tries to grasp the heterogeneity of qualitative change, it is merely a representation. Nevertheless, it results from its very own subjective experience. To the method by means of which, from immediate experiences, concepts are engendered, Bergson calls "intuition" (2007, pp. 164–165). As method, intuition corresponds to the movements of thought that develop with experience's qualitative change. It corresponds to experiencing duration, which is the experience of time as such (i.e. a non-chronological time). Intuition is not an intellectual mode of thought deployable into discrete units of actuality. It is rather a mode of reflection capable of grasping what has no extension whatsoever. It is thought moving itself in duration.

after such division is but a radical reduction of movement to discontinuous positions. In Bergson's words: "To suppose that the moving body is at a point of its course is to cut the course in two by a snip of the scissors at this point, and to substitute two trajectories for the single trajectory which we were first considering. [...] it is to attribute to the course of the arrow itself everything that can be said of the interval that the arrow has traversed, that is to say, to admit *a priori* the absurdity that movement coincides with immobility." (1944, p. 336). This is Bergson's direct answer to Zeno's paradoxes of motion. Hence, instead of movement being thought as coinciding with the immobile character of space, it should be thought as corresponding to an elastic interval capable of connecting all its transient states.

It should be noted that movement can only be divided after it has occurred. To say that the flying arrow coincides with any given point of its trajectory is an affirmation that can only be made after the fact, i.e. after the arrow has in fact come to connect a determinate point of rest with its preceding ones. Importantly, the retrospection of movement can only be performed by adding an abstract idea of succession to the given space. In this sense, succession corresponds to a spatial idea of time: a homogeneous, mechanical spatialization that subsumes the continuity of interior change to the measurability of exteriority. In succession, no real movement occurs, except for the thought that abstracts an idea of time from the space given. In regard to the arrow's real movement, such thought is but a representation. Because of this, Bergson affirms that we habitually think according to a "cinematographic mechanism of thought" (Ibid, pp. 335–343). Which is to say that, frame by frame, thought proceeds on retrospectively representing the representation of what might have happened in the intervals of perception.

Rather than being discontinuous, the elastic interval of durational movement is an indivisible whole, i.e. there is more to it than a succession of points. For this reason, movement's indivisibility is argued by Bergson to pertain to a type of multiplicity distinguishable from any line's multiple points. For him, there are discrete multiplicities, which are series of elements numerically accountable. In contrast, the elastic bound of movement is of another kind, i.e. it pertains to a type of multiplicity that is continuous rather than discontinuous, variable in kind rather than variable in degree. The differences between these two types of multiplicity are clearly explained in the following passage from French philosopher Gilles Deleuze's readings of Bergson's philosophy: "[The actual multiplicity] is represented by space (or rather, if all the nuances are taken into account, by the impure combination of homogeneous time): It is

a multiplicity of exteriority, of simultaneity, of juxtaposition, of order, of quantitative differentiation, of difference in degree; it is a numerical multiplicity, discontinuous and actual. The other type of multiplicity appears in pure duration: It is an internal multiplicity of succession, of fusion, of organization, of heterogeneity, of qualitative discrimination, or of difference in kind; it is a virtual and continuous multiplicity that cannot be reduced to numbers.” (1988a, p. 38). With such distinction, the discontinuous elements of an actual multiplicity can only be said to be gregarious if granted that the two types of multiplicity are related to one another by a principle of immanence. The antidote to the cinematographic mechanism of thought, from which result paradoxes such as Zeno's, is the relation of immanence between actuality and virtuality. Only by reason of them being immanent in one another can the discontinuity of metric space be said to include a field of succession that is qualitative rather than quantitative, durational rather than organized in frames. In short, for movement to occur the continuity of duration must exist together with and inextricably from the same conditions of experience that allow space to be abstracted in numerical terms.

This distinction between continuity and discontinuity was formulated by Bergson on the wake of the topological studies developed by German mathematician Bernhard Riemann (1873). Riemann proposed that a discrete multiplicity can be counted according to its divisibility and that a continuous multiplicity can be measured according to the forces that in it are active.³⁸ Measuring a continuous multiplicity refers here to superposing magnitudes so that either one is used as a standard for the other in determining the amount of relative variation. Accordingly, for Bergson, as for his commentator Deleuze, a continuous multiplicity does not simply correspond to what cannot be counted or divided. Instead, it is rather “that which is divided only by

38 The mathematical calculus of topological multiplicities developed by Riemann can be traced back to the works of mathematicians such as Euler, Listing, Mobius and Gauss (Riemann's mentor). It was nonetheless earlier, in the 17th century, that Gottfried Wilhelm von Leibniz worked towards making topology a rigorous mathematical discipline. Topology can be generally defined as the study of the properties preserved in processes of deformation and of the objects that might possess such properties. A common example is the deformation of a coffee cup into a doughnut (or vice-versa). From the one to the other, deformation can unfold without any break in the continuity of the intervening points. Both the coffee cup and the doughnut belong to the same topological figure. Topological studies bring to the fore functions of deformation. They give prevalence to the ways in which a form becomes another by means of continuous changes. Since it encompasses the potential to be expressed in multiple forms, the same topological figure is in itself a multiplicity. And precisely because topological variations are continuous, without cuts in the set of intervening points, it is impossible to account for the infinity of intermediary states in any interval of space-time considered. Topological continuity thus refers to what two different states of one same system share with one another. It refers to invariabilities in processes of deformation. This continuity of the same, at the same time that connects the actual expressions of form, presupposes difference as discontinuity, i.e. as the interruption of invariance. Therefore, topology poses the problem of how to reconcile continuity with discontinuity, similitude with difference, infinity with finitude, and so on.

changing in kind, that which is susceptible to measurement only by varying its metrical principle at each stage of the division” (Deleuze, 1988a, p. 40). In fact, it is only because duration divides and differentiates itself that multiplicities can be considered as being implicated in continuity, i.e. in non-numerical multiplicities. For Deleuze, this means that “there is other without there being several; number exists only potentially. In other words, the subjective, or duration, is the virtual” (1988a, p. 42). By asserting the coincidence between duration and virtuality, that which is heterogeneous in kind is reconciled with what is continuous in nature.

Duration can be reduced neither to numbers nor to logical and mathematical analyses. By the same token, the time derivable from actual divisions is but a mechanical time. Whereas space can be quantified in terms of external relations, duration elasticises a body's differentiations in kind. In this sense, duration cannot be made spatial. Relations of exteriority belong to homogeneous spaces and relations of interiority belong to heterogeneous movements, irreducible amongst themselves. Whereas the division of space changes its numerical degree, the division of movement changes the very identity of what is divided. It follows that interior movement is a field of intensive differentiation and exterior movement just a rearticulation of given relations. To say that duration has no exteriority is the same as saying that it has no spatial determination. It allows for the interior experience of a subject that feels its own becoming and imagines it in retrospective as a succession of states. At each instant of the imagined succession, space is objectified as a divisible multiplicity to which more abstractions can be added. Be it possible or real, imagined or extended by external relations, space doesn't change in kind and, for this very reason, as Bergson says, it can be “known in such a way that a constantly increasing number of new impressions could be substituted for the idea which we actually have of it” (2001, p. 83). It is by and in thought that divisibility is performed. For Bergson, this operation of the mind is in itself actual. As he writes: “This actual, not merely virtual, apperception of subdivisions in the undivided is precisely what we call objectivity.” (Ibid, p. 84). Hence, exterior objectivity is structured by a multiplicity of differences in degree, which has no virtuality whatsoever but which can be either possible (i.e. the image of divisibility) or factual (i.e. the very act of division).

Continuous and discontinuous multiplicities are inseparable from one another in movements that, at the same time that propel qualitative changes, add actual elements to one another in spatial succession. Actualization is a process that not only creates actualities and, with them, the possibility of numerical order, but one that also changes

the virtual multiplicities from which actuality results. The immanence between virtuality and actuality corresponds therefore to the inextricable relation between space and time in movements that simultaneously quantify and qualify their own effects. If the mobility of bodies in space corresponds to changes of state, it is only because movement as such cannot be reduced to numerical successions. The series of spatial instants (be them constitutive of geometric relations or of temporal mechanisms) do not account for the reality of change that necessarily accompanies displacements. To account for such reality, the initial conditions of a movement-event must be considered. Already in the conditions that allow for a movement to initiate, a plane of differentiation must occur, for it is from the event of difference that both the spatialization of movement and its durational becoming are energized. Whatever makes a body move necessarily corresponds to forces that partake its changes. As an example of the action of such forces in the dislocation of bodies, Bergson talks about survival impulses and the movement that follows from them (1944, pp. 274–278). Animals move to feed themselves, to occupy more favourable climacteric conditions, to procreate, and so on. Such movements correspond not only to spatial displacements, but also to transformations that, when completed, have changed the difference of potentials that initially forced them to occur. This intensive change is no different in the case of planets, plants and bacteria. Intensive forces are the necessary condition for any body to actually move.

It follows that movement needs to be thought as an assemblage of virtual alterations and actual additions. Space is traversed and discrete multiplicities are created. But that which traverses space always changes qualitatively with each division (i.e. with each number that it creates). What from an external perspective can be depicted as numerical divisibility, from an internal perspective can be experienced as a change of state (number in potential). In Bergson's words: “the line traversed by the moving body lends itself to any kind of division, because it has no internal organization. But all movement is articulated inwardly. It is either an indivisible bound (which may occupy, nevertheless, a very long duration) or a series of indivisible bounds” (1944, p. 337). Movement needs therefore to be considered as a whole. What changes when a body moves is the whole of the ecology of relations that the body partakes. This amounts to saying that a difference of potentials can only be cancelled by a change of state in the relational field that allowed it to appear. When an animal moves to feed itself, it not only transforms its own state but also the state of the whole that it partakes. It transforms the food that it eats and the whole ecology of which that food is part.

When a meteorite enters the gravitational pull of a planet to the point of collision, it is the whole that changes and not only one of its parts. The numerical reduction of movement to the spatial parts that it explicates cannot account for the changes in potential of a whole encompassing all the forms and all the forces of an ecology of relations. Altogether, the intensities and extensions of a whole ecology of relations are necessarily open to what is not yet formed as a possibility of movement, i.e. to what exists as potential and cannot be anticipated.

Considering that potentiality is a fundamental condition for the occurrence of movement and that this needs to be taken as a whole, potentiality must therefore be understood as the openness of an ecology of relations to what in itself is undetermined. As Deleuze once more clarifies: “According to Bergson the whole is neither given nor giveable. [...] if the whole is not giveable, it is because it is the Open, and because its nature is to change constantly, or to give rise to something new, in short, to endure. [...] So that each time we find ourselves confronted with a duration, or in a duration, we may conclude that there exists somewhere a whole which is changing, and which is open somewhere.” (1986, p. 9). Duration can thus be thought as the inscription of time in a body open to its own indetermination, i.e. to what in it is neither given nor giveable. If duration corresponds to a whole's capacity to remain open, to maintain the indetermination of its own potentials unresolved throughout the changes endured, then, as long as a body transforms, it can be said to be open. And it is precisely because of this that Bergson says: “wherever anything lives, there is, open somewhere, a register in which time is being inscribed”³⁹ (1944, p. 20). If the openness that the whole of duration introduces in the stability of objectified space allows for its qualitative change and for creativity to bring into existence that which did not yet exist, then it is also from this very openness that space can be objectified in extensive series. Objective space, as a series of immobile sections to which time can be added as mathematical abstraction, results from divisions that transform the whole and condition duration. And this is so because movement can only occur in the interval of what does not change, i.e. from the difference of potentials existing in-between given immobilities. With Deleuze, “we can therefore say that movement relates the objects of a closed system to open duration, and

39 In regard to the indetermination of potentials as a necessary condition for real movement, Deleuze says the following: “In fact, to recompose movement with eternal poses [ideal images] or with immobile sections [after-images] comes to the same thing: in both cases, one misses the movement because one constructs a Whole, one assumes that 'all is given', whilst movement only occurs if the whole is neither given nor giveable. As soon as a whole is given to one in the eternal order of forms or poses, or in the set of any-instant-whatevers, then either time is no more than the image of eternity, or it is the consequence of the set; there is no longer room for real movement.” (1986, p. 7).

duration to the objects of the system which it forces to open up” (1986, p. 11).

1.2 - Creativity in Encounter

The quantification and measurement of moving bodies by technical means is a prevalent phenomenon in examples of the so called encounter between “dance and technology” (Birringer, 1998, 2008; Leeker & Dinkla, 2002). The encounter that this expression usually refers to is embedded in the technical advances of the digital age, with a genealogy that can be traced back to a series of encounters between dance and film (Deren, 2005; Garelick, 2007).⁴⁰ The term itself, dance and technology (or dance-tech, for abbreviation), appeared in the early nineties to encompass the convergence of a variety of dance-related artists who, in different ways, were also busy with the new possibilities offered by the widespread use of computational machines and their increasing capacity to process data.⁴¹ Nonetheless, it is the contention of this study that this term corresponds to a larger project within the historical practice of dance, namely, choreography. For if it can be acknowledged that technology necessarily refers to instances of knowledge that regard ways of doing (and in this specific case, ways of dancing), then it must also be acknowledged that the encounter between dance and technology, rather than corresponding only to the encounter between dancing bodies and computational machines, corresponds first and foremost to the interface of dance-related knowledge with different modes of representative expression.

Choreography⁴² has first appeared from the necessity of registering, by means of symbolic representation, forms of dance. Throughout its historical development, both as an apparatus of representation and as a technology of dance, choreography has strived to express and transmit dance-related knowledge. On the one hand, such knowledge is diagrammatic: it organizes the experience of dance in space and time according to relational concepts and representative expressions. On the other hand, it is algorithmic: its diagrams are resumable in space and time, regardless of their expression (i.e. they

40 For a small collection of seminal examples of the encounter between dance and film see <http://www.ubu.com/film/dance-with-camera.html>.

41 There was a series of conferences held between 1992 and 1995 in North America that later gave place to the “*International Dance and Technology Conference*”, which has been happening since 1999 (also under the name of “*Dance Tech Inc.*”). Not only this, but some key figures in this field's development, namely Scott deLahunta, Marc Coniglio and Scott Sutherland, were responsible at the time for setting up a website called “*Dance & Technology Zone*” (<http://art.net/~dtz/>), which served as an important platform to reify and support this convergence.

42 The advent of which will be briefly discussed in Section 3.1.

can be expressed both by dancing bodies and by choreographic notations). By being organizable and resumable in space and time, dance becomes complied to be the object of a knowledge that, because it regards ways of doing, it is technical (i.e. *tekhné* as skill or craft). The knowledge of dance that choreography has allowed to transmit across generations of dancing bodies is, literally, its main legacy. As such, it is its main capacity. The encounter between dance and technology must be understood in relation to this historical frame, i.e. it must be understood in relation to the constitution of choreographic knowledge within the overarching project of Western epistemology.

From this standpoint, it can be proposed that using digital tools to express dance-related knowledge is but one specific mode of choreographing. Of course digital tools offer possibilities to represent dance that are far more complex and varied than simpler modes of symbolic expression, such as systems of choreographic notation.⁴³ Notwithstanding, in relation to the overall historical project of choreography, such specification remains tied to the representation of dance-related knowledge. Choreography as such remains unchanged by the use of digital tools. The digital domain continues to serve the same technological character of dance that choreography has always served, but with more and new possibilities.

The encounter between dance and technology can therefore be said to correspond, most fundamentally, to the technical modes of thought that have given rise to choreographic techniques. Which is also the reason why choreography can be subjected to computation and, more specifically, to digital computation. Not in the sense of digital computation being simply a function of registration and representation, but rather in the sense of being itself organized diagrammatically and algorithmically. Digital choreography can in this way iterate the diagrams of dance and express representations of the dancing body in ways that, at once, conform to the latter and express it otherwise.⁴⁴ Simply put, the transition towards the use of computational machines in choreography can be said to correspond to a passage from non-automated procedures to automated ones. A passage that changes what choreography can do only insofar as the possibilities of digital programming are more vast than any other computation performed by non-automated means.

Despite the possibilities offered by digital programming to choreographic processes, it is true that many times the dancing body has been represented only by

43 For a series of examples regarding the digital representation of dancing bodies, see Chapters 4 and 5.

44 For a discussion of the digital as a domain of possibilities see Chapters 5 and 6.

metrical principles of organization,⁴⁵ principles that regard, first and foremost, the workings of computational machines. Many times the dancing body has been automatically captured into the digital domain only to become a determinate set of numbers in representation of its movement wholeness. In this case, due to the reduction of analog media to arrays of 0's and 1's, whatever is hold intensively and durationally in the source domain remains cast out of numbers. The digital, which is discontinuous and coded according to Boolean⁴⁶ logics, can only represent the analog. Conversely, the analog is to a large extent incompressible.⁴⁷

This regards the argument that what has no external organization cannot be transposed to a domain exclusively based on numbers. The virtual reality of the dancing body has no parallel in digital arrays. The dancing body is always more than all the extensions that from it might be derived, not only because it comprises too many variables, but also because it possesses varieties of reality that are not quantifiable and, as such, not organizable in extension. The analog's incompressibility regards as well the argument that qualities and quantities are irreducible to one another, leaving aside in any translation that which is untranslatable. It is true that the representation of the dancing body in domains other than its own is necessarily expressive, for the sake of being perceivable, and therefore comprises its own qualities. But these are to be acknowledged as corresponding to events of perception that discard the dancing body's presence. The digital domain is, in this respect, a multilayered and multidimensional mediatic domain wherein code is translated into code and, eventually, into audio-visual expression. Each translation overrides what the digital cannot articulate, only to bring into expression qualities that are but a resumption of given quantities. Translation can be here defined as the reduction of perception into arrays of binary code. From

45 In this regard, all possible examples share one same aspect: the digital representations of the dancing body are constructed solely on the basis of computation. "*Lifeforms*", a seminal software in digital choreography, is a paradigmatic example of this. Being a digital program for animating and notating choreographic ideas, "*Lifeforms*" allows for representing dancing bodies in a euclidean fashion. Here, the dancing body is reduced to a series of computational possibilities, which notwithstanding can be creative of choreographic ideas impossible for real dancers to perform. There is no input apart from user-determined data, to be computed according to built-in parameters. On the other hand, throughout the years, choreographic softwares became more prone to compute motion-capture data (see Chapter 5). Motion-capture devices do no more than sampling data from sensed variations, i.e. they organize the numerical representation of these variations according to predetermined parameters of articulation. Which is to say that, for motion data to be computed, it first needs to be structured. Such structuration is itself computed by parametric algorithms predetermined into the devices' software. Hence, this passage from raw to structured data corresponds to the articulation of numbers with one another in accordance with digital representations of space and time. All in all, the digital demands the analog to be reduced to a binarism that is but a metrical mode of organizing space and time.

46 See footnote 147.

47 For a discussion regarding incompressible quantities of data existing together with finite quantities of data, see Chapter 6.

perception to abstraction and from abstraction to expression, translation proceeds first as reduction, and then as additive speculation. Reduction, because various quantities of data are synthesized into the limited articulation of numbers. Additive speculation, because whatever is missed by the discrete quantities of data needs to be generated anew when expressively qualified.⁴⁸ This necessity of adding data to what is given attests the reduction that occurs when going from qualitative experiences to quantitative expressions. The digital samples the analog and simulates it to the point of coincidence. But this neither means that they are one nor that they are the same. The possibilities of the digital domain are sufficient neither to constitute a whole dancing body nor to reproduce the analog in its full depth. Translating the dancing body into digital code is always to register data predetermined to be of choice and to compose a double of reality defined only to the extent of its useful participation in the field of perception (i.e. what cannot be perceived can be discarded).

If the digital representation of dancing bodies always misses their virtuality, how is it then that choreographic knowledge can be constituted anew? Clearly, the speculative addition of reality has a role in creativity. But if the invention of digital machines only adds to preconceived notions of what dance is, translations from the analog to the digital can only represent what the dancing body is assumed to be. In this case, before the encounter, dance is given as a preformed idea. Additive speculation can then only follow its own biases, which pertain to specific points of view, each informed by a past of its own. For novel instances of choreographic knowledge to emerge in the encounter between dance and technology, translations need to be infected by potentials with the capacity to constitute what cannot be predicted. If novelty is to occur, neither what dancers know nor what anyone else might suppose to be dance should be assumed to define the encounter between dance and technology. For such encounter to be the site of novelty, choreographic potentials must be activated. This is to be done by means of transduction, rather than translation. As it will be argued below,⁴⁹ transduction is an

48 Speculative addition can be understood both as abstract invention and as concrete operation. The latter case regards the addition of inexistent data that, if it were to exist, would probably be as it is added. In this sense, what is added is what the present lacks for experience to be consistent with its past. This can also thought as recollection: whatever lacks in the present is filled with past memories. In this way, the present becomes consistent and coherent with its own past. As an example, philosopher Brian Massumi's take on the field of vision can be mentioned: "The 'pure' field of vision is a virtual field. No matter how carefully an experimental setup approximates it, actual 'impurities' will sneak in. For there will always already have been experience. What are the formlike emergences of the "pure" field of vision as isolated in the laboratory if not traces of past intermodal experiences straining to reactualize their ratio of constancy, to refresh already-objects they have been, to regain the world, preknown anew?" (2002, p. 155). See *Ibid*, pp. 144-161.

49 See page 74, Section 2.4.

operation that, rather than proceeding only on the basis of what is given (having to fill what is not), proceeds as well on the basis of what is not given (including, or practically acknowledging, the unconscious as a constitutive part of the process). Transduction is energized by undetermined potentials, which can bring novelty into emergence. Here, speculation does not add what is already known, but rather what is not. It expresses the difference implied in potentials that cannot resemble the past. Which is to say that novelty necessarily results from differences between potentials implicated in the encounter between dance and technology. Novelty speculates the resolution of such differences with what cannot be known in advance.

At this point, an argument regarding the creative capacities of any encounter whatsoever, and more specifically regarding the creativity of the encounter between dance and technology, must be made. For if it were not for these capacities, the encounter between dance and technology would not be capable of generating novel instances of knowledge and would, therefore, not even be this one generic encounter. On the basis of this argument is the assumption that dance can occur without generating a transmittable and repeatable know-how. Of course the one who dances (or even the one who watches dance) experiences the occurrence of dance. But this occurrence is not the sole condition for the formation of a diagrammatic and algorithmic kind of knowledge. The choreographic knowledge of dance requires a stabilization, if not of form, at least of the generative principles of one specific diagram. It requires a degree of determination regarding an interplay of forces. Only such stabilization allows for choreographic transmission. The formation of choreographic knowledge requires that the conditions of possibility of the experience of dance are known to the point of being reproducible. A knowledge that, at the same time that it is formed, defines the very diagram according to which it is organized. It is not important at this point to clarify the processes by means of which the formation of knowledge acquires a diagrammatic character.⁵⁰ It matters only to assert that, be it from a subjective point of view (i.e. interiority) or from an objective point of view (i.e. exteriority), the formal determination of experiential knowledge is a fundamental condition for the iteration of choreographic principles. In sum, if the experience of dance is to be repeated according to certain parameters, these must be determined accordingly.

It is therefore from the interplay between what dance is known to be and the unknowable itself that choreographic knowledge can be constituted as what regards,

⁵⁰ This is one of the central concerns of Chapter 4.

simultaneously, the emergence of experience and the necessary conditions for the latter to eventuate in this or that particular fashion. Since the constitution of this sort of knowledge necessarily results from focusing corporeal potentials towards the determination of repeatable parameters, it is in itself processual. Additionally, it objectifies the very process by means of which dance is experienced, a process that unfolds in-between the cognitive and the uncognizable towards the resolution of problems related with such indeterminate in-betweenness.

It can be advanced that the conditions of a creative encounter must necessarily involve a degree of indetermination capable of bringing into emergence that which cannot be anticipated. If the encounter between dance and technology is to constitute novel instances of knowledge, it must overcome predetermination with what in its conditions remains indeterminate. This regards the assumption that the ontic determination of dance is limited by reason of its own definition: when dance is defined as being this and not that, its knowledge remains bound to what dance is said to be. But it also regards the assumption that, if novel choreographies are to be attained by diagramming and iterating dance, the latter must not be given in advance. Rather, dance must be in itself, at least to a point, indeterminate. It must include in its own conditions of possibility the potentials to become more than what it already is. Only in this way is it possible to talk about an encounter between dance and technology. Not only because an encounter is an event and, therefore, by definition⁵¹, creative of more than what there was, but also because creativity requires conditions of possibility that are to a great extent indeterminate.

If new choreographies are to be created, movement needs to be acknowledged in its full scope. Not only must the dancing body be seen as encompassing both extensive and intensive realities, but also the constitution of knowledge must be acknowledged to involve both indeterminate and determinate realities. All in all, the assumption that movement occurs in space, but not without being open to the inscription of a durational time, corresponds to assuming that it effectuates its own conditions by moving through a constitutive degree of indetermination. It is by reason of potentiality that movement can create, even if in a series of replicas, images consistent with what has moved, i.e. a knowledge of what has been created. The conditions of knowledge therefore coincide with the conditions of movement. An equation that, as it will be argued below,⁵² conflates the conditions of possibility of both process and knowledge. Which is to say

51 For an overview of different definitions of the event see Zizek (2014).

52 See Section 2.4.

that the enabling conditions of the becoming of things (i.e. ontogenesis) are the same that enable the knowledge of them (i.e. epistemology).

If the encounter between dance and technology is to take the form of a determinate relationship between dancing bodies and computational machines, the resulting knowledge should therefore be understood as resolving a problematic process. In this sense, the expression of choreographic knowledge by digital means shouldn't be understood only in representational terms. Instead of choreographic knowledge being determined previously to digital expression, it must be determined with the very resolution of the problems implied by such relationship. This is not to say that the iterations of choreography into the digital domain do not entail conditions of possibility with regard to the formation of novel instances of knowledge. In this latter case, whereby formed instances of choreographic knowledge are given to the digital domain as data to be expressed by any of its possible means, it is possible that, from the simple resolution of problems of translation, novel ideas and their corresponding expressions are formed. In this way, the transference from determinate instances of knowledge from one domain of expression to another can generate choreographic ideas that are not only novel but also disembodied in regard to the dancing bodies that they might refer to. Here, with the possibility of thinking choreographically without the actual ground of a dancing body, choreography relieves its abstract capacities, i.e. it manifests diagrammatic arrangements that do not necessarily correspond to the traditional bodies of theatrical dance. Notwithstanding this possibility,⁵³ the constitution of novel instances of knowledge by means of the encounter between dancing bodies and computational machines, if it is to have its genesis in the conditions of possibility of this same encounter, it must be understood as a process that implicates heterogeneous problems, i.e. a process conditioned by bodies that comprise singular and heterogeneous differences at the level of their constitutive multiplicities. As such, it is not a case of translation, from given instances of knowledge to novel domains of expression, but a case of transduction—the transmission of potentials between domains of expression.

Transduction is not fully measurable. Inasmuch as it regards the resolution of problems posed at the level of what in choreographic systems remains without referent, it encompasses the durational movement of a process that creates the correlated subjects and objects of singular epistemological relations. It is in transduction that the creative powers of movement are to be attained, especially if the case regards the heterogeneous

53 Which will be explored mostly in Chapters 5 and 6.

multiplicity of a whole that, at the same time that it is open to and by undetermined potentials, it is actually composed by a variety of extensions. It is not worth at this point to discuss possible definitions of transduction and their related implications.⁵⁴ It is enough to say that it is through transduction that problems are transferred across scales and domains. Transduction regards the transference of diagrammatic ideas across the possible resumptions of choreographic expression.⁵⁵ It knows nothing about representation but instead informs unfolding processes with problems and resolutions. In short, transduction resumes problematic conditions throughout the iterative expression of correlated resolutions. It gives prevalence to creative differences rather than to the image of what might express the resolution of a problem.

If the encounter between dance and technology is to create novel instances of knowledge, the dancing body and its expressive movements shouldn't be taken as a representational referent for translation. Rather, the dancing body must be activated to the point of being creative of what it does not yet know. In that which regards the encounter between dance and technology, such activation corresponds to the interplay between the giveable and the not giveable. To measure movement, as it is commonly performed by the kinds of computational machines that intake sensorial feeds according to their structure,⁵⁶ is to translate the given, i.e. data, into a different domain. To assume that movement is only this, i.e. an expression as extensive as numerable, and that the conditions of possibility for the constitution of knowledge do not implicate continuous multiplicities, is to freeze choreography in one given form, of which the dancing body is a primary condition, but which cannot but act as a representational referent for translation.

In contrast to this, the involvement of computational machines in the encounter between dance and technology, as a condition of possibility for the constitution of knowledge, can be regarded as part of one open whole. Even if computational machines are programmable only on the basis of possibility (i.e. digital coding), the encounter between dance and technology instantiated with their aid should be thought as encompassing a variety of bodies and domains and as including in its development a durational dimension irreducible to counting and computation. It is by activating

54 For a discussion of the notion of transduction within the frame of French philosopher Gilbert Simondon's philosophy of individuation, see Sections 2.4 and 2.5 (a definition is given on page 74). Transduction, and more specifically Simondon's definition of it, has been a key notion throughout the development of this study, and it can be perhaps best understood in relation to the subject matters here discussed in the final Sections of Chapter 4.

55 For a discussion of problems as the objects of ideas, see Section 4.1.

56 For a series of examples of such computational systems, see Chapter 5.

potentials in a process of technological individuation that novel instances of knowledge can come about. Not as the iterative resumption of determinate cases of solution, but rather as the transduction of diagrammatic ideas that, notwithstanding, can be iterated without end. That which is without measure, without extension and without formal organization must be assumed to have a generative role and to be a constitutive dimension of creativity. The encounter between dance and technology, like any other creative encounter, must be acknowledged as having at its core a differential relation between indeterminate forces and determinate forms. Because, if the dancing body is defined according to a finite set of axioms out of which only a series of possibilities is renderable, nothing but that which conforms with what is already known can emerge as a valid proposition. Presumptions restrict potentials with possibilities that can be imagined beforehand. Predetermining the terms of a relation precludes creativity by setting possibility as the ground from which any development can occur. Possibility, as large as the set may be, is always limited and finite. It preforms images of what the future may bring, foreclosing the openness towards that in regard to which there is no possible anterior image. Assuming what dance and technology can do corresponds to premapping what their encounter can generate as a possibility that can be known in advance. As much as the results of this encounter can be imagined in anticipation to its particular resonances, no true novelty can be expected. In such conditions, creativity is subsumed by technical reproduction.⁵⁷

Possibility is inevitable. Forms are always already there to be abstracted by images of their possible participation in the future. On its turn, indeterminacy is present in the interval of forms, in the relational field that they establish by affecting one another to the point of a reciprocal transformation. From the initial conditions of an encounter to the emergence of novelty, creativity reconfigures the implications and explications of possibility and potentiality. It transforms the ways in which the order of what is determinate and the order of what is not relate to and affect one another. It brings into emergence novel facts of unity by changing the state of the whole to which it belongs. It is by means of actual contingencies that the encounter between dance and technology can be performed. But it is by means of potentials that both parts can affect one another beyond possibility. Affect, defined here as the simultaneous participation of

⁵⁷ Let us briefly recall that Walter Benjamin, like many after him, saw in the technical reproduction of the work of art a process that destroys the “aura” of the object. In other words, for the author, technical reproduction is but a mechanism that dispossesses the object of creation from “its unique existence in a particular place” (2008, pp. 19–55). The uniqueness of creativity can thus be thought in terms of the interpenetration of particular conditions that allow for the emergence of singularities.

intensity in extension and of extension in intensity, corresponds to the order of process whereby potentials escape the containment of their formal structuration and resolve themselves into the emergence of novel structures. Only by means of an encounter can potentials energize processes of creation. Encounter is the event of self-differentiation of its own initial conditions. When these conditions are moved by what in them is potential to the point of becoming different from themselves, what remains in relation can no longer be what it was. Hence, the emergence of novelty corresponds to a determinate transformation of its own enabling conditions.

For the encounter between dance and technology to be open to the potential creation of the unpredictable, neither dancing bodies nor apparatuses of capture can be given in advance. This means to move from a set of predictable possibilities to the indetermination of potentials in a creative movement, i.e. to activate an a-parallel evolution of dancing bodies and technical objects. From this, only one expectation can be maintained: that a creative process, rather than following a hylomorphic determinism, modulates its constitutive forces towards the creation of novelty. The constitutive creativity of an encounter regards not what might result from one given part entering in relation with one other, but rather what can result from a whole's openness: novelty not as what regards the absolutely different, but rather as what instead follows from conditions that involve both the possible and the potential. Indetermination is therefore a fundamental condition of an encounter's creativity. Only with the potentials of an encounter can what is given in possibility become different from itself and what is not yet given come to be. A true encounter engenders the unimaginable, it foregrounds what cannot be known in advance.

If letting go of assumptions on what a body can do is to move from ontological predicates to ontogenetic processes, to let go of assumptions on what technology can do is to embrace “technogenesis” (Simondon, 2005). In regard to the encounter between dance and technology, philosopher Erin Manning calls forth the composition of a “technogenetic body” (2009, pp. 61–76), conceived as a body that is not extended in capacity by prosthetic technologies but rather as one that is fully capable of becoming different from itself. As the author points out “concepts such as the Machinic (Deleuze & Guattari, 1987, pp. 71–74), the Body without Organs (Ibid., pp. 149–166), the Posthuman (Hayles, 2008), and Originary Technicity (Derrida, 1976, pp. 242–246), [...] suggest that a body is always already 'more-than', refuting the logic of the 'than' that would need to be prosthetically enhanced to reach its 'more-than' state.” (2009, p. 63). Such excess of the body over itself allows for thinking about the relationship between

dance and technology not as an encounter between self-identical parts, supplementing one another in what each one lacks, but rather as a becoming that, far from being predictable, holds in itself an excessive potential, a potential for becoming “more” than itself. Whereas possibility comprises images that can be concretized without differing from themselves, potentiality is the force of self-differentiation that opens the becoming of each encounter to the indetermination of what cannot be predicted. But what does it mean for a body to be “more-than” itself? What are the conditions that enable a body's capacity to create novel appearances? Perhaps the most complete answer given to these questions can be found in the theoretical works of philosopher of science Gilbert Simondon (1969, 2005)⁵⁸. For, while striving to understand the dynamisms by means of which domains such as the physical, the vital, the psychic and the collective come into existence, Simondon has proffered that the potentials of an individual exist in it as a reserve for more (2005, pp. 9–30). From this perspective, due to its own potentials, the individual can differ from itself and become other.

In Simondon's theory of individuation, potentials are said to be “preindividual”. Or, to be more correct, potentials are the means by which individuals access a preindividual reality, which is the reason of their self-incompatibility. The self-incompatibility of an individual is the condition whereby the latter accesses enough energy to prompt itself into a different state. The difference of potentials corresponding to an individual's self-incompatibility corresponds as well to its pre-individual reality. It is the force exerted by an energetic excess—the individual's 'more-than-individual' share —, with the power to overturn a determinate structural state. Having to resolve its own disparity, the individual cancels the incompatibility between potentials by creating novel structures. With each structural state, the individual keeps in form its own potentials, i.e. it keeps them within the limits of force required for the preservation of form (metastability). Structural transitioning can therefore be said to correspond to the transduction of force between formal appearances, i.e. it corresponds to the process by means of which an initial incompatibility is resolved with the emergence of a novel structure. Together with an individual's potentials, the preindividual can be said to correspond to what in the individual lacks formal determination. Or, to be more correct, if what is potential is undetermined in regard to actual expressions, the preindividual is

58 Because these texts are written in French, it should be noted that most of the quotes used in this study were in fact taken from partial translations of other authors. As such, the main translations from where references were taken are Simondon (1992), Lamarre (2012), Combes, (2013). Notwithstanding this adequation, when quoting Simondon, this text will reference primary sources (his own texts).

the source of the movement by means of which an individual comes to be. It is what comes before the individual, but not in a chronological sense. The preindividual is a reserve for more that the individual can access whenever becoming incompatible with itself. It is either dormant or active, but always contemporary to the individual. As such, in what regards the latter, the preindividual is a non-temporal anteriority.⁵⁹ It is the movement by means of which the pattern of a higher dimension resolves itself into the pattern of a lower dimension, i.e. force giving birth to form. Individuation—the becoming of an individual—should thus be understood as the process whereby the latter accesses its preindividual share, only to become something else: the effect of a transductive resolution. Transduction occurs while the individual and the preindividual are kept in communication. It transfers the force of disparity into the metastable agreement of forces and forms. Conversely, the individual should be understood as corresponding to a state of compatibility between potentials. In a state of self-compatibility, no communication between the individual and the preindividual occurs.

For this reason, it is said in Simondon's theory of individuation that being does not exhaust itself with its actual expressions. After each individuation, the order of potentials is kept in the formed individual, exceeding its actuality and endowing it with the capacity to participate in subsequent individuations. In this sense, a system of being corresponds not only to its actual expressions but also to its developmental processes. As much as potentials exist in actuality, being cannot be reduced to its individuals. It is more than them, for it encompasses all the individuals that it can potentially form. The same system of being can become different individuals, changing with each individuation the structures that keep in form its own potentials. The excess of a body over itself can thus be conceived as a preindividual “more-than-unity and more-than-identity” coexisting with and conditioning the “unity and identity” of “the phases of being, subsequent to the operation of individuation”. (Simondon, 2005, pp. 25–26).

Having said this, a couple of questions must be posed: Which kind of conditions enable technogenesis? Or, to be more precise, what are the necessary conditions for the encounter between dance and technology to individuate a technogenetic body, i.e. for it to bring forth an ecology of relations between dancing bodies and technical objects that is charged with potentials? How should the preindividual potentials of a technogenetic body be thought, given that its specificities are necessarily tied to what actually constitutes dancing bodies and technical objects? In order to essay some answers, this

⁵⁹ As Simondon points out, even time “develops out of the preindividual just like the other dimensions according to which the process of individuation takes place” (Simondon, 2005, p. 34).

study will now turn towards Simondon's philosophy, not only because of what has been indicated, but also because his theory of individuation deserves to be granted the status of being one of the most thorough inquiries made throughout modernity regarding the problematic relation between man and machines, from the standpoint of the relationship between potentiality and actuality. Or, as Simondon himself says, because technology, as the scientific study of technics, serves to reintroduce into culture—“that by which the human being regulates its relation to the world and its relation to itself” (1969, p. 227) —“a consciousness of the nature of machines, of their mutual relations and their relations with the human being, and of values implied in these relations” (Ibid., p. 13).

Before proceeding, one remark regarding the encounter between dance and technology must be made: there is no general category of this encounter from which principles of technogenesis could be extracted. What exists instead are series of singular encounters, each of which with its own ecology of relations. In each encounter, there is the potential for singular dances and technologies to emerge, as what results from an affective individuation between parts that do not remain unaltered. And in spite of dancing bodies and technical objects being capable of existing on their own and possibly coming together in order to compose functional aggregates, this doesn't assure the activation of their potentials. The fact of contact between encountering parts does not necessarily stand for incompatibilities in the choreographic system and therefore does not assure resolutions into novelty. In the set of mutually inclusive possibilities shared by dancing bodies and technical objects nothing more than what is already given can occur. The singularity of an encounter thus requires more than possibility. It requires the activation of potentials that, belonging to each of the encountering parts, can affect one another to the point of realizing an encounter's creativity. Affect is the fundamental order of the creative encounter. It exceeds the possibilities of contact between the encountering parts with unimaginable events.

Chapter 2 - SIMONDON ON INDIVIDUATION

This Chapter will synthesize Gilbert Simondon's philosophy of individuation in five Sections. With regard to this study's overall frame, this should be understood in two distinct ways. On the one hand, it has the purpose of essaying a second approach to ontology. If Bergson's theory of multiplicities has allowed for a first approximation to the thought of creativity, from the perspective of potentiality, Simondon's conception of this latter notion will more specifically allow for this same thought in regard to technical systems. This concerns, of course, the encounter between dance and technology. On the other hand, Simondon's philosophy of individuation will be here expounded in order to provide a conceptual framework apt to approach the constitution of choreographic knowledge from a processual viewpoint. Despite this being a chapter that does not refer one single time any concern with choreographic issues, it will prove itself not only fundamental for the remaining chapters' development but also valuable for their understanding. Section 2.1 will discuss Simondon's fundamental concerns with process and the ontogenesis of being. It will continue to conceptualize the notions already mentioned in the previous Chapter (i.e. individual and preindividual) and it will introduce concepts as fundamental to this philosophy as “phase”, “dephasing”, “principle of individuation”, “information”, “associated milieu” and “metastability”. Section 2.2 will introduce the “physical paradigm” that Simondon engendered to sustain most of his thoughts on individuation. It will not only situate the function of a paradigm in the structuration of this system of thought, but also discuss how the parameters of individuation extracted from it are used as a lens to look upon any kind of individuation. Section 2.3 will delve into the increment of complexity in the structuration of individuals to explicit how Simondon goes from the physical paradigm of individuation to the “psycho-collective” individuation of what he calls the “transindividual”. Section 2.4 will built upon the previous Section to argue about the conflation of ontology with epistemology. It will present the dynamisms of knowledge formation in accordance with Simondon's philosophy and, in this guise, explicate the concepts of “analogy”, “transduction”, “transindividual” and “allagmatics”. Finally, Section 2.5 will discuss the formation of technical individuals and their networks. Notions such as “machine”, “reticularity” and “technicity” will not only allow for defining the technical individual but also to indicate a possible way to approach the encounter between dance and technology from its processes' perspective.

2.1 - *Ontogenesis*

Gilbert Simondon's theory of individuation is preoccupied with accounting for the formation of individuals while putting forth the implication of forces in forms and the ways by which the former condition the latter. Which is to say that, rather than considering individuals according to a principle of self-identity, it gives primacy to the force of self-differentiation by means of which individuals come to be and transform.

Against the stakes of substantialism and hylomorphism, Simondon's philosophy proposes that any process of individuation encompasses more than its resulting individuals. It puts forth the primacy of ontogenesis over ontology, to the point of determining the individuation of knowledge itself. According to the author, knowledge cannot result but from a process of individuation.⁶⁰ Even the knowledge of individuation individuates. Upon such premise, it is further said that only by means of an individuating knowledge can individuation itself be known. This not only conflates the processes by means of which both knowledge and its individuals come to be, but it conflates epistemology and ontology themselves with the overall development of one system of being (i.e. ontogenesis). Here implied is the assumption that the knowledge derived from given individuals cannot be but an after-effect of their individuation. On its turn, the knowledge of individuation is one that individuates with the individuals to be known. In contrast to a knowledge constituted on the basis of givens, with which processes can only be known in respect to an articulated succession of formed individuals, the knowledge of individuation is in itself a processual knowledge. It is a knowledge that individuates together with the individuation of what will come to be known and that, therefore, results from the openness of the system in which it emerges to its own constitutive and implicit potentials. A conflation that it is only possible inasmuch as both processes are capable of affecting one another, reciprocally, to the point of becoming intrinsically related. This is, of course, the co-constitution of subjects and objects. A relation that, rather than being given, constitutes itself simultaneously to the constitution of its own terms.

The formation of knowledge not only encompasses the constitution of subjects and objects, but also a plurality of processes and structures that exist independently from epistemological relations. Regardless of acquiring a subjective or an objective point of view, the many individuals of one same system of individuation are primarily

⁶⁰ See Section 2.4.

related to one another by a shared field of potential affects. As already mentioned, such field comprises what Simondon designates as “preindividual”—the primary force of individuation. It is at the level of the preindividual that the plurality of individuation is unified. Not as set, but as whole. As the continuous charge that underlies any of the system's individuals, which is also the principal cause of their individuation. The different individuals of one same system of individuation correspond in this way to “the phases of being, subsequent to the operation of individuation” (Simondon, 2005, pp. 25–26). They express the system's potentials to endure under different conditions and manifest one same preindividual potential.

In contrast to an ontological approach, which defines entities on the basis of self-identity, ontogenesis regards the development of the system of being as a whole. It privileges the self-differentiation of individuals and, rather than granting them an existential autonomy, i.e. the self-sufficiency of ontological determinations, it considers them only as transient expressions of one open whole. From an ontogenetic perspective, the system's openness to preindividual indetermination is given as much value as its individual expressions. Which amounts to the conception that the overall development of a system of being can only be grasped if this is taken to be becoming. The implicit and potential difference constitutive of any becoming is in this way made to be as constitutive of being itself. Being is both preindividual and individual; it is virtual, potential and actual; and it is ordered in relation to the dynamic interplay of these many dimensions by a generative, i.e. ontogenetic, principle of immanence.

As an example, one can think of water: its molecules are the same but they can be arranged in different ways. Water can be solid, gaseous and liquid, depending on the intensity of forces such as temperature and pressure. The system of being named water encompasses all of this: its molecules and its states, its transitionings and the necessary conditions for different individuations to occur. Water, as being, is a multiplicity. It relates its many expressions to one another as different phases of one same system. Solid, gaseous and liquid are all such expressive phases, granted that they are continuous to one another by means of some preindividual share. The very potential of ice to become liquid, for example, attests water's irreducibility to each of its expressions and calls forth the necessity of acknowledging that the whole of it includes ever present potentials. Being as becoming encompasses all of this, it encompasses the plurality of its system's whole development.

The opposition between being and becoming that the ontogenetic perspective

overcomes generally results from a perspective that gives prevalence to the static over the mobile. From this perspective, the individual first needs to be given in order for its individuation to be known, after the actual fact. In a kind of reverse engineering, individuation is reduced to a succession of facts, connected to one another by means of actual causalities. Qualitative change is subsumed by quantitative variation, i.e. by the after-effect of change itself, to which only formed individuals correspond. For Simondon (2005, pp. 23–24), this oppositional standpoint between being and becoming can be reduced to two different perspectives: substantialism, which considers the individual as self-coincident and separated from others; and hylomorphism, which considers the individual as a conjunction of matter and form. Both perspectives assume a principle of individuation, but one which derives from stable things, from the formal invariance of individuals. In this way, the significance of individuation is overridden. Both substantialism and hylomorphism ignore the potential becoming of being, i.e. that being develops with each individuation, but only partially. Both perspectives do not account for the excess of individuals, i.e. for what impedes them from being the total expression of the system to which they belong. The plurality of individuation, in its continuous multiplicity, is missing. By ignoring this intrinsic force of self-differentiation, both substantialism and hylomorphism postulate the self-identity of individuals as a fundamental definition of being.

In contrast to these perspectives, Simondon's theory of individuation not only postulates the continuity of being by reason of potentiality, as it also asserts that none of its expressions is primary relatively to the others. In fact, inasmuch as being is becoming, its different phases must be acknowledged to exist continuously with its overall development, if not actually, at least potentially. They are not related to one another in the fashion of a discontinuous temporal succession, i.e. one after the other, but rather implicated in the potentials that energize each individuation. As such, they are as contemporary to one another as they are to the one system to which they belong. As Simondon writes, “[...] the idea of a discontinuity [discontinu] becomes that of a discontinuity [discontinuité] of phases, which is linked to the hypothesis of the compatibility of successive phases of being: a being, considered as individuated, can in fact exist according to several phases that are present at the same time, and it can change phases in itself; there is a plurality in being that is not the plurality of parts (the plurality of parts would be below the level of the unity of being), but a plurality that is above this unity, because it is that of being as phase, in the relation of one phase of being to another phase of being” (2005, p. 317). Not only is the hypothesis that the

relativity between phases corresponds to the reality of being as phase consistent with the latter's plurality, but also consistent with what in it is without phase—i.e. the preindividual. In this sense, the multiphasic reality of being can be said to be immanent in its system's preindividuality, and vice-versa. The passage from one phase of being to another must correspond to a transference of potentials between the preindividual and the individual levels of an individuating system. “Dephasing”, a term borrowed by Simondon from thermodynamics, denotes such passage. It depicts the event whereby being becomes self-incompatible and falls out of phase with itself. A dephasing is a phase-shift; it remarks the point at which two phases intersect and charge the system with preindividual potentials. Its aftermath is none other than the most adequate solution for the problem posed, a singularity corresponding to one of the concurrent phases' expression. Because in Simondon's theory of individuation being is conflated with becoming, and because becoming is necessarily polyphased, then any system of being can be said to comprise its many phases in potential.

An individuated system of being possesses therefore the capacity to become self-incompatible by reason of the preindividual charge immanent in it. If strong enough, such incompatibility can force the system into resolution, that is, into the process whereby a problem is posed and further cancelled. The system's overall development proceeds on the basis of this dynamic interplay between implicit disparities and explicit solutions. Dephasing manifests a problem as the very potential of its own resolution. Each phase expressed should thus be understood as the cessation of its own individuation. In regard to knowledge, this amounts to saying that an individual can only be known if the whole system to which it belongs is taken into consideration. Not that everything in the system is knowable. But only a knowledge that individuates on the same basis of the individuations to be known, a basis which includes the unconscious itself, allows for the understanding of individuals as actual manifestations of a more-than-individual whole. Once more, this corresponds to the primacy of movement over positions. It corresponds to the understanding that difference is primary to identity, not only because of being immanent in it but also because of being a fundamental condition for the latter's appearance and conservation.

Being is excessive in relation to itself and, precisely because of this, generative of its own resolute expressions. It is a system laden with potentials, which are kept in form with each individuation. Each phase of the system of being corresponds to the singular structuration of its own potentials. It is the form of the system's self-consistency. This means that, even when expressed with a certain form, the system of

being shouldn't be thought as being at rest. It continues to individuate by reason of its openness to undetermined potentials. In fact, as Simondon says, “the sole principle by which [individuation] is guided is that of the conservation of being through becoming” (1992, p. 301). Which amounts to saying that individuation is the process by means of which the potentials of one system of being are conserved. In each of its phases, the system holds the potentials to individuate further phases and, by doing so, resolve inescapable problems. Difference is a necessary condition for being to become and to conserve itself through becoming. If the system of being conserves itself through becoming, the disparity of its potentials is fundamental to its existence because only by resolving an internal problematic can it transfer its own potentials (i.e. the potentials to continue becoming) to yet another unproblematic phase. In sum, in order to endure, the system of being must remain potentially incompatible with itself.

A brief remark regarding the notion that individuation is guided by an intrinsic principle must be made. While constructing an approach that moves away from the premises of substantialism and hylomorphism, Simondon adverts: “[t]he idea that individuation might have a principle at all is a crucial postulate in the search for a principle of individuation” (1992, p. 298). Searching for a principle of individuation located before or after individuation, as substantialism and hylomorphism do, can only result in the transcendental or essential determination of reality. In such cases, either being corresponds to a pure ideality that acts on matter from the outside, determining in this way its actual expressions (hylomorphism), or being is given by the infinitely variable combination of unchanging atoms (essentialism). In one way or the other, the indetermination of potentials is missed. In opposition to such stances, which take individuation to be a “region of uncertainty [...] that needs to be explained”, Simondon proposes that individuation itself is where “explanation is to be found” (1992, p. 298). From an ontogenetic perspective, the principle of individuation corresponds to the operation by means of which “the system of energy that is individuating [...] realizes in the individual this internal resonance of the matter taking form and a mediation between orders of magnitude” (Ibid., 2005, p. 44). From the outset, the system of individuation conserves in communication potentials belonging to different orders magnitude, which can exert a force strong enough to dephase it. Such force is the potential of disparity. From phase to phase, the system restructures the distribution of its energetic potentials, only to keep itself becoming. As such, as Simondon writes, “the true principle of individuation is mediation, which generally presumes the existence of the original duality of the orders of magnitude and the initial absence of interactive communication

between them, followed by a subsequent communication between orders of magnitude and stabilization” (1992, p. 304). The becoming of being is tantamount to the internal resonance of its system. As long as potentials belonging to different orders of magnitude keep affecting one another, the system of individuation can access its preindividual share and individuate adequate resolutions to its self-incompatibility. The principle of individuation is a principle of resonance.

There are, here implied, three important concepts in Simondon's theory of individuation: “information”, which corresponds to the resolution of an internal problem; “associated milieu”⁶¹, which corresponds to the energetic field situated across a collective of individual structures; and “metastability”, which corresponds to the overall state of a system when no disparity is to be found. It follows that, with these three concepts, individuation can be defined as follows: it is the process whereby a disparity between potentials belonging to the individual's associated milieu disrupts the system's metastability and informs it into a novel state of resolution. Further, by defining information as “that by which the incompatibility within the unresolved system becomes an organizing dimension in its resolution”, Simondon deliberately moves away from how this notion was conceived by information theory—i.e. information as a given unity—, in order to fully encompass the ontogenetic reality of being. For the author information pertains to the affective exchange provoked by an incompatibility in the system's potentials and to the process by means of which these same potentials are restructured in the form of a metastable solution. Hence, information “is the signification that emerges when a process of individuation reveals the dimension through which two disparate realities together become a system” (Simondon, 1992, p. 311).

To say that individuation resolves an initial incompatibility by restructuring the system's potentials corresponds to saying that what it individuates is both a structure of remarkable points and a formless field of potentials, i.e. the individual's associated milieu. When commenting upon Simondon's theory of individuation, media theorist Thomas LaMarre has defined the latter in the following way: “the associated milieu is what runs across the structure's contrast (external milieu) and spacing (internal milieu).

61 Philosopher Brian Massumi recently gave a brief explanation of the term “milieu” that is worth mentioning: “The word, often qualified by 'associated', is a favourite of both Simondon and Deleuze and Guattari for its double entendre in French. In French milieu means both 'middle' and 'surroundings'. To put the two meanings together without falling back into an outside/inside division that calls for a subject or object to found or regulate it, you have to conceive of a middle that wraps around, to self-surround, as it phases onward in the direction of the “more” of its formative openness.” (Manning, 2013, p. xii).

And, where terms such as 'contrast' and 'spacing' have largely spatial and static connotations, the associated milieu is energetic, charged, potentiality. [...] In sum, the associated milieu is the energetically charged field running across internal spacing and external contrast.” (2012, p. 40). The associated milieu is a fundamental condition of individuation. It is the very ground from which and on which the internal resonance of an individuating system unfolds. In order for individuation to occur, the internal milieu and the external milieu need to communicate with one another. Without their communication, the system remains charged with potentials, but latent in a metastable phase. The individual's associated milieu facilitates the communication between the system's potentials; it is its medium. Its activation is tantamount to the inevitable exchange between milieus that follows from a disparity between potentials. Only by means of an associated milieu can a system of individuation resolve its self-incompatibility.

After resolution, the system of individuation remains metastable, a notion that was borrowed from thermodynamics too, remarkably not only by Simondon but also by mathematician Norbert Wiener in his account of cybernetics (1965, pp. 58–59). The notion of metastability depicts the state of a phase. It depicts the fact that a phase of being is not stable, but rather charged with differences of potential that keep on exerting their forces, not only on one another, but also on the phase's individual structures. In a metastable state there's no disparity. In spite of the system being charged with differences of potential, none is problematic enough to dephase it. In a metastable state being is conserved within the limits of a phase. Such notion can be exemplified with a standing posture: in order to stand on its two legs, the human body needs to constantly modulate the distribution of forces exerted on it. In standing, the body keeps itself within the limits of force holding it in such state. This corresponds to saying that, in equilibrium, the standing body is far from being stable: it continuously mediates differences of potentials belonging, for example, to earth's gravitational pull and to the body's muscular activity.⁶² Any variation in the conditions of the metastable stand strong enough to disrupt it suffices to inform the body into another state of resolution (a

62 In order to feel the metastability of any standing posture, one just needs to stand, close the eyes, breath into any part of the body that feels tight, and let the weight fall down through the vertical stacking of the bones. By doing this, one can easily feel the ongoing movement occurring at the level of the hip joints, knees and ankles. In order for the body to stand, the muscles crossing these joints can't stop moving. Notably, dancer and choreographer Steve Paxton has developed this exercise as a dance practice, with the name of “Small Dance”. Similarly to what has just been described, the “Small Dance” exercise consists in bringing one's attention to the ongoing adjustments of the body's musculoskeletal system, while this keeps the distribution of energies throughout the body in a standing balance (Paxton, 2008).

moving floor, such as in a bus, with all its variations in acceleration, is all is needed). While standing, there is movement. In fact, this is one possible definition of equilibrium: a state of relatedness in which a multiplicity of forces is kept under a determinate threshold of transformation. In the case of the standing body the negotiating forces can be located, for example, at the level its musculoskeletal system. And the reason for this is that muscles work in antagonistic pairs: whenever one group of muscles shortens (e.g. the hamstrings), another one stretches (e.g. the quadriceps). There is, even at this level of muscular antagonism, a metastability between different regions of the body (e.g. anterior and posterior, left and right, high and low). While standing, the body remains charged with potentials that can bring it whenever required into novel states of resolution.

2.2 - Physical Paradigm

Following the developments of twentieth century's science, and more specifically of thermodynamics, Simondon made of the concept of metastability a central notion to his theory of individuation. For the author it mattered that the principle of individuation guiding the passage from one metastability to another could account for the developments of a system across domains as different as the physical, the vital, the psychic, the social and the technical. While looking for the “first domain in which an operation of individuation can exist”, Simondon found in physical individuation “a [paradigmatic] case of the resolution of a metastable system”. From this case, it was crystallization that came to provide the theory of individuation with an “abundant fund of notions”. But granting physical individuation the status of paradigm in relation to individuation in general, one that provides the necessary notions for thinking individuation in domains other than the physical one, does not stand for reducing non-physical individuations to the simplicity of crystallization. While progressing in the knowledge of individuation, from a simple case to a more complex one, “the transposition of the schema [of individuation] is in turn accompanied by a composition of it”. Which means that, when passing from one structural domain to another, it is the very operation of individuation that, while conforming to its paradigm, is composed and therefore differentiated. Despite all individuations having the physical domain as their fundamental ground, each domain still has its own proper dynamisms of individuation. The differences between individuations are, therefore, to a great extent, the same

differences that can be found between domains. What differs from the paradigm of individuation to the individuation of non-paradigmatic domains are the dynamisms that unfold beyond the ones characteristic of the physical domain. A differentiation which is grounded on what is most paradigmatic to individuation and which unfolds into the concretization of more-than-physical expressions. In this sense, when individuating more-than-physical domains, the paradigmatic schema of physical individuation is further composed with aspects of different and more complex individuations. (Simondon, 2005, p. 319).

The parameters of individuation that Simondon extracts from crystallization are indicated by Thomas LaMarre as follows: “(1) remarkable points, that is, form or structure of the individual; (2) the charged ground or potentialized associated milieu of the individual that is at once external contrast and internal spacing; (3) the neutral point of the event (absolute origin) of individuation that simultaneously sets off individuation and arises in it; and (4) the field of preindividual being, which is the specific activation associated with a specific neutral point, that is, the specific activation of a relation between disparate orders of magnitude that 'potentializes' or 'energizes' the process of individuation.” (2012, p. 40) And, as LaMarre also notes, in order to not take this paradigm as a metaphor, but rather as a process analogous to the individuation of other domains, “we need to look at the individual in terms of a sort of energized topological configuration that has remarkable points, a charged ground (contrast and spacing), a neutral point, and a plane of disparity crossing orders of magnitude” (Ibid., p. 40). With such definition, and because of its centrality in Simondon's theory of individuation, it is worth discussing each one of these parameters at length.

The associated milieu is distinguished from the preindividual due to a difference existing between the former's internal spacing and external contrast and the latter's potentials. It is plausible that the one does not correspond to the other insofar as internal spacing and external contrast pertain to one same order of magnitude. In the case of crystallization, the structure's associated milieu is the crystal's aqueous solution. As the ground against which the crystal's structure is remarked, this solution surrounds and pervades it. It is simultaneously external and internal to it, as long as their relation is kept active. The crystal's remarkable structure is in this way contrasted against the ordinary ground of its aqueous solution. Contrast is said to be external to the crystal because it corresponds to differences between the structure's remarkable points and the ordinary points of its associated milieu. By the same token, internal spacing does not correspond to what is inside the crystal. Instead, it corresponds to the spatial relations

held between the crystal's remarkable points. The absence of contrast either defines the crystal or its associated milieu. And when this absence defines the crystal, it defines as well its internal spacing, that is, it defines the crystal's remarkable points relation to one another. For these reasons, both internal spacing and external contrast can be said to belong to one same order of magnitude. The associated milieu is therefore distinguishable from the preindividual, which brings into relation different orders of magnitude.

Further, crystallization depends neither only on the internal milieu nor only on the external milieu. Rather, it depends on their affective relation. The very fact that crystallization can only occur as long as the crystal's internal and external milieus are kept communicating with one another attests precisely this. When taken out of its solution, the crystal stops growing. When put back into it, it restarts its growth. What matters then for individuation is the reciprocal affectiveness between internal spacing and external contrast. Their exchange allows for the system to access its preindividual reality and resolve itself into novel states. Again, the preindividual is distinguishable from the associated milieu as what is activated when internal and external milieus communicate with one another.

In this guise, LaMarre (2012, p. 38) tells us that the preindividual is “a disparity between orders of magnitude that is deeper than or prior to potentiality or potential energy itself”. What does this mean? Here we are confronted with the problem of understanding what exactly triggers individuation. As mentioned before, individuation follows from an initial incompatibility between potentials belonging to different orders of magnitude within one same system of individuation. But in order to understand why the resulting individual acquires a specific form, i.e. this one and not that other, it is important to account for the fact that the initial conditions of individuation necessarily implicate developmental tendencies. While Simondon talks about a “seed of form”, LaMarre talks about a “neutral point”. Both terms refer to structural tendencies implicated in the initial conditions of individuation, from which result individual expressions. It is by means of a structural seed that is nowhere to be found (which is why it is a neutral point) that the resolutions of individuation express determinate structural characteristics.

When a crystal forms, for example, it follows the shape of the surfaces on which it depends as structural support. In the case of supersaturated solutions, such as supercooled water or sodium acetate, the potentials to individuate a determinate

structure are all there, latent in the solution itself. But in order for crystallization to commence, the solution needs to become impure, to become disparate relatively to itself. Crystallization follows from this disparity, forming structures that directly depend on the formal tendencies implicated in the initial impurity. This does not mean that the resulting crystals will necessarily be isomorphic to whatever form the impurity has. Other variables, such as the concentration of salt and temperature, also enter in the processual equation. Whatever results from this, from the process of individuation itself, follows from the system's internal resonance and therefore from non-localized relations. Which means that the shape of an individual does not result directly from a process's seed of form. The relation between the two must rather be thought in accordance with structural tendencies that the seed of form implicates in individuation itself. Notwithstanding this non-localisable relation, what here matters is that potentiality is not tantamount to preindividuality. The system can be charged with potentials, yet without moving them into other states of metastability. For individuation to unfold, a disparity between potentials needs to occur. The assertion that the preindividual is “deeper than or prior to potentiality” (Simondon, 1995, p. 203) can be therefore understood in the same way that disparity is deeper than the terms in relation.

This is a depth that can be approached with regard to a process's initial location. The fact that a difference between concentrations of salt belonging to different regions of the individual's associated milieu can be infinitely divided in order to precise the location of the seed of form or, in other words, the very beginning of process, means that at the end of the infinitesimal division of space only a virtual image of what that might be will be found.⁶³ As such, the actual seed can only be accessed by an imagination based on what is actually perceived. Difference remains inaccessible throughout the infinitesimal regression of a negative dialectics (i.e. this is this because it is different from that, and from that, and from that, and so on *ad infinitum*). The self-coincidence of each actual form corresponds to a difference that is always external to it.

⁶³ It is worth noting that, with this division, qualities are overridden in order to give place to the absolute extension of actuality. A difference between concentrations might very well be understood as a qualitative multiplicity, one that is continuous and that therefore cannot be divided. Nonetheless, inasmuch as a process can be reduced to expressions, the qualitative relations hold between any terms can be cast into the intervals of actual space, i.e. into the in-betweenness of ever smaller and discontinuous parts. Hence, when dividing space according to a fundamental difference between quantities and qualities, nothing but a virtual image is to be found beyond given forms: the image of an origin. In this way, a crystal is defined exclusively in accordance with quantitative determinations (concentration as a relation between quantities) and the qualitative dimension of relations is cast away from any actuality whatsoever. The conception of a difference between potentials is as problematic as the very split between the virtual and the actual, which is a split between quantities and qualities. For more on this split see Section 1.1, in articulation with Sections 6.3 and 6.4.

This is a virtual difference. It is nowhere to be found in actuality. The “absolute origin” of individuation, as Simondon (1969, pp. 40–43) calls it, is therefore the transcendental difference located at the heart of process. Implicit, but imperceptible; generative, but inaccessible. Fated to be known only by means of what is possible to imagine.

With regard to the difference between the neutral point and the absolute origin of individuation, Thomas LaMarre writes the following: “We can think of the neutral point in relation to the physical form of the crystal, as a given, while the absolute origin refers to the eventfulness that is triggered by the neutral point, the activation of the field of potential energy. The proximity of neutral point and absolute origin helps us to understand how this neutral point functions: the relations triggered or activated by the neutral point are relative, but the entire set of relations, potential and actual, are relative to an absolute origin (an eventfulness), which allows for them to be operative as well as measurable within a frame of reference, or more precisely, within a concerned relation.” (2012, p. 37). As such, the event of initiation simultaneously generates individuating structures and that which acts as their seed. Before its commencement, what will have in fact initiated individuation cannot be known. And after its initiation, the origin of process can only be idealized in abstraction. There is thus in each beginning of individuation a concrete point—the seed of form—and an abstract point—the absolute origin of individuation. From which it follows that individuation corresponds to a passage from the formless to the formal, which simultaneously determines the seed of form and its subsequent structures.

This passage depends on potentials. In spite of the possible split between the virtual and the actual—so characteristic of topology, differential calculus and Leibniz's theory of infinitesimals—, potentials belonging to different orders of magnitude do enter in relation with one another. Only this allows for individuation to commence and terminate. This is clearly explained by Simondon in the following passage: “There is a 'disparity' when two twin sets that cannot be entirely superimposed, such as the left retinal image and the right retinal image, are grasped together as a system, allowing for the formation of a single set of a higher degree which integrates their elements thanks to a new dimension” (1995, p. 203). It is therefore the conjunction of what is disjunct and not compatible in absolute that allows for the emergence of novel dimensions in the overall development of a system of individuation. Only on the condition of this sort of incompatibility can a system of potentials access its preindividual reality and individuate what is not yet completely determined. In sum, the preindividual can be distinguished from a system's potentials insofar as it corresponds to the activation of an

amplification in resonance.

From this standpoint, and confirming what has already been said, it can be posited that the preindividual is activated only on the condition of a disparity between potentials belonging to an individual's associated milieu. From such activation follows the structuration of a new individual order. In regard to such order, what is most important to retain is the fact that the novel structure is primarily defined as relation, i.e. as being both the relation of its remarkable points to one another and the relation of the structure to its ground. This definition of the individual as relation results in fact from the system's internal resonance. For, as Simondon recalls, relation is “an aspect of the internal resonance of a system of individuation” (2005, p. 29). The individual is not determined relatively to an external world, such as an outside observer, but determined relatively to itself. This aspect of the internal resonance of individuation can be best understood together with the following passage of French philosopher Muriel Combes's commentary on Simondon's theory of individuation: “Unless we grasp the importance of its relation with an associated milieu, we do not understand what the reality of the individual consists in: the individual, in effect, is not an absolute; by itself alone, it is an incomplete reality, incapable of expressing the entirety of being; and yet it is not illusory either, and, associated with a milieu of the same order of magnitude retaining the preindividual, the individual acquires the consistency of a relation.” (2013, p. 21). Being relative to itself, the individual consists with itself by reason of its difference to itself. The difference between its remarkable points and its associated milieu assures the individual's self-consistency. From which it follows that relation itself emerges with the constitution of individuals. Relation shouldn't be conceived as what is established between two preexisting individuals, but rather as what individuates with the constitution of individuals as relation. Simondon adverts: “it is because terms are conceived as substances that relation is a relationship between terms, and being is separated into terms because it is conceived as substance, primitively, prior to any examination of individuation.” (2005, p. 32). Hence, if individuation is granted to encompass as many individuals as allowed by the plurality of a system of being, individuals themselves must be conceived as relation. And how could it not be so, if what defines an individual is the internal spacing and the external contrast of an associated milieu?

2.3 - *Transindividuation*

When passing from the physical domain to the domain of living beings, Simondon asserts one major difference: while the individuation of the physical being happens “in one step, [...] the living being conserves in itself an activity of permanent individuation” (1992, p. 305). The reason for this lies precisely in what the living stands for: an ongoing constitution of problems, from which follows the continuous emergence of novel states of resolution. “[I]n order to exist, [the living being] needs to be able to continue individualizing by resolving problems in the milieu surrounding it, which is its milieu” (Ibid., p. 305).

In contrast to other systems, such as machines (which can also organize compatibilities out of problematic relations), the living being stands out with yet another specific characteristic: its internal resonance. Because its first individuation is further amplified by the same field of resonance that emerges with it, the living being not only solves problems by changing its relation to the environment but also by modifying its own internal structure. It can thus be said, together with Simondon, that “[t]he living individual is a system of individuation, an individuating system and also a system that individuates itself.” (Ibid.). All these aspects express the continuous relation occurring between its interiority and its exteriority, throughout an ongoing resolution of problems. The multiple orders of magnitude that compose the living system keep communicating with one another in order to solve problems that inevitably result from this same communication. There is thus a constitutive loop-character to living systems: they are capable of self-regulation as long as their multiple orders keep communicating with one another, feeding-back and feeding-forward. In this way, the living system's internal and external milieus endure in a permanent and reciprocal exchange of energies, which is simultaneously the cause and effect of the system's self-resonance. For example: in order to prolong its existence in time, a living body needs to mediate the communication between the atmospheric order, which provides it with oxygen, and the metabolic order of its cellular activity. A small variation in one of these orders (e.g. the lack of oxygen) can generate a difference that is strong enough to energize transformations (e.g. cellular death).⁶⁴ As long as such disparity does not occur, breath can keep itself on a steady

⁶⁴ Interestingly, the fact that breathing techniques enable a body to modulate differences of potential between these two orders, indicates that one of the conditions of technical activity is precisely the ongoing communication between different orders of magnitude (a topic to be discussed, together with Simondon's conception of machines and technical life, at Section 2.5). Breathing techniques are used, for example, in sports to enhance performance: the modulation of the muscular activity related with breath is used to decrease energetic consumption and thus to optimize endurance and effortlessness.

pace. From which it follows that the dephasing of breath corresponds to the individuation of a novel period in the cycles of respiration.

There are two distinct yet correlated aspects of an individuating system's ongoing individualizations that are argued by Simondon to belong to the living system's potentials: one is perception and the other is thought. While perceiving, the individual resolves disparities that have become implicit in its associated milieu. Instead of this being the case of a given subject grasping a given object, it rather corresponds to the resolution of a problem in the relation of a living individual with its associated milieu. As such, subjects and objects come to be, as the transient sense of an event of perception. They are neither given nor giveable, and can only be considered from the standpoint of the metastability that is inherent to any perception whatsoever. (Simondon, 2006a). In addition, “[e]ach thought, each conceptual discovery, each surge of affection reprises the first individuation; thought develops as a reprise of this schema of the first individuation, of which it is a distant rebirth, partial but faithful” (Simondon, 2005, p. 264). As a reprise of individuation, thought is usually designated in the theory of individuation as “psychic individuation”. But it is Simondon himself who adverts that the individuation of thought in a living system is “not properly [...] a psychic individuation”; instead, it is “an individualization of the living being that gives birth to the somatic and the psychic” (Ibid., p. 268).

These two domains, the psychic and the somatic, are here said to result from a series of correlated individuations, rather than pertaining to an irreducible psychosomatic unity. Which is by no means a “body-mind” Cartesian duality. The reason why Simondon doesn't understand the psychosomatic individual as a seamless unity should rather be understood in terms of the rhythm of individuation that occurs in a heterogeneous field of potentials. Such rhythm follows from the conjunction of disjunctive series (psychic and somatic) in the system's overall development. There is an affective correlation between series that punctuates their differences and creates a singular psychosomatic nexus. Rhythm is key for understanding the differences between nexus and unity. When capturing one another, the series intensify their correlative differences and pose problems for the system to cancel. But since the system continues to individuate, because it is alive, these series can continue to affect one another and to intensify their differences. The result is a psycho-somatic rhythm of problematization

Another example are breathing techniques used in yogic traditions (i.e. *pranayama*): they also effect changes at the level of cellular metabolism, to the point of being used by apnea divers to lower the body's consumption of oxygen and prolong the duration of aquatic submersion.

and resolution that, inasmuch as it results from the remarked correlation of one same set of series, has a proper nexus.⁶⁵ Hence, the psychosomatic nexus, instead of being a homogeneous unity, as it tends to be considered by some holistic approaches, or what results from a relation between distinct systems, as proponents of the body-mind duality such as Andy Clark (1998) would have it, is to be thought as a heterogeneous field that, even after individuation, does not cease to be plural and differentiated. In each living system there is a characteristic nexus composed by disparate series of somatic and psychic resolutions that, while intensifying their difference by means of a reciprocal affectivity, structure the individual across different levels of psychosomatic resonance.⁶⁶

The degree of psychosomatic structuration depends on the heterogeneity of forces and forms constitutive of the living being. As Simondon says, “the problem [for the psychosomatic individual] is that of the heterogeneity between perceptual worlds and the affective world, between the individual and the preindividual”. In a sense, the living being is defined by relating a problematic of perception with a problematic of affection. Whereas the former is resolved at the somatic level, creating compatibilities between the individual and the milieu of its perception, the latter is resolved at the psychic level, creating compatibilities of the individual with itself. Notwithstanding the imbrication of the two domains, it is via the affective problematic that the living individual accesses its preindividual share and becomes incompatible with itself. The resolution of the affective self-incompatibility corresponds to the psychic individuation of a subject with a proper metastability. As Simondon says, “the subject is individual and more-than-individual; it is incompatible with itself”. (2005, p. 253).

If the resonance of the living system in relation to itself, its self-affectivity, brings into communication its individuated reality with its preindividual share, then it is by means of this same communication that perception can put the individual in relation to its milieu. This is a fundamental condition for the living individual to solve its self-incompatibility, for it cannot cancel its problems only by own its means. It needs to find in its associated milieu the resources required for such resolution. For Simondon, this incapacity of the living individual to deal by itself with its own problems corresponds to a state of anxiety: “If the individual being puts itself, but nothing else, into question, then it will not be able to move beyond the limits of anxiety, for anxiety is a process without action, a permanent emotion that does not succeed in resolving affectivity, a

65 It is worth noting that, later on this study, choreography will also be discussed according to this definition of nexus. See Section 3.1.

66 The upshot of this being that what distinguishes man from animal is not a difference in nature but a difference in degree of structuration (Simondon, 2005, p.272).

challenge in which the individuated being explores the dimensions of its being without being able to progress beyond them.” From which it follows that the conditions of psychic individuation, whereby the individual resolves its self-incompatibility, necessarily comprise potentials other than those of the system in tension. The conditions of psychic individuation coincide with the conditions of what Simondon calls “collective individuation”. This corresponds to saying that the resolution of the living individual cannot take place without the plural dimension of its affective-perceptive nexus, i.e. without the fact that, in order to individuate thought, a living individual must enter in relation with other individuals. As such, psychic individuation is necessarily accompanied by the individuation of a collective, that is, by the constitution of a field of relations comprising different individuals.

The affective problematic can thus be seen as a tendency in the living individual towards participating in collective individuations. And inasmuch as the collective is a fundamental condition for the individuation of psychic resolutions, both individuations, the psychic and the collective, cannot be accounted for but in relation to one another. Precisely because of their inextricable relation, the affective-perceptive field of a living system should be understood as belonging to one overall psychic-collective individuation. This overall character of the living is explained by Simondon in the following way: “the *psyche* is composed of successive individuations, which allow the being to resolve its problematic states by effectuating permanent communications between that which is larger than it and that which is smaller than it” (1992, p. 310). In a sense, this posits that the external milieu of the psychic individual cannot be but a collective of other psychic individuals with which the former communicates and co-individuates. Similarly, in the individuation of the living in general, any individual is the intermediate process of an ongoing communication between individuals belonging to orders of magnitude that are larger and smaller than it.

It follows that psychic individuation corresponds to the collective structuration of an individuals' affective potentials. The constitution of the collective occurs via the same shares of preindividual reality that affect subjects to the point of self-incompatibility. Conversely, all the subjects of collective individuation individuate from the same preindividual reality underpinning the emergence of the collective to which they belong. The relation between the subjects of psychic individuation and the collective that together they form is therefore not a relation between pre-constituted subjects, but a relation that is the collective itself. As Simondon clarifies, since relation is “a reciprocal regime of exchanges of information and of causality in a system that

individuates”, it is not the relation between individuals that constitutes the collective but rather the “individuation of the collective that is relation between individuated beings” (2005, p. 313). Relation, as event, does not precede the collective. Instead, it coincides with its very individuation. It emerges in the individuating system together with the terms that will end up relating. Neither relation nor its terms precede one another. And neither the one nor the others anticipate the individuation that constitutes them.

The co-constitution of different subjects belonging to one same collective attests the inextricable character of the occurrent psychic and collective individuations. To this co-emergence of the “systematic unity of internal individuation (psychic) and external individuation (collective)”, Simondon calls “transindividuation” (1992, p. 307). The notion of the collective in transindividuation shouldn't be confused with the notion of community. The collective is not the social realm in which the subject is “grasped as a character by way of the functional representation that others make of it” (2005, pp. 279–280). It is rather what comes to constitution by means of what is not yet constituted, i.e. the preindividual. In transindividuation, neither already formed individuals nor social entities suffice to allow for the emergence of the collective. The collective is what “comes into existence when the forces of the future harboured within a number of living individuals lead to a collective structuration” (Ibid., p. 298). Collective individuation requires more than individuals and social connections, it requires the preindividual that they all share. The collective thus corresponds to the transindividual resolution lived by a multiplicity of co-individuating subjects. It “is real insofar as it is a stable relational operation; it exists *physikos* and not *logikos*” (Ibid., p. 314).

As with the physical individual, after having individuated, the living individual keeps with itself the potentials that first allowed for its structuration. There is a process that goes from the individuation of the physical domain to the individuation of the vital domain and further into transindividuation, all by means of the potentials that each individual conserves with itself after cancelling an initial difference. Accordingly, there is for Simondon an individuation of the universe that comprises in its different phases its multiple manifestations. In transindividuation, the animal and the human, the individual and the collective, rather than being different in nature, are conceived as different phases of one same big system of individuation. The human, “having available more extended psychic possibilities, in particular due to the resources of symbolism, more frequently calls on psyche [...]”. Conversely, “[...] the vital situation is exceptional in the human, and thus humans feel more destitute. But it is not a matter of a nature, an essence serving to found an anthropology; it is simply that a threshold is crossed”.

(2005, p. 165). The same goes for the history of technics, in regard to which the philosopher identifies different phases of development: the phase “anterior to the use of the tool and the instrument”; the phase “of the tool, the instrument”; the phase “of the machine-tool and the machine”; and the phase of “reticulation” (2006b, p. 104).⁶⁷ All these different phases of one same system of individuation result from its progressive structuration across domains. From which it follows that the domains of transindividuation cannot be considered separately from one another. As Simondon notes, there is a “persistence of the primitive and original phase of being in the second phase, and this persistence implies a tendency toward a third phase, which is that of the collective” (2005, p. 305). All domains, as phases of one overall individuation, share this primitive and original phase, which is the very field of their immanent and continuous relationship.

“To the collective understood as an axiomatic that resolves the psychic problematic corresponds the notion of the transindividual”, tells us Simondon (1992, p. 310). If seen from the perspective of the collective, the transindividual is objective. If seen from the perspective of its individuals, the transindividual is subjective. When discussing these two different perspectives, Muriel Combes elaborates the following commentary: “We will thus speak of subjective transindividual when our aim is to clarify how the elaboration of psychic individuality is transindividual, that is, how an individual cannot psychically consist in itself. Indeed it is apparent that what gives consistency to individual psychic life is found neither inside the individual nor outside it, but in what surpasses it while accompanying it, that is, the share of preindividual reality it cannot resolve in itself. Thus, while it is the condition for the collective in the subject (by constituting [...] the basis for objective transindividual), it is also the foundation for psychological individuality: it is impossible to stress this point enough, that it is not relation to self that comes first and makes the collective possible, but relation to what, in the self, surpasses the individual, communicating without mediation with a nonindividual share in the other.⁶⁸ What gives consistency to relation to self, what gives consistency to the psychological dimension of the individual, is something in the individual surpassing the individual, turning it toward the collective; what is real in the psychological is transindividual. To propose a distinction between subjective and objective transindividual is ultimately to make clear that transindividuality illuminates

67 The technical aspect of transindividuation will be discussed in Section 2.5.

68 Which is also why the individual “begins to participate [in the individuation of a collective] by association within itself before any manifest presence of some other individuated reality” (Simondon, 2005, p. 304).

not only the nature of the collective as reality in becoming, but also the nature of psychic individuality.” (2013, pp. 40–41).

In the collective milieu of psychic individuation, the transindividual is the antithesis to a deficiency that can only be supplemented with prosthetic extensions and amplifications.⁶⁹ The constitutive incompleteness of individuals does not correspond to a negative lack, but rather to the creative potentials of the transindividual in them. “Together, all individuals thus have a sort of unstructured ground from which new individuation may be produced” (Simondon, 2005, p. 313). Which is to say that the unity of the transindividual is that of being a relation between relations.

2.4 - Analogical Knowledge

The determination of a subjective standpoint in the constitution of the transindividual corresponds to the constitution of a determinate instance of knowledge. For Simondon, there is a most important aspect to this process. In his words: “[t]he individuation of the reality that is exterior to the subject is grasped by the subject using the analogical individuation of knowledge within the subject; but it is through the individuation of knowledge, and not through knowledge alone, that the individuation of non-subject beings is grasped. Beings may be known by the subject’s knowledge, but the individuation of beings can only be grasped by the individuation of the subject’s knowledge.” (2009, p. 13). There is a knowledge that pertains to the structures of being and an individuation of knowledge that individuates with the known individuation. If Simondon's postulate that individuals are to be understood “from the perspective of the process of individuation rather than the process of individuation [understood] by means of the individual” (1992, p. 300) is to be taken seriously, then any knowledge regarding non-subjects depends on the individuation of knowledge itself. Furthermore, insofar as

69 That the human is constitutively deficient and that it depends on technical individuation to supplement this originary lack is a premise that has guided French philosopher Bernard Stiegler in his theoretical project “Technics and Time” (1998). Since Stiegler's philosophy is much influenced by Simondon's theory of individuation, it is here worth noting that, notwithstanding this influence, Stiegler has been pointed to misread Simondon and to not account for the creative capacities of the transindividual. This critique is, for example, addressed to Stiegler by Combes in the following way: “While he thoroughly stigmatizes those who 'do not accept that [...] humans are prosthetic beings', Stiegler does not seem to countenance the possibility that humans share more than default or lack. Yet such a possibility seems to me to be the lesson to draw from Simondon's hypothesis on the existence of preindividual potential associated with individuals, on their common belonging to an ontological dimension preceding them; and nothing in it forces us to conceive of preindividual as technological. If human individuals should not be conceived on the basis of fixed bioanthropological nature, I do not see why they should be conceived on the basis of original defect that we then take pains to call originary in entirely metaphysical nostalgia for foundations.” (2013, p. 69).

the individuation of knowledge depends on the constitution of a transindividual order, knowledge cannot but result from the relation between two distinct individuations: the one of the subject and the one of the object. Hence, as Simondon puts it, “[i]t is neither immediate nor mediate knowledge that we can have of individuation, but a knowledge that is an operation that runs parallel to the known operation. We cannot, in the common understanding of the term, know individuation, we can only individuate, individuate ourselves, and individuate within ourselves.” (2009, p. 13). Knowledge is a relation between two operations, of the analogical kind.

Whereas the knowledge of structures follows a method of “structural analogy”, which is guided by a principle of identity between individuals, the knowledge of processes follows an “operational analogy”, which is guided by a “transfer [to the knowing subject] of an operation that reproduces the operative schema of the being known” (2005, pp. 562–563). As such, the knowledge of individuation is itself a processual knowledge. In transferring the operative schema of the being known to the individuation of the knowing subject, thought individuates subjectively in analogy to the objective individuation. This happens not by following the individuation of what is grasped in a deterministic kind of way, but rather by resolving the self-incompatibility of the system of being on the basis of what exceeds the subject's individuation, that is, on the basis of the individuation of non-subject beings. It is in individuations other than its own that the knowing subject finds the necessary conditions for its own structuration. The operational analogy of knowledge distributes across the multiplicity of processes in transindividuation one same operative schema, from which result both the subjective and the objective perspectives of the transindividual, as two poles of one same epistemological relation.

This analogical character of knowledge in Simondon's philosophy is the condition upon which a paradigm of individuation can be found. The knowledge of crystallization, while individuating in a domain different from the physical one, only has a significant epistemological value insofar as it corresponds to the manifest instance of a relation between processes. As a relation between objects and subjects, knowledge is neither the condition of projection, i.e. imagination, nor the condition of retrospection, i.e. memory. In Simondon's words, it “is neither *a priori* nor *a posteriori* but *a praesenti*, because it is an informative and interactive communication between that which is larger than the individual and that which is smaller than the individual.” (2009, p. 15). Since it is characteristically processual and transindividual, “defined by the operation that constitutes it more than by the reality it objectively aims for” (Ibid, p.

554), knowledge is said to result from “an initial tropistic or taxonomic unity, a pairing of sensation and tropism, an orientation of the living being in a polarized world” (Ibid., p. 4). As such, it is not something that occurs inside an individual. The very notion of transindividual invalidates any idealistic conception of representation positing that the external world is reproduced, or even reproducible, by an individual's thought. This is a notion similar to the ones of embeddedness and embodiment, as these were developed by theories that strived both to put aside the Cartesian split between idealism and materialism and to reconsider the co-implication of individuals and environment in the constitution of knowledge (Maturana, 1975; Varela et al., 1992; Johnson, 1987, 2012; Clark, 1998, 2008; Noë, 2004; Gallagher, 2005). And here too, in Simondon's theory of individuation, this co-implication is a fundamental condition for the constitution of knowledge. The polar forces that pervade an individual because of its embeddedness in an associated milieu are the ground on which both problems and resolutions can occur, providing therefore the system of individuation with the capacity to generate novel states of relation. Be it from the perspective of perception or from the perspective of thought, these novel states of relation correspond to determinate orientations of the individual in its milieu. They correspond to the tendencies that the relation between the two generates within the mediation of what is both larger and smaller than the individual.

In regard to the concepts of the understanding, this orientation is an axiomatic. It is the epistemological value of the transindividual. Simondon tells us: “If knowledge rediscovers the lines that allow for interpreting the world according to stable laws, it is not because there exist in the subject a priori forms of sensibility, whose coherence with brute facts coming from the world would be inexplicable; it is because being as subject and being as object arise from the same primitive reality, and the thought that now appears to institute an inexplicable relation between object and subject in fact prolongs this initial individuation; the conditions of possibility of knowledge are in fact the causes of existence of the individuated being” (2005, p. 264). In a system of individuation, the relation between being and knowledge is that of a double becoming. Since the ground of knowledge coincides with the conditions of individuation, the transindividual necessarily coincides with the axioms of the epistemological relation between subjects and objects. The transindividual and its knowledge co-emerge. They are inextricable from one another because they result from the ingression of the preindividual that they share into the transindividual coordination of subjective and objective correspondences. It is in the ground of the transindividual relation that

knowledge finds its own validity. Or, in other words, the resolution of a problem of self-incompatibility in the system of being finds its emergent sense in the latter's tropisms relatively to the charged ground of its associated milieu. Any instance of knowledge is therefore most valid when with regard to the inextricable relation between individual and milieu from which it stems and to which it belongs. Valid knowledge must be situated.

Muriel Combes emphasizes this contextual aspect of knowledge in a very clear way: “Like all real being, like any fragment of the real that is individuated, thought is rooted in a milieu, which constitutes its historical dimension; thoughts are not ahistorical, not stars in the heaven of ideas. They emerge from a theoretical environment, drawing the seeds of their development from it; but of course, not everything is a seed for thought, and all thought entails operative selection within the theoretical milieu of the era in which it is immersed. Taking on structure through its selective inscription in an era, thought gradually resolves its problems, and in resolving them, justifies itself.” (2013, p. 12). It follows that there is no reality outside of the individual to be learnt in a sort of reproductive manner. Instead, knowledge emerges with the individuation of being, with the resolution of the same problems that fundamentally condition individuation. It finds in the problematic conditions of individuation the ground of its own structuration, that is, the fundament of its own determination as a determinate standpoint in regard to the reality of relations. Since it does not exist before its own individuation, real thought is not something given. It requires the composite constitution of a transindividual reality.

The transindividual constitution of knowledge corresponds neither to induction nor to deduction. Both methods follow from the assumption that what is known is identical to itself. Both assume that individuation can only be understood after the knowledge of individuals. They do no more than relating self-identical and discontinuous images to one another, creating lines of causality at the cost of overlooking the immanent field of undetermined potentials that pervades all actuality. For Simondon, in both methods “[t]here is, therefore, the presupposition of the existence of a temporal succession: first there is the principle of individuation, then this principle undertakes an operation of individuation, and finally the constituted individual appears. If, on the contrary, one supposes that individuation does not only produce the individual, one would not attempt to pass quickly through the stage of individuation in order to arrive at the final reality that is the individual – one would attempt to grasp the ontogenesis in the entire progression of its reality, and to know the individual through

the individuation, rather than the individuation through the individual.” (Simondon, 2009, p. 5). The entirety of process must be acknowledged and accounted for. For if an individual is never only a structure, coincident with itself, but also the contrasting ground of its associated milieu, then the intricate relation between sameness and difference needs too to be accounted for in what regards the constitution of knowledge. The point is that the conditional problems of individuation can only appear at the level of this relation, that is, at the level at which the individual's excess over itself marks not only its self-coincidence but also its self-differentiation. Only by taking into consideration this relationship between identity and difference, between structure and milieu, can individuation be properly understood. Likewise, knowledge needs to be approached in accordance with the dynamisms of affect between what is both different and identical to itself in the process of its own individuation.

There is therefore a differential topology of individuation that needs to be given primacy over its conditions and resolutions, i.e. over the different states to be connected in retrospective after the individuation of knowledge. Instead of knowledge being understood as a determinate state of affairs, resolved in itself and only capable of proceeding by means of comparison, it should be understood as a transfer of potentials between domains. In contrast to both induction and deduction, of which comparison is the veritable operation, Simondon designates this transfer as “transduction”: the process whereby the individuation of the being known acts as a functional and structural source for the individuation of the knowing subject. For Simondon, transduction “denotes a process – be it physical, biological, mental or social – in which an activity gradually sets itself in motion, propagating within a given domain, by basing this propagation on a structuration carried out in different zones of the domain: each region of the constituted structure serves as a constituting principle for the following one, so much so that a modification progressively extends itself at the same time as this structuring operation. [...] The transductive operation is an individuation in progress; it can physically occur most simply in the form of progressive iteration. However, in more complex domains, such as the domains of vital metastability or psychic problematics, it can move forward with a constantly variable step, and expand in a heterogeneous field.” (1995, pp. 30–31).

In the domain of knowledge, transduction corresponds to the formation of correlated subjects and objects. By transferring principles of individuation from one domain to the next, transduction facilitates the operational analogy of knowledge. It distributes across domains the excessive resources from where the constitution of knowledge draws its emergent axiomatics. According to Simondon, the fact that

transduction is used “to understand a domain of reality, indicates that this domain is indeed the location of a transductive structuration” (1992, pp. 313–314). In fact, only because the individuation of being unfolds through a progressive structuration of potentials, can knowledge receive from this same individuation the principles necessary for its own constitution. “Logically”, concludes Simondon, transductive knowledge “can be used as the foundation of a new species of analogical paradigms so as to enable us to pass from physical individuation to organic individuation, from organic individuation to psychic individuation, and from psychic individuation to the subjective and objective level of the transindividual [...]” (Ibid., pp. 311–314).

From this standpoint, the analogical character of knowledge can be better understood. To say that knowledge is a relation between two operations corresponds to saying that it results from a principle of individuation transferred across domains. Rather than being a comparison between processes, knowledge derives from a co-individuation of perspectives that, instead of following from given terms, transfers across domains one same field of problematic potentials. Whereas deduction and induction facilitate the comparative relation between self-coincident terms, transduction integrates in the progressive structuration of potentials the initial problems from which it follows. It both transfers information from one domain to the next and conserves its active principles so as to allow for different domains to be known accordingly. The processual analogy of knowledge fundamentally depends on the operation of transduction.

In order to account for the fact that knowledge individuates with the individuation of the being known and that, as such, it depends on the fundamental conditions of transindividuation, Simondon engendered the concept of the “allagmatic”⁷⁰. In itself a theory of knowledge, the allagmatic strives to account for constitutive differences in the relationship between structures and processes. It is based on the speculation that transduction transfers information not only across domains but, primarily, across states of structural organization. The neutral point of individuation necessarily occurs together with the seed of form and therefore with structures of remarkable points. From which it follows that the individuation of knowledge depends on transfers of energy between the given and the emergent, i.e. between the initial conditions of individuation and what emerges from them. The allagmatic refers to this

70 The Greek root of this term is *allagma*, which can mean either change or vicissitude. But in Simondon's use of it, *allagma* is more correctly understood as that which can be given or taken in exchange.

conversion of structures into processes and of processes into structures. It refers to the primacy of relation in process, which regards the inextricable affectivity between the determinate and the undetermined. The mutual convertibility between structures and operations that the allagmatic proposes regards the transfer of information in dephasing: from one phase to the next the system operates its potentials for resolution, enhancing the power of undetermined potentials over determinate structures (structure-operation conversion) and resolving co-related problems with the structuration of potentials (operation-structure conversion). For this reason, Simondon tells us that the allagmatic is “prior to any distinction or opposition between operation and structure” (1992, p. 29). Because it is mostly concerned with “the rigorous and valid relation between structural knowledge and operative knowledge” (2005, p. 565), it strives for encompassing the whole of individuation, that is, for encompassing both analytical perspectives, which reduce the whole to parts, and analogical ones, which equate the whole with structural change. The pertinence of the allagmatic derives therefore from the fact that neither structural knowledge nor operational knowledge suffice to know the whole of being. Only their relation, which is an individuation in itself, can provide the necessary insights into the immanent principle of relation between structures and operations, which is the very unity of being.

2.5 - Networks

When considering the relation between humans and machines and the possibility of technogenesis, one of the first questions that comes to mind is: how should the associated milieu of machines be understood? In other words, if a technical system is to be granted the capacity of changing, how is it that the potentials of individuation are related to technical individuals, such as machines and larger technical ensembles? How is the becoming of technical individuals to be understood if, in any case, it is arguable that technics are a mere result of humans' cognitive life? In order to address these questions, the notion of machine in Simondon's theory of individuation must be first addressed.

As Simondon (1969) recalls, machines need to be invented. From an abstract diagram to a concrete network of technical objects, invention proceeds as heuristic experimentation: probing the concrete attributes and capacities of matter, it adjusts the initial abstraction to the machine's best possible functioning. In this passage from

abstraction to expression, what emerges with invention is both a technical individual and its associated milieu. Whereas the abstraction of the machine lacks concreteness and therefore possesses no associated milieu, the concrete machine individuates together with its own internal and external milieus. Technical individuation thus opens the internal character of pure abstraction to the indetermination of potentials belonging to the machine's associated milieu. Simondon approaches the machine's internal milieu in terms of its "recurrent causality" (Ibid., p. 53). When being invented, the machine becomes progressively concrete and, in this way, determined. With such progression, a set of possibilities is formed and limited by the actual affordances of the elements in the composition. If subtracting possibilities corresponds to building one particular machine, the resulting affordances relate its elements to one another according to an equally particular mode of recurrence. In short, the machine recurs in the possibility of its own functioning. On its turn, the external milieu of the machine corresponds to what Simondon calls a "technogeographical milieu" (Ibid., p. 48). Only by being open to what is different from itself can the machine exchange information and be in relation with, most notably, other machines. In this case, and because each machine has its own internal milieu, the associated milieu is that which connects an internal spacing of recurrent causality to an external contrast of recurrent causality. It is by exchanging information between internal and external milieus that machines can assure their metastability. The machinic character of technical individuals assures a dependence between the recurrent causalities of different milieus. This dependency attests that variations in the recurrence of internal milieus necessarily induce changes in the recurrence of external milieus, if granted that machines are to be kept in form. This is a metastable self-regulation that brings machines closer to living beings than to physical ones, for what results from it is their very capacity to process information.

Simondon also defines the machine as that "which carries tools and directs them" (1969, p. 78). For the author, there are "simple, passive machines", such as "the handle", defined by being capable of transforming movement; there are "machine-tools" or "active machines", which are "semi-autonomous", that is, "autonomous for their energy and heteronomous for information"; and finally there are "reflexive and informational machines", defined by being "autonomous for both alimentation and information during its functioning, with information being delivered as a ground before the functioning". (2006, pp. 97–98). And in regard to the latter, he establishes an important distinction between the automaton of cybernetics and that which he calls the open machine: "The notion of a perfect automaton conceals a contradiction: the

automaton would be a machine so perfect that the margin of indetermination in its functioning would be non-existent, while it would still be able to receive, interpret, or send out information” (1969, p. 140). Being that, for Simondon, information is the process whereby an incompatibility between potentials is resolved, the inherent contradiction of the automaton lies precisely in the fact that its closure doesn't allow for the indetermination of the potentials in information. Being closed in itself, the pure automaton is incapable of accessing its preindividual reality and cannot therefore transform and resolve its own disparities. For this reason, Simondon proffers that “there is no such thing as a robot” (1969, p.10).

On the contrary, he says, it is “by the medium of this margin of indetermination, and not by automatism, that machines can be grouped into coherent ensembles so as to exchange information with each other through the intermediacy of the human interpreter as coordinator. Even when the exchange of information between two machines is direct (such as between a pilot oscillator and another oscillator synchronized by impulses), man intervenes as the being who regulates the margin of indetermination so as to make it adaptable to the greatest possible exchange of information” (Ibid., p. 12). The machine's undetermined openness is what allows for it to partake larger “technical ensembles”. These ensembles, tells us Thomas Lamarre, comprise “specific human assemblages, technical individuals or machines, technical elements, resources, and milieus” (2012, p. 48), and correspond to the machine's associated milieu. The machine's margin of indetermination not only corresponds to potentials that in the first place allowed for its individuation, but also to the means by which the machine accesses what in itself is undetermined and opens it to the informational exchange with other machines (provided that the margin of indetermination is regulated).

Remarkably, Simondon gives us a telling example of the position of man amongst technical ensembles, drawn from the collective performance of a musical score: “Far from being the supervisor of a squad of slaves, man is the permanent organizer of a society of technical objects which need him as much as musicians in an orchestra need a conductor. The conductor can direct his musicians only because, like them, and with a similar intensity, he can interpret the piece of music performed; he determines the tempo of their performance, but as he does so, his interpretative decisions are affected by the actual performance of the musicians; in fact, it is through him that the members of the orchestra affect each other's interpretation; for each of them he is the real, inspiring form of the group's existence as group; he is the central focus of interpretation of all of them in relation to each other. This is how man functions as

permanent inventor and coordinator of the machines around him.” (1969, pp. 11–12). This description is somewhat close to examples given by theories of distributed cognition, such as the one proffered by Edwin Hutchins (1995a), which focus on the interaction between the external and internal structures of representation. “Distributed cognition allows the examination of the role of the material media in which representations are embodied, and the physical processes that propagate representations across media” (Hutchins, 1995b, p. 226). It emphasizes the fact that cognizing processes are not exclusive of any single, isolated agent, but rather occur across the interiority of human agents and the exteriority of media. A paradigmatic example of distributed cognition is the way in which an airplane's cockpit remembers its speeds: the cockpit performs this task via a system of memory comprising both humans and machines (i.e. pilots, co-pilots, air controllers, satellites, on-board and on-ground computers); no single part of the system is sufficient for retaining and further remembering the airplane's speed. Like with Simondon's example of the orchestra, here, the human coordination of technical objects and machines assures that information is intensive enough to prompt the technical system into a state of metastability.

Between the machine's self-regulation and the regulation of information's margin of indetermination there's no contradiction whatsoever. While inventing the machine, man regulates the margin of indetermination necessary for its proper functioning. Without this regulation, the individuating being would become a physical individual, a natural object or a tool, rather than a machine. A machine-like functioning effectuates its informational and networking capacities, which are simultaneously the cause and the effect of its self-regulation. With this, it must be acknowledged that the intrinsic normativity of the machine's self-regulation is not given. Rather, it emerges with the machine itself. For this to accord with the technical system of individuation, it must also be granted that there is a preindividual of norms from which the machine's self-regulation acquires its own normativity. The technical system individuates norms, for it is by them that its individuals are provided with an associated milieu, i.e. with the technical networks that they partake. Together with the individuation of norms, potentials for further normativity are restructured and constituted as the associated milieu of norms. After the disparity of its normative potentials, the technical being can access the preindividual of norms and resolve itself into a new state of self-regulation, with its proper normativity. The upshot of this emergent self-regulation is that not only can machines be transformed because of partaking technical ensembles, but also the latter can transform as a whole. In this sense, the normativity granted to technical

ensembles is not a fundamental characteristic to them. What is most fundamental to the technical system are instead the conditions of emergence from which norms individuate. Such conditions are primary in regard to individuated norms, which are but an expression of those same conditions. This stands for the case that the technical individual is more-than-individual, i.e. that it is excessive in relation to itself. The very fact that the technical individual can only emerge out of already existing networks attests its incompleteness and specifies that its excess regards the technical network itself.

It follows that the technical preindividual can only become active by means of networking. At whatever scale of technical systems, reticulation is what allows them to become incompatible with themselves and resolve into novel phases. Networks are in this sense opposed to the kind of hylomorphism that determines the formality of tools. For, as Simondon says, “we cannot change networks or construct a network ourselves, [as we do with tools, but only] join up with the network, adapt to it, participate in it” (1969, p. 221). In short, we can only be an element in the life of technical ensembles. But it is by means of information that networks are established. Only the self-incompatibility of a technical system assures necessary conditions of its own internal resonance. Networks are informed, but they are also the very condition of informational exchange and resolution. The reticular character of technical systems allows for the propagation of information, which is the very means by which networks become topographically determined. In this sense, says Muriel Combes, “[r]eticularity [...] takes us from a normative horizon to a horizon of amplification of action” (2013, p. 66). Which means that networks constitute the very condition for information to be transferred and amplified, without normative predetermination.

Precisely because of this, networks can be seen as the ground of an ethics. For Simondon, ethics does not pertain to any model of norms imposed on the networkability of individuals. Rather, it corresponds to the technical act's capacity to transfer and amplify itself across networks. As the author says, “[e]thical reality is indeed structured in a network, that is, acts take on resonance in relation to one another [...] within the system they form, which is becoming of being” (2005, p. 333). Since the individuating system's internal resonance is the conditional network of technical transfers and amplifications, it is as well the very condition of an ethical relation between different acts of resolution. Further, it is what results from this same relation. Ethics, as an individuating resonance that goes “from one act to others in the same way that one may go from yellow-green to green and to yellow through augmentation in the amplitude of

the band of frequencies” (1995, p. 245), depends therefore upon the network's materiality. The value of an ethical act is given by the amplitude of its effects in a network of informational exchanges.

Reticularity is a mode of being that, in its collective plurality, individuates technical individuals and their associated milieus. Simondon designates such mode as “technicity”, which he defines in the following manner: “a mode of being only able to fully and permanently exist as a temporal, as well as spatial, network. Temporal reticulation consists of resumptions of the object in which it is reactualized, renovated, repeated under the very conditions of its initial fabrication. Spatial reticulation consists in the fact that technicity cannot be contained in a single object. An object is only technical if it occurs in relation with other objects, in a network where it takes on the meaning of a keypoint; in itself and as an object, it only possesses virtual characters of technicity which actualize themselves in active relation to the ensemble of a system” (Simondon, 1958, p. 325). The technicity of a technical ensemble is not reducible to the sum of its parts, but rather found in the networks formed by them. Here again, the paradigmatic principle of individuation is guiding: technics individuate from a preindividual reality that becomes structured without being exhausted. From it, further technical individuations can occur. Reticularity is thus tantamount to the technicity of the technical system, for it is what allows its elements to become disparate with themselves and access the preindividual charge necessary for the individuation of novel states.

The emergence of a technical individual thus necessarily corresponds to the co-emergence of a technical network, which is its associated milieu. From a conditional network to an emergent one, information is transferred and amplified by means of transduction—the characteristic operation of Simondon's theory of individuation. Transduction acts in all domains of individuation and, for this reason, it allows for thinking about the differences between these domains not as differences in nature or substance, but rather as differences in degree of structuration (i.e. lower degrees corresponding to less complex individuals, such as physical ones, and higher degrees corresponding to more complex individuals, such as technical ones). In this sense, it is with transduction that the contribution of lower degrees of complexity to higher degrees can be understood. Accordingly, transduction allows for conceptualizing and understanding the overall development of technical systems in terms of progressive structurations. As much as the conditions of technical individuation necessarily comprise networks, the individuation of novel structures acquire from this same ground,

which is its milieu, both its constitutive principles and its technical character.

An example of a simple transduction is a microphone in action. The transduction occurs when the air's pressure of a travelling sound is converted into electric current. The energy of one event is transferred to an event of another kind. But this process shouldn't be thought as a simple informational resolution. Though transductions are necessarily energized by information, what is at stake in this process is the mode by which a given structure comes to inform the formation of novel structures with a principle of individuation. Rather than mechanically reproducing forms, a transduction transfers from one form to another a principle of activity. In this sense, not only sound can transform from aerial pressure to electric signal and back again to aerial pressure, but also a more complex technical ensemble, such as a soccer team, can transfer its energetic state into another complex technical ensemble, such as another soccer team.⁷¹ When increasing the degree of complexity of the events being transduced, the principle of energetic transfer, which is the principle of an individuation in progress, remains. In any case, from a network of technical objects to another, individuation necessarily progresses through a dedicated milieu.

The individual structures that result from transductions can be thought as corresponding to the complexity of the problems posed. Depending on the degree of complexity of an initial incompatibility between potentials, the corresponding solution will be more or less complex. It is worth mentioning that complexity pertains here to the number of interdependent dimensions implicated in and explicated from technical individuals. In this sense, a technical individual with a lower degree of complexity corresponds to a simple element, such as silicon in digital computers or a flat floor for dancing. In contrast, a technical individual with a higher degree of complexity corresponds, for example, to a network of computers or to the many interrelated techniques necessary for flattening a floor. Variations in the complexity of technical problems will require different degrees of complexity in each corresponding solution. Less complex problems will require less complex solutions, and more complex problems will require more complex solutions. Hence, the individuals that result from transductions will necessarily correspond to the complexity of the problems given at start.

There is, according to this, a variable degree of structuration that follows from transduction. At lower degrees of structuration, the general schema of potentials tends to

71 For a compelling account of soccer's transductive character, see Massumi (2002, pp. 71–83).

remain at its own phase, i.e. it is not informed otherwise.⁷² The more complexity is brought to the network, by ingressing and emergent individuals, the more tendencies will form in the process of transduction itself. With this, novel phases can arise and reconfigure the system's technicity. At higher degrees of structuration, in which the formation of an individual does increase the complexity of the network to which it belongs, technicity changes. There are limit-points in the process of technical transduction where the progressive structuration of potentials moves from a lower level of complexity to a higher one. These are the singularities—attractors and bifurcations—in the vicinity of which an accumulation of tendencies occurs, towards dephasing. When dephasing, the technical system goes from one state of recurrence to another through a reconfiguration of its own technicity.

If technicity is, as Simondon says, “the quality of an element by which what has been acquired in a technical ensemble expresses and conserves itself in being transported to a new period” (1969, p. 73), then it corresponds to the potentials moved with each transduction. But since these potentials implicate their own schema, technicity also needs to be considered in abstraction, that is, in accordance with the abstract facet that, beyond potentiality, thinks technics. As mentioned before in regard to the invention of machines, the concretization of technical thought necessarily moves from the inexistence of a milieu to the creation of one associated with the emergent individuals. At the level of pure abstraction, there is no technicity whatsoever. But for what matters here, i.e. for the relation between abstract schematics and concrete technics, what is important to retain is the fact that abstraction is not temporally anterior to concretization. Abstraction is immanent in this process and in the resulting individuals. It is immanent in the potentials mobilized with transduction and in the emergent technicity. From this standpoint, it is important to acknowledge that the abstractions from which invention draws its predicaments are transformed with the process of invention itself. The technical qualities expressed and conserved by transduction not only correspond to the moved potentials but also to the virtual ideas from which actual solutions are drawn. With the inventive restructuring of potentials, abstractions can themselves change. For technical novelty can actually convey ideas capable of reforming previous ones. Hence, it is here, at the level of technicity's

72 This is the case when, for example, in the serial fabrication of technical elements at an industrial facility, a novel element comes to being, but only as one amongst a discrete multiplicity of many others like it, which in themselves don't change the technicity of the system to which they belong. Any element repeating without difference the technicity already present in its own enabling conditions cannot be said to contribute to changes in the technicity of the system to which it belongs, i.e. it cannot be said to change the schema of the larger technical ensembles conditioning it.

immanent relation between abstraction and expression, that its transduction can be fully understood: while transferring and amplifying resolutions and their implicated problems, transduction simultaneously prompts the emergence of novel expressions and the determination of implicated ideas.

If technicity corresponds to the virtual schema according to which the actual connectivity of an individual becomes structured, then it can be said to be diagrammatic. The same technical diagram can be transmitted from individual to individual, determining in the same manner their regulation. This is, for example, the case of techniques. According to media theorist Adrian Mackenzie and his readings of Simondon's philosophy, techniques are “somewhere between a transient, unstable event and a durable, heavily reproduced structure” (2002, p. 14). Technique and technicity are not independent from one another. Whereas the concretization of a technique brings into emergence a new ecology of relations, technicity corresponds both to the enabling conditions of this emergence and to the technical act's reticular result. Technicity is transduced with the concretization of techniques. It ingathers the potentials that energize and structure the technical act, but also creates with those same potentials the singularity of each event. At once, it allows both for the iteration of techniques and for the expressive variations that result from their repeated concretization. As such, it can be thought as the associated milieu of techniques. It is by means of their technicity that techniques access the preindividual and are transformed. Only because of its implicit technicity can a technique not only yield different results but also transform itself to the point of becoming something else, i.e. to the point of becoming a novel technique.

If a new technique can emerge from the transductions of technicity, then it is a solution with regard to problems in potential. But it is not the case that a technique is a simple individual. For a technique to individuate it needs to follow a heuristic succession of experiments. For it to be learnt it needs to be actualized repeatedly to the point of a coincidence between its abstractions and its expressions. Such coincidence stands for its iterability. For only when a technique results repeatedly in outcomes that, despite their possible differences, can be said to correspond to one same diagrammatic structure, has it fully individuated. Only after having been learnt with such consistency can a technique be repeatedly performed and transmitted. Which implies, of course, that a technique only individuates by means of embodiment, i.e. when its abstraction ingresses into a milieu of potential concretization. Take the case of the physical skills required for performing technical tasks such as making caramel, singing, surfing, or the likes. Such techniques can only be expressed with different bodies after their

diagrammatic structure has been transmitted from body to body. What happens in the body-to-body transmission of physical skills is precisely a transduction. The diagram that organizes the potentials of one's body will in the same way organize the potentials of someone else's body, despite their different expressions (just think of a dance class). The technical act's transductive character is manifested in the different expressions that different bodies can yield by affecting one another. As such, it is not guided by principles of formal identity but rather by principles of individuation. More than knowing the technical act by its results, it matters to know it by the forces of resonance with which its abstractions affect its expressions. It matters to know it in accordance with the mode by which its technicity ingresses into the actual constraints of bodily expression. Only in such processual way can a technique be known, not as static form, but as generative force.

Technique acts upon the implicit potentials of what is already affectively connected. It acts upon the technicity of the very conditions that allow for its deployment. The technical act, with its repetitive mode of specification, is responsible for making potentials move towards the resolution of problems posed by its own deployment. In this sense, there is both a general potential of abstraction and a relative potential of expression. The technical act is generic insofar as its ideal character is invariable. And it is singular insofar as, with concretization, the general potentials of such abstraction necessarily become relative to determinate conditions of individuation. The singularity of technical ideas is, therefore, immanent in the problem that its generic diagram poses to a concrete field of potentials. Relatively to one another, technicity and technique are one individuating system of resonance. Technicity is not a given medium but rather a field of informational exchange where the resolution of technical problems can take this or that form (only and always as the singular expression of a unique and unrepeatable encounter between abstract ideas and concrete potentials). The transmission of techniques needs to unfold through concrete milieus and, with this, necessarily singularize them. Hence, together with Mackenzie, it is possible to say that techniques are always in-between ideal abstractions and singular expressions. Never reducible to either the one or the other, but always potentially becoming (something else).

With all this, it is comprehensible why Simondon's thought of technics is pertinent to the question of novelty in the encounter between dance and technology. Not only is the preindividual reality of technical systems a notion that allows for conceptualizing the necessary conditions of novelty in such encounter, as it also allows

for the understanding that choreographic knowledge can only be constituted anew by means of a dynamic and affective interplay between abstraction and expression. In this sense, choreographic objects can and will be defined as technical objects. Because of their networks, they can be understood neither exclusively in abstract terms nor exclusively in concrete terms. Their processual character calls for the understanding that, only by means of a difference between potentials, can they be determined and expressed as singular movements of choreographic thought.

It follows that choreographic transmission necessarily occurs by means of transduction. In this sense, it becomes possible to think of choreographic objects as models of transduction that assure the connection between different and discontinuous expressions by means of a continuous multiplicity of potentials. As such, they are topological, i.e. each choreographic object assures that its different expressions take place in accordance with one same diagram of potentials. This stands both for the fact that the ideal and invariable character of choreographic objects is diagrammatic, i.e. a general potential of individuation, and for the fact that each expression of one same choreographic idea is necessarily singular and always relative to the actual conditions of its own individuation. Here, is implied the fact that the choreographic object, instead of being just a technical individual, is rather a system of individuation. Or, better yet, a system defined by determinate margins of indetermination. To think choreographic objects in this way is to think that their diagrammatic structure corresponds in fact to an idea of limits and of how these relate to one another. Once again, this is a matter of norms. Which is to say that, as technical individual, the choreographic object has individuated together with the becoming of its own norms. But, as technical system, it can express these same norms in as many different ways as the milieus and specific conditions of individuation that it might come to affect and be affected by. For this very reason, choreographing, as technical act, has its own ethical reality. Each choreographic expression necessarily occurs by co-individuating together with an associated milieu, which realizes the object's reticular character and, therefore, its technical mode of being.

From this standpoint, it matters to continue unfolding the resonance that the thought of technical individuation might have with choreography in general and with a series of choreographic objects in particular. The following Chapter will follow this relation and start to layout the terms of a theory of choreography that looks upon objects as processes and upon processes as movements of thought.

Chapter 3 - CHOREOTECHNICS

This chapter's three sections will essay a conception of choreography under the light of Simondon's philosophy. More specifically, the notions of choreographic system, choreographic knowledge and choreographic object will be explored in accordance with the abstractions, transductions and expressions of individuation. First, the potentials of choreography will be tackled from the perspective of dance's relationship with writing. Such relationship will be conceived as being problematic and, precisely because of this, potential with regard to the individuation of novel instances of choreographic knowledge. Moreover, the resolution of such problematic potentials will be defined in terms of a continuous differentiation of serial parts that, inasmuch as the latter regard movement-events, expresses choreography as such. Second, the choreographic object will be defined after the argument that choreography can exist without dance. Such argument allows not only for thinking choreography in abstraction, but also for defining the choreographic object as a diagrammatic structure of potentials, from which many different expressions can result. By defining the choreographic object in this way, it will be emphasized that, rather than this being an ideal form, it is a system of potential transductions most apt to elicit the transindividuation of subjective and objective perspectives upon one same epistemological relation. Third, the notion of choreographic object will be further explored by analyzing a paradigmatic example of how choreography can be expressed by means other than dance. By looking into William Forsythe's collection of choreographic objects "*Improvisation Technologies*", it will be argued that the choreographic object is characteristically topological and, as such, capable of expressing the same diagram of potentials, not only in different ways but also, and more importantly, in different domains of expression. From this, the choreographic object's topological character will be explored together with notions of memory and rhythm. It will be argued that only by means of conceiving memory both in terms of perception and forgetting can the choreographic object's topological potentials be understood to be creative. Additionally, it will be argued that neither abstraction nor expression suffice to define choreography. Their affective becoming needs to be considered as an irreducible whole, most fundamentally defined by rhythmic ideas of movement.

3.1 - Choreography's Excess

After the previous incursion into Simondon's theory of individuation, we are now better equipped to tackle the question previously posed with regard to the conditions of technogenesis in the encounter between dance and technology. To say that an encounter is defined by the event of novelty, by the concretization of a creative potential present in a process's initial conditions, is to say that novelty itself cannot result but from an encounter. In this sense, encounter and novelty can be conflated into the kind of event whereby a system's disparities are resolved into unpredictable facts. A truly creative process will at some point of its development allow for an encounter's perspective, for a perspective corresponding to the multiplicity of concrescent parts conditioning the emergence of novelty. But this perspective does not correspond only to the multiplicity of given parts. Inasmuch as this multiplicity is immanent in the multiplicity of what is not given, the encounter's perspective corresponds as well to the qualitative field of undetermined potentials from which novelty necessarily results. As such, the actual-virtual dynamisms of process already mentioned to be a fundamental force of creativity can be understood as being characteristic of an encounter, for what results from a principle of immanence active in a creative process is precisely the relation between forces and forms necessary to the resolution of a system's problems. The principle of immanence is the principle of an encounter. It supposes the relation between parts that are simultaneously given and not given and that therefore are potentially problematic in regard to the overall development of the system to which they belong. From this standpoint, the conditions of technogenesis in the encounter between dance and technology can be said to include the principle of immanence defining any creative process whatsoever. Only by reason of the virtual-actual dynamisms active in individuation can the encounter between dance and technology be said to be so, that is, to be considered as a truly creative process. Such potentials of creativity are none other than the ones of its excessive reality, i.e. its more-than-individual reality. From which it follows that, despite the possible constraints given by what is determinate at any point of a system's technical development, what the singular encounters between dance and technology share, beyond possibility, is the fact that they emerge from a network of relations where information mobilizes the becoming of technics. Independently of how the actuality of these networks conditions informational exchange, what in the end attests the event of the encounter between dance and technology is the very fact of novelty, the fact that the emergent encounter is singular in that it results from irreducible

resolutions.

Amidst the general becoming of technics, and alongside its many different expressions, the encounter between dance and technology must be defined by means with a proper character. The question is: which kind of networks are proper to this species of encounter? Or, in other words, what is its characteristic technicity? The answer resides in what has been, from its first manifestations to the present, a prevalent mode of individuation in the history of encounters between dance and technology, namely, choreography. From the outset, choreography has established a relation between dance and writing: Thoinot Arbeau's "Orchesography" (1925), choreography's first treatise, founded the writing of dance in the European Renaissance as a technology of transmission and regulation; from this moment onwards, the organization of gestures and bodies in time and space had no longer to be passed directly from a dance master to his students, but could be learnt at a distance, via writing. About this fundamental project, dance scholar André Lepecki comments that it was established on the basis of a "semiotic symmetry between writing and dancing that guarantees the unproblematic traffic from one to the other" (2004, p. 126). This equation, between dancing and writing, served to further establish conventional codes, such as Feuillet's notation (1701), the use of which facilitated choreographers' hermeneutic authority over the dances. In this sense, what might have been first a drive to not forget and remember the dances, led to an "apparatus of capture" that mostly served their regulation. "To conceive choreography as an apparatus", says Lepecki, "is to see it as a mechanism that simultaneously distributes and organizes dance's relationship to perception and signification. For it is precisely this kind of organization of the perceptive-linguistic field that apparatuses perform" (2007, p. 120). But the incapacity of writing to transmit the essential traits of dance was a preoccupation that soon became manifest, most notably with dance master Jean-Georges Noverre. Identifying this transition, Lepecki further writes: "[...] from a perception of dance as unproblematically translatable from code to steps, and from steps back to code again (a peacefully symmetry between inscription and dancing that characterizes [...] Arbeau's and Feuillet's perception), we arrive, with Noverre, to an understanding of dance as elusive presence, dance as the fleeting trace of an always irretrievable, never fully translatable motion: neither into notation, nor into writing." (2004, p. 127). Which is an argument that came to define a longstanding tradition in claiming that performance is fundamentally irreducible and irretrievable; a tradition that has had as prominent advocates figures as influent as Antonin Artaud (Derrida, 1978), Richard Schechner (2011, p. 50) and Peggy Phelan

(1993, p. 146). This is the argument that performance is defined as that which comes into presence—a unitary, self-identical, and non-linguistic presence conveying that which nothing but performance itself can convey. In this sense, and in spite of possible recursions of the live event, immediate presence is taken to be that which holds the truth-value of performance, for only through performance can there take place an irreducible experience that cannot be mediated otherwise. Reinforcing the irreducibility of performance is the argument that the event of presence in performance is a fleeting one, vanishing at the very moment of its appearance. Performance, as such, is irretrievable, for it is impossible to retain it without losing its fundamental character, that of being always transient.

But performance does recur. It creates correspondences between different modes of expression, from performative events to writing and back. Considering this fact, expressed by the variety of ways in which performance can be acted, written and remembered, performance art theorist Adrian Heathfield writes that “[...] one of performance's most consistent and recurring conditions is transformation” (2012, p. 32). Across its multiple instances of experience, the recurrence of performance enacts its transformation. It moves from one event to another through writing, and from one writing to another through all kinds of events, forming a system of assertion that, rather than attributing any kind of essential authenticity to its different expressions, is fundamentally defined by its transformative capacities. As a system of assertion, performance is capable of conveying both the immediacy of its events and the mediation of its written inscriptions. In either case, the experience of performance occurs. With writing, the knowledge conveyed by the transient events of performance can be reactivated, notwithstanding the fact that this passage, which implicates remembrance, necessarily leads to novel experiences. By the same token, which regards the potentials of the overall system of assertion comprising performance and writing, the experiences of writing can lead to new experiences in performance. As an example of this encompassing capacity of performance to recur repeatedly, but not without difference, one can think of “*Le Sacre du Printemps*”. This well known piece, first choreographed and performed in 1913 by Vaslav Nijinsky for Sergei Diaghilev's Les Ballets Russes, accompanied by the also well known musical score by Igor Stravinski, has been to the present date one of the most reenacted and recurrent pieces in the history of theatrical production.⁷³ Despite the controversy provoked by its presentation in Paris

⁷³ For a list of reenactments of “*Le Sacre du Printemps*”, see “*Stravinsky: The Global Dancer: A Chronology of Choreography to the Music of Igor Stravinsky*”, in <http://ws1.roehampton.ac.uk/stravi>

of that time, it is symptomatic that 2013 was the year in which a wide range of expressions took place, commemorating the work's centenary and showing its influence to this date. Today, not only all sorts of artistic reformulations and reinterpretations of “*Le Sacre du Printemps*” can be seen, from video works to performances and festivals dedicated to it (many due to the fact of its everlasting influent and still today actual soundtrack), but also discursive embeddings of the work can be found allover, notably in the theoretical production of disciplines such as performance and dance studies. “*Le Sacre du Printemps*” can be seen as one big system of performance, encompassing all of its variable expressions and potentials of transformation.

In the whole field of performance, choreography attests the systemic relation between possible modes of expression, for the relationship between writing and dancing is paradigmatic of the causality that performance's various recurrences can establish among themselves. The causation of a system of performance where relationships between writing and dancing are determinate is nonetheless not complete, given in its logics, but rather a process open both to what cannot be predicted and to what cannot be known subsequently (because imperceptible and unconscious). An openness that should be understood neither in opposition to the choreographic regulation of dances nor in opposition to the idea of performance's irreducible character, but rather as encompassing both. Positing choreography as an open system of performance, where all sorts of expressions can take place, stands for acknowledging difference as an operative dimension of process, constitutive of a system's overall development. As such, it is present both in writing and in dancing, and also in the operations whereby one gives place to the other. The differences between choreography's modes of expression are the motor of its individuation. Only by means of ingressing problems, to be resolved in the transition from one expression to another, can the creative powers of this system of assertion be activated and allow for transformations where the referent remains the same, but not without being differently expressed.

With all its creative capacities, choreography corresponds in a very precise way to what French philosopher Michel Foucault has defined as “archive”. For the author, the archive is that which “reveals the rules of a practise that enables statements both to survive and to undergo regular modification. [The archive] is the general system of the formation and transformation of statements” (2007, p. 102). In this sense, the ontological predicate according to which performance is irreducible and irretrievable

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must give way to the ontogenetic depiction of choreography's overall development as a system of assertion. Which is not to say that the event of performance does not possess a singular and irretrievable character, but rather to affirm that this uniqueness partakes in a larger context of enunciation that also conditions its transformed recursions. As archive, choreography can be said to be a system of assertion that most fundamentally regards ideas of movement. Between a field of potentials and a series of assertions, what forms and transforms in the archive of choreography are problems and resolutions of movement. Choreography's capacity for expressing movement ideas in different ways attests its excessive reality, i.e. it attests the fact that it is itself a system of individuation including both a preindividual reality and an individual order of assertion. The very asymmetry between dancing and writing corresponds to the problems that determinate ideas of movement posit to the system to which they belong in the process of their own assertion. When asserted in several instances, the same idea can differ from itself by creating problems to the choreographic system. Once again, it should be acknowledged that what intensifies the becoming of a choreographic system is the dynamic interplay between the virtual and the actual, i.e. the interplay between an idea of movement and the actual constraints exerted upon its own assertion. The asymmetry of choreography's expressions, rather than revealing the incompleteness of each of them relatively to one another, simply manifests the system's transformative capacities. With each individuation, choreography expresses differently the problematic reality of its own ideas. Writing and dancing do not complete one another for the expression of one choreographic totality, but rather correspond to the expression of ideas that, moving through different conditions, express each time anew the ground from which they stem.

The argument that writing supplements the event is in this way converted into a productive relation between the two. The asymmetry between writing and dancing corresponds precisely to choreography's capacity for activating potentials, resolving itself into the emergence of yet another actual expression. Even Jacques Derrida's deconstructions accord to this in their own way: having extensively dwelt upon the conception that writing supplements the event, compensating its irretrievability, Derrida has shown how in fact the "supplement" is "undecided [between] accretion and substitution"; it is "not a signified more than a signifier, a representer than a presence, a writing than a speech" (1976, p. 315). This undecidability of writing marks the fact that what recurs with its assertion can both supplement its referent, and thus remain indexed by it, and substitute it with its own autonomy, as a generative regime of signs. Writing can both depend on the contexts of its inscription and be an autopoietic system. Beyond

the supplementary logic that writing may be said to commit to, adding to the event, writing is also capable of generating reality by its own means. Regarding its autonomy, Derrida further says that “[f]or a writing to be a writing it must continue to 'act' and to be readable even when what is called the author of the writing no longer answers for what he has written, for what he seems to have signed, be it because of a temporary absence, because he is dead or, more generally, because he has not employed his absolutely actual and present intention or attention, the plenitude of his desire to say what he means, in order to sustain what seems to be written 'in his name'.” (1982, p. 307). An argument that, at once, invokes the fact that the intentions of a writer aren't assured to be accessed via the written, and that the written can in fact act on its own, away from hermeneutic regulations. In the cases where dances are transmitted via writing, not only characteristic of the Renaissance but also of such massive projects as the development of Labanotation throughout the twentieth century, or even of more recent projects such as those discussed throughout in this study, this autonomy of writing attests the fact that, regarding the overall system of assertion that it partakes, writing stands on its own feet as the choreographic expression of movement ideas. Hence, writing doesn't require supplements of any sort. It is fully capable of expressing movement ideas. A corollary that, in relation to the ontological definition of performance as transient and irreducible, posits as well the singular capacities of other modes of expression. If performance conserves an irretrievable character, then writing itself is capable of conveying that which only writing can convey. Both dancing and writing are fully capable of problematizing and resolving ideas of movement.

In what regards choreography, writing should be understood not only as the inscription of graphemes characteristic of notation, but as a more encompassing creation of invariant functions, that is, as the creation of what does not vary throughout one same choreography's different expressions. The structures shared both by choreographic notation and by the performance of dance, inasmuch as they don't vary, can be said to correspond to one same written choreography. Choreography is in this way equated with the formation of recursive structures, which makes of the writing of dance the choreotechnical formation of stable memories. With them, choreographic ideas can be transposed from one individuation the next, to be possibly resolved only by means of an interplay between the given and the ungiven. Such interplay corresponds to the affective reality of memory in processes of choreographic individuation. Memory acts both virtually and actually towards the resolution of problematic ideas of movement. When, for example, a group of dancers performs, once again, a choreography that they have

been performing repeatedly for some time, what necessarily takes place is a resolution of the problems posed by the emergent relation between what is actuality given (e.g. the muscular memory, or patterned habit, of each dancing body) and what is not (i.e. the indetermination implied in recollecting what had not been remembered until that very moment). Despite the fact that each performance necessarily corresponds to the singular resolution of problems, what is transposed from one event to the next is precisely this problematic potential of choreographic memory, as it persists in each dancing body.

The invariant functions of choreography are not the substances of its identity. To say that a system of choreographic individuation does not vary throughout its development and across its expressions corresponds to saying that a principle of individuation is transduced throughout the multiple modulations of the system's potentials. To ask what is a choreographic principle of individuation is to ask “what is a choreography?”, a question to which Portuguese philosopher José Gil answers with: “it is a nexus of movements” (2001, p. 81, *my translation*). With this answer, the author already acknowledges that movement is double. On the one hand, movement is virtual and contributory, ingressing into actuality and traversing all occasions of experience (what the author calls “whole movement”). On the other hand, it corresponds to the actual expressions of the ongoing transformation of states. Understanding choreography as a nexus of movements is to acknowledge the dynamic interplay between the virtual and the actual. In this way, choreography is understood as comprising simultaneously the movements of thought initiated by a problematic idea and the expressive movements of the latter's resolution. Furthermore, for Gil, a nexus “is dictated neither by its expressivity nor by its finality” (Ibid). Rather a nexus is said to result from the combination of series that, notwithstanding the fact of being divergent, are continuous to one another. This is no paradox, for their continuity is the continuity of their differences. Only by means of relating continuously to one another, can divergent series intensify their differences. From which it follows that a nexus can be defined as the rhythmic intensification of differences between series that, in this way, become continuous to one another as the multiple parts of one whole. According to Gil, “[t]he rhythm assures the distances [between the series] in continuity, allowing for an uninterrupted movement of differentiation that modulates time [...] and the internal distance to the intervals” (Ibid., pp. 86–87, *my translation*). This can be understood by simply considering a dancing body and the movement of its musculoskeletal regions. For example, the movement of one foot and the movement of one hand involve different regions of the musculoskeletal system. While moving simultaneously, the different

series of each movement region form a rhythm by continuously intensifying their differences. The differential intensification of the series actually defines each of them in the continuous relation to the other. This is the nexus of their choreography, be the dance a more or less determinate one.⁷⁴ The nexus, rather than being given, is emergent. From which one possible conclusion can be drawn: the choreographic nexus is not given and emerges with each choreographic process that it comes to define because of being relative to the absolute event of its own appearance.⁷⁵ What is transduced throughout a choreographic system's development is the relativity of its nexus' formal structure to its own "absolute origin". This allows for one same principle of individuation to resume itself across different events of expression. Hence, the invariant function of choreography, which is its principle of individuation, corresponds to the event of rhythm, which is the recurrent intensification of differences between the series of a multiplicity. Choreography is the nexus that forms when the series of movement-events intensify their differences to the point of becoming continuous to one another and, by these means, constituting a whole.

From this standpoint, it can be said that the technicity of the encounter between dance and technology regards most fundamentally the rhythm of individuation of movement ideas. Which is also to say that choreography's associated milieu, its technical network, is informed with the resolution of the problems posed by such ideas to the dedicated domains of individuation. And if the principle of choreographic individuation corresponds to a nexus' relativity to its own "absolute origin", then this relativity must be related to what lies at the heart of an incompatibility between potentials, notably the disparity of a movement idea. This disparity can be thought as pertaining to the problems posed to a process when in face of its actual conditions. A movement idea is never exactly the same as its possible expressions because, in individuation, undetermined potentials persist in exerting their force upon what is given. Despite the margins of indetermination built into a system, movement ideas will always bear a difference in regard to the possibilities of their own expression. Besides, this disparity can be thought as pertaining to the fact that, without actuality, an idea cannot acquire a resolute definition. Its abstract reality is fundamentally indefinite and therefore

74 For Gil (2001, p. 81), the requirements of a choreographic nexus are as strong in improvised dances as in choreographed ones, a demand that attests how much choreographic individuation involves a multiplicity of processes and structures (i.e. a whole of which the choreographic nexus is only one part), each of them with its proper nexus.

75 Much in the same way as the "seed of form" of individuation is not given but nonetheless determines the tropisms of the individuating system where it comes to occur. For more on this subject see pages 60-62.

assures its openness to the potentials of the system to which it belongs. Only by means of this relation can a movement idea be not only relative to its different modes of expression but also relative to the absolute potential of its own appearance. It is disparate in relation to itself because it mediates between the virtual and the actual the rhythm of its own choreographic nexus. And if, as Adrian Mackenzie tells us, “[t]o think transductively is to mediate between different orders, to place heterogeneous realities in contact, and to become something different” (2002, p. 18), then the nexus of the encounter between dance and technology is that which results from this very mediation. Choreography can thus be said to correspond to a transductive mode of thought that differentiates its movement ideas according to a rhythm of individuation: it differentiates them in relation to themselves with the disparition of the problematic conditions of their own appearance; and it differentiates them and in relation to the progressive structuration of potentials, by means of which multiple series simultaneously diverge and intensify their differences. In sum, the technicity of choreography corresponds to the rhythm with which a network of movement ideas is (in)formed, to the point of expressing a determinate nexus.

3.2 - The Choreographic Object

In face of choreography’s transformative capacities, choreographer William Forsythe calls forth the opening of its definition: “To reduce choreography to a single definition is not to understand the most crucial of its mechanisms: to resist and reform previous conceptions of its definition” (2008, pp. 5–6). As mentioned before, these “mechanisms” exist not only where different expressions do in fact resist and reform one another, but also where the potentials of choreography reside. It is only because of such potentials that choreography can express itself in this or that novel way. Its renewal depends on this implicit capacity. And when expressed otherwise, choreography can be the subject of an individuation that does not even require dancing bodies. As such, it is possible to look for choreography elsewhere than in the performance of dance. It is also from this standpoint that Forsythe has proffered the disjunction of dance and choreography: “Choreography and dancing are two distinct and very different practices” (Ibid.). Which corresponds both to the fact that dance can occur without a choreographic nexus and that a choreographic nexus can be expressed by forms other than dance. Following from this capacity, Forsythe came to define the choreographic

object as “a model of potential transition from one state to another in any space imaginable” (Ibid.). A definition which accords with the theory of individuation expounded before insofar as the model in it included corresponds to the diagram of choreographic individuation. As already mentioned,⁷⁶ such diagram is virtual as long as its potentials are kept apart from concrete individuals. But when mobilized, these are potentials that tend to be expressed as network: the diagram becomes concrete as a network of technical objects, of which the choreographic one is a keypoint. Despite its possible expressions, the choreographic diagram is always abstract and more-than-individual. In abstraction, it verges towards possibility, creating tendencies in an otherwise flat field of potentials. This is an asymmetric distribution of possibilities, of which only particular nexuses can result.⁷⁷ Hence, to each choreographic object corresponds a diagram of forces and a rhythm of individuation.

The choreographic diagram is closer to Felix Guattari's notion of “metamodel” (2012) than to the notion of model as understood by structuralism and cybernetics. Though Guattari's notion has been engendered in reaction to prevailing modes of analysis in fields such as psychology (i.e. Jacques Lacan), anthropology (i.e. Claude Levi-Strauss) and philosophy (i.e. Louis Althusser), to name a few, it draws its predicaments from several other influences, such as linguistics, semiotics, cybernetics, information theory, systems theory, ethology, thermodynamics and mathematics (Watson, 2011, pp. 1–14). A multiplicity of sources that grants it with the capacity to adapt itself to any field of inquiry. As Guattari himself states, a metamodel pertains “[n]ot to a general model, but to an instrument for deciphering modelling systems in diverse domains [...]” (2012, p. 17). More importantly, the author writes elsewhere, “[w]hat distinguishes metamodelization from modelization is the way it uses terms to develop possible openings onto the virtual and onto creative processuality” (1995, p. 31). The metamodel is a general potential of creativity that, while addressing the problems posed by the realization of models, proceeds by forging “new coordinates for reading and to ‘bring into existence’ new representations and propositions” (2012, p. 17). If a technical object can in any way be approached as model, it is only because it has become one. Conversely, before becoming, such model exists only in potential.⁷⁸ The choreographic diagram must therefore be understood as that which opens the object

⁷⁶ See Simondon's notion of technicity on pages 83-86.

⁷⁷ For a discussion on how the diagram acts in processes of individuation, see Section 4.3.

⁷⁸ The topic of general potentiality will be addressed at length when discussing its distinction with the notion of relative potentials in Alfred N. Whitehead's theory of the “extensive continuum”. See page 219.

onto the virtual. It opens it onto potentials that, though not choreographic *per se*, assure the object's capacity to express a determinate nexus of movements.

The choreographic object's processual character, as defined above, corresponds as well to its transductive character. Its potential transitions between states, in any space imaginable, regard the modulation of forces performed by its diagram. Individuation proceeds, but not without being subjected to tendencies implied by the latter. What moves with choreographic transduction is less a form than a principle of individuation. In the brief essay where Forsythe defines the choreographic object, as just quoted, instead of providing examples of it, the choreographer invokes the musical score, which for him is an object of the same kind. The musical score, as it is known, holds the necessary potentials for transducing the organization of musical ideas into the actual performance of music. Or, better yet, the potentials for such transduction exist within the system of assertion to which the musical score belongs, for these are potentials related with the representation that the signs in the score can elicit in a signifying agent. This process attests both the incompleteness of each expression relatively to the whole and the latter's capacity for existing in between forms, that is, the object's capacity to conserve its diagrammatic potential throughout the incorporeal phases of each transduction. The simple fact that music can be memorized and remembered, without any need for mnemonic artifacts such as scores, attests that it is as well open onto the virtual. As much as the musical object is finalized neither by scores nor by performances, its definition must comprise the diagram of its own ideas. Only by means of a diagrammatic arrangement of potentials can musical transductions be understood. From performance into score and from score into performance, one same object can only be iterated as long as its diagram persists across transitions.

All of this applies equally to choreographic objects. While understanding that a musical score “represents the potential of perceptual phenomena to instigate action, the result of which can be perceived by a sense of a different order: a transition via the body from the visual to the aural”, Forsythe understands as well that a “choreographic object, or score, is by nature open to a full palette of phenomenological instigations because it acknowledges the body as wholly designed to persistently read every signal from its environment.” (2008, pp. 5–6). There is therefore a degree of indetermination to the choreographic object that is larger than the one of the musical object. The lesser degree of the musical object is given by the conventional bias that its transductions must necessarily engage, at some point, the aural domain. In turn, choreography's larger degree of indetermination regards the fact that the body is capable of transducing any

signal whatsoever into different domains of expression. In this sense, it is more likely for a musical object to be perceived as being as well choreographic than the opposite. Insofar as music conveys movements with nexus, it can be read as choreographic. To say that choreographic transductions occur between “any space imaginable” not only stands for acknowledging the body's capacity to perceive movements with nexus out of, virtually, anything, but also for acknowledging its capacity to transduce such nexus into other domains of individuation.

The potentials of choreography are deeply rooted in the transductive capacities of the body. Such capacities, which rely on the body's “wholly design to persistently read every signal from its environment”, pertain most evidently to the ongoing resolutions of perception and affection. According to the preindividual of individuation, there is here a level of indistinction between the senses because perception is yet to be determined. The choreographic object addresses such indetermination. It addresses sense-making in its processual unfolding, which does not occur without a confusion of senses yet to be determined. It acknowledges the body as an open system and uses its capacity to “persistently read every signal from its environment” to attribute nexus to any possible conjunction of perceptions. Besides Simondon's understanding of the role of the preindividual in perception and thought, the undifferentiated resonance of the senses can be thought together with the notion of synaesthesia. A concept traceable back to Stoic philosophy, synaesthesia (*synaesthesia*) can be understood as a “joint-sense” (Elo, 2012, p. 4), as a capacity of the senses to “feel-with” one another (Heller-Roazen, 2007, p. 108). This capacity gives place to what the body senses by means of what it doesn't. It is a process that, before resolving itself into the perceptual differentiation of senses, proceeds unresolved. The case of synaesthesia posits that the emergence of sense does not occur without a process that is without mode. Before becoming modally disjunct (e.g. hearing, seeing, touching, tasting and smelling), sense is amodal. It belongs to the unresolved of bodily processes where the incorporeal relates to the excessive regime of affects. Amodal sense-affectivity is part of the unconscious process of being in/with the world. Accordingly, synaesthesia can be thought as the self-affectivity through which the body folds over itself, imbricating into one another events yet to be associated with this or that specific sense. Even after having individuated, each sense does not cease to be embedded in such activity. It is not possible to consider each mode of sense-perception without considering as well the regime of affects on which it depends. Hearing, for example, does not take place as it does without a related body-schema, which is partially constituted by proprioceptive, vestibular and kinaesthetic

orientations (Lingis, 1993). Any sufficiently strong change in the latter will inevitably change the former, such when the subject experiences the absence of echo (in an anechoic chamber), only to notice how much its own proprioception depends on the perception of sound. To a large extent, the synaesthetic resonance of the senses can only be felt in effect. In the case of heightened synaesthesia, for example, perception informs the subject of ongoing affects between that which, from a habitual perspective, might be said to be disjunct, but which from the eventful disruption of the associative habit indisputably reveals itself as associate and in some way dependent, even if the logic of such dependence remains unknown, because inaccessible (Campen, 2010).

From this standpoint, it matters to acknowledge that choreographic objects cannot be associated with any one specific modality of sense. Rather, they must be defined in terms of processes that convey ideas independently from domains of expression, as these may be associated with specific modes of sense-perception. What pertains more precisely to the definition of such objects is their potential to elicit thoughts that, in retrospective, might be said to be choreographic. This, of course, depends on the context of assertion where each thought takes place. As already mentioned when quoting philosopher Muriel Combes,⁷⁹ each psychic individuation intricately depends on the collective milieu of ideas from which it stems and where it finds its conceptual value. A choreographic thought can only be said to be so because of a context where other choreographic abstractions are collectively transduced and in relation to which it concurs, with variable degrees of contrast. The choreographic object exists upon this relation. It persists as a principle of individuation with the potential to relate emerging thoughts with a co-individuating milieu of choreographic abstractions. A relation which depends on transductions where the conceptual seed of choreography must be potentially present. Together with the expression of a choreographic nexus, it must also be transduced the potential for it to be thought and recognized as such.

The independence of choreographic thinking from specific domains of expression runs in parallel to its reliance upon the body's capacities of abstraction. But such capacities necessarily depend from its actual experiences. Which means that there is at the heart of thought an implication of processes, making of concepts a resolution that does not go without the synaesthetic resonance of sense-making. In other words, the sense of thought emerges itself from the senses' indistinct junction, as any other modality of sense (Aristotle, 1931, p. 421a; Heller-Roazen, 2007, pp. 291–300). Not

⁷⁹ See page 73.

only does this comply with the immanence of abstraction in expression, but more specifically with the immanence of choreographic thoughts in a relationship between individual and milieu, where the resolution of problems in perception corresponds to the individuation of movements with nexus. And how could it not be so, if for there to be a correspondence between thought and nexus both must individuate from one same preindividual reality. They both follow from the transductive analogy of their own processes. An analogy which accords with Simondon's argument that knowledge does not follow from an inexplicable relation between subjects and objects given by "*a priori* forms of sensibility", but rather from their co-individuation "from the same primitive reality".⁸⁰ To equate choreographic principles with "models of potential transition" regards not only the fact that any relation between subjects and objects has its proper nexus, but also the fact that any principle of individuation can only be understood together with what it gives birth to. Once more, this is the case of the nexus' relativity to its own absolute origin.⁸¹ The case that choreographic principles are not given in advance to the individuations that they come to energize and structure, but that they are defined only with the process of individuation itself. A choreographic principle is the choreographic nexus that comes to be known, it is the diagrammatic arrangement of forces implicit in the thoughts that from them might result.

It should nonetheless be made clear that, because of its technical character, the choreographic object relies upon the application of technical acts. Only by becoming a keypoint in a technical network can the choreographic object transduce its potentials and become known as such. In contrast to other technical acts, the choreographic one can be defined by its potentials for eliciting synaesthetic resonances. Only by these means can thoughts which are truly choreographic acquire some resolute determination. And due to the analogies of transductive knowledge, what will have become a choreographic thought must necessarily regard actual forms of informational exchange defining the relative nexus of movements. The choreographic object is known as such only within the limits defined by its margins of indetermination, which are determined by the act itself. The choreographic act modulates the ingression of undetermined potentials into processes of individuation by determining parameters that will define each object's choreographic nexus. The readership of choreographic notation makes a good case for what is a technical act, in the choreographic sense. Once a choreographic object has been notated, it can only elicit transductions if the body coincides with a

80 See page 72.

81 See pages 94-96.

signifying agent, i.e. if the subject is constituted on the basis of a capacity to read notations according to a particular nexus. Choreographic readership is a capacity which focuses the “wholly design [of the body] to persistently read every signal from its environment” towards the justification of what it reads as a nexus of movements. It allows for the body to access choreographic rhythms of intensification and differentiation, in a continuous relation between signifying series. Such continuity is assured by the act of reading itself. Reading transduces the choreographic principles implied in written parameters and allows for modulating processes with determinate margins of indetermination.

While setting margins of indetermination for individuating systems, technical acts constrain informational exchanges and define the resulting networks. To say that the choreographic object is a “model of potential transition” stands for saying that, as model, it constrains the rhythmic differentiation of a multiplicity of series with determinate parameters. This is the expression of its technicity. A standpoint implying that a parameter is a relation between variables and that each choreographic parameter is defined by margins of indetermination that assure its very continuity. The parametric constraining of choreography determines the continuity of its nexus and allows for it to be recognized as such. In other words, an object will only be recognized as being choreographic on the condition that its individuation differentiates series of sense-events at the same time that it constrains their relation in continuity. Individuating choreographies at once differentiate series of sense-events, assure their differential relation in continuity and allow for co-individuating movements of thought.

3.3 - Topological Continuity, Differential Expressivity

When accounting for the choreographic object's features, for the fact that it is capable of eliciting technical action, for the fact that it does so with an emphasis on synaesthesia, and for the fact that synaesthetic indetermination is limited by a set of parametric constraints, its expression in domains other than the dancing body becomes somewhat problematic. After all, if all these aspects are to be attained, it is necessary that the choreographic object is expressed in ways that are worthy of the body's complexity. Despite Forsythe's assertion that “[c]horeography and dancing are two distinct and very different practices” (2008, pp. 5–6), in most cases they still remain bound to each other. Even if they are taken to be autonomous practices, it is via their

relationship that the powers and limitations of the one are transferred to the other. When dancing is put in relation with choreography, the latter's expressions must necessarily comply with the dancing body's potentials. As such, to express choreography in domains other than the dancing body while keeping it as referent, i.e. as a possible receptacle of choreographic transductions, stands for solving the problem of how to individuate expressions as potential as the dancing body itself.

This is a problem well known to dance notators. As much as the dancing body implies a variety of infinities, the notation of dance is primarily defined by an exclusive selection of data. Already in 1930, choreographer Fritz Klingenberg wrote: "The dance notator must, along with a trained eye for the rapid perception of movement events, possess above all an understanding of the actual elements of the dance movement. In this consideration three factors stand out as particularly important, which the dance notator must be able to keep apart reliably. First, the actual composition, the naked, clear structure of the dance, second, the performance, the personal interpretation of the artist, and third, there are in most cases the factors determining style. It may not be entirely simple to draw the boundaries between these three factors, especially between the first two, the composition and the interpretation. [...] Thousands of small movements, phrasings, head, feet, are mainly idiosyncrasies of the performing artist, for whom it would be absurd to prescribe something else. Thus, there falls on the dance writer the same difficult and responsible task, namely to strip away all these secondary manifestations from his notation score and to leave them out of consideration. To recognise what must be written down, and what not, is not entirely easy, because the boundaries are always fluid and in most cases it is exactly the secondary manifestations belonging to the interpretation, which can make a dance interesting and valuable. Nevertheless, composition and interpretation must be clearly separated from each other by the dance notator, if another artist is to be able to recreate thereafter." (1990). More recently, dance notator Marion Bastien also wrote: "When I was notating with some maturity [...], I was often thinking that my expertise was not based on how many details I could write down in the score, but on what I was able to throw away. My greatest expertise was the ability to filter, to select." (2007, p. 51). From this standpoint, it should be noticed that what is actually written from the performance of dance is its choreographic character. What is selected from the dancing body's varieties are the parameters of its structured movement. And inasmuch as such parameters individuate amidst a milieu of bodily potentials, their recognition and notational inscription must necessarily subtract all that in the dancing body is indivisible. The writing of dance

must go from the body's continuous infinity of potentials to the finite and discontinuous articulation of symbolic notations. In this passage, the notator selects what appears to define the choreographic nexus, leaving aside all the rest. A subtraction of all that is not accessible and of all that does not appear to define the nexus of movements. From which it follows that the choreographic score cannot be but a partial fragment of what moves when a body dances. A fragment that nonetheless implicates potentials for a choreographic principle to be further transduced.

In order to experiment with novel ways of expressing choreographic objects, ways that are both worthy of the dancing body and alternative to traditional modes of choreographic notation, Forsythe set himself to create what would become a landmark in the field of choreographic expression, mostly due to its use of new media. The interactive CD-ROM "*Improvisation Technologies: A Tool for the Analytical Dance Eye*" (2012), created together with dancer Nik Haffner, media artists Volker Kuchelmeister and Christian Ziegler, and first published by Karlsruhe's Center for Art and Media Technology (ZKM) in 1999, comprises a collection of objects devised as a toolbox for choreographic creation. Which is to say that these are choreographic objects which can be assembled in a wide range of ways in order to compose ever more complex choreographies. Notably, these are some of the resources that Forsythe used to create choreographic work with the Ballet Frankfurt at that time.⁸² A fact that brings to the fore how a choreographic technology such as this one is not neutral with regard to the aesthetics that it allows for. Despite its bias, it is nevertheless remarkable that the publication of "*Improvisation Technologies*" (IT) constituted a turning point in the dissemination of choreographic tools and in the practice of "open source choreography" (Delahunta, 2003). Its use of the multimodal capacities of digital media have influenced to a great extent, not only the publishing of choreographic knowledge, but more fundamentally the very means of its production. An influence that has reached into the development of this study and of all the cases here discussed.⁸³

The choreographic objects of this collection (around 60) are expressed in the form of short video recordings over which graphemes are further laid. In each video, one can watch both Forsythe himself explaining the object's parameters and the graphic (animated) notation of their formal results. At once, these objects resonate with the practice of choreographic notation and with the practice of dancing as drawing, a double

82 This CD-ROM was a follow up of a digital archive of movement material used in the making of performances such as "Loss of Small Detail" (1991) and "Self Meant to Govern" (1994), by the Ballet Frankfurt.

83 For a listing of these projects, see pages 15-19.

connection that is synthesized in the notion of writing, as previously argued.⁸⁴ To say that a gesture can be traced by mapping parameters corresponds to saying that it can be written for further use. Correspondingly, what in the case of Forsythe's *IT* is in fact written are less the resulting forms, as traced by the graphemes, than the ideas underlying the dancing body's parametric constraining. In this sense, to move the body according to the idea of, for example, “*Dropping Curves*” (see Illustration 1, below) is less to move it in accordance with a given form than with potentials capable of expressing it. And this is so simply because the diagram of this choreographic object doesn't map this or that specific curved line, but rather the general potential of any dropped curve whatsoever.⁸⁵

In this respect, it is worth noticing that this specific collection of objects results from an analytical approach to dance where movements are geometrically organized. This is an approach that can be traced back to Rudolf von Laban's “kinesphere” (1956), a geometry which depicts the constant limits of the dancing body. Simply described, this is a volume the centre of which is placed over the dancer's centre of gravity and further defined by the multiple points that the body can reach while unchanging its centre. In short, it is a sphere located around the body, at the distance of its centred reach. In contrast to this univocal approach, Forsythe grants the body with the capacity to

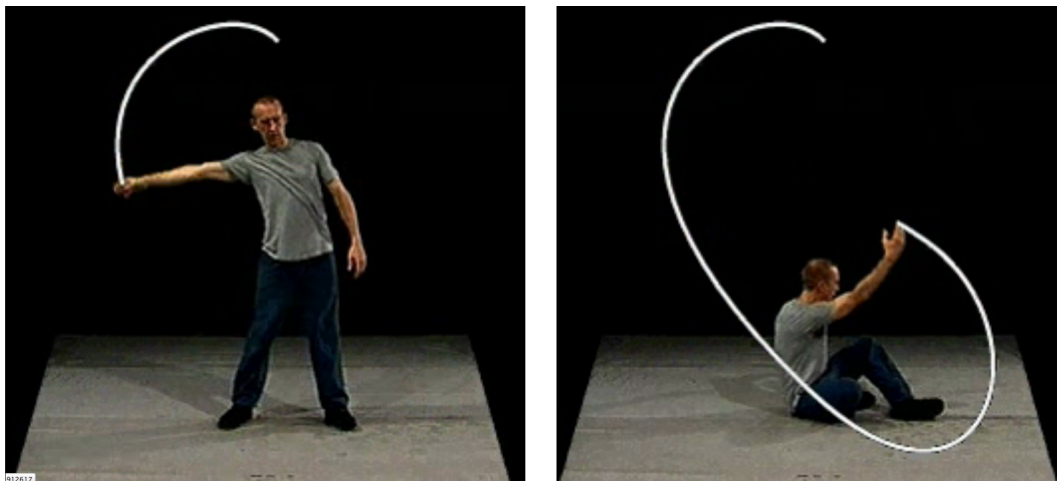


Illustration 1: William Forsythe exemplifying the object “Dropping Curves”, plus the graphic notation of the curved line, in “Improvisation Technologies” CD-ROM (Forsythe, 2012).

84 See page 93.

85 It should be noticed that philosopher Erin Manning, in her recent book “Always More Than One: Individuation's Dance”, also discusses the choreographic object “Dropping Curves” in Forsythe's work (2013, p. 77). In contrast to the reference here at stake—the “*Improvisation Technologies*” collection—, Manning discusses it in the context of her own observations of Forsythe Company's rehearsals. For more on Manning's own take on this choreographic object, see pages 119–121.

displace its centre or even to have multiple centres. Its geometries are mobile and transformative. Not only can the centre of movement migrate throughout the body, but also can its relative geometries be converted into one another, much in the manner of a topological form. In fact, it seems to be more correct to consider Forsythe's analysis of movement in topological terms than in terms of euclidean geometries. After all, inasmuch as the dancing body serves here as a transducer of abstract potentials, it cannot know them but by moving (with) them. Such transductions do not occur when movement just conforms to the reproduction of static figures.

It is perhaps the *IT's* topological character that is better attained with the multimodality of each videogram. If on the one hand each choreographic object is irreducible to danced expressions, verbal explanations and graphemes, on the other hand it is their articulation that offers insights into the object's potentials. This insight, of course, is here enhanced by the fact that these expressive modalities are overlapped onto one another in one same plane of expression. In this way, not only each modality offers insights into the object's parameters, but their relation forms a nexus with the multimodal possibilities of digital articulation. What results from the object's multimodal expression is a relation between nexuses: there is the nexus of each expressive modality and there is the nexus of their articulate relation. The more nexuses are articulated, the better the object that they all express becomes defined. The choreographic object's multimodal expression allows for its parameters to be defined as what remains invariant across the different modalities involved. As mentioned before, this invariant function of choreography corresponds to its principle of individuation, which in turn corresponds to the nexus' relativity to its own absolute origin.⁸⁶ Insofar as the nexus' absolute origin is inaccessible, this relativity is nowhere to be found. It is a virtual potential that can only be accessed in effect. Therefore, if the multimodality of each *IT's* videogram expresses invariant parameters, it is only because it implicates virtual potentials. And it is only by reason of these potentials, which assure each parametric structure's topology, that a nexus is expressed.

Depending on each domain's possibilities of expression, one same choreographic object can appear differently. The parameters possibly depicted from written graphemes are not exactly the same as the depictable in either the object's danced expressions or its verbal explanations. It is only by relating these differences that what they share becomes explicit. In regard to the choreographic object shown above (see Illustration 1), the

86 See page 95.

following parameters can be depicted: a starting point, a final point and a series of intermediate points connecting the previous two, not in a straight line, but in a descendent arc (the final point being lower than the starting point). This structure can be depicted as well in the dancing body's expressions. But whereas the grapheme doesn't express data with regard to the dancing body, it is with the latter that the object's parameters acquire further definition: all the points of the descendent arc coincide with one single bodily point—in this case, the right hand. Despite its appearance, this is not a simple parameter. For here it is implied that, while the hand follows the descendent arc, there occurs a progressive structuration throughout the rest of the body, which organizes its movements with spiralling forms. This is somewhat inevitable, since spiralling is the organizational tendency of the musculoskeletal system in movement. In this sense, the descendent arc, rather than being given, emerges when the dancing body follows the given parameters, determining in this way the arc's amplitude and length. From this organizational tendency follows a final parameter, which is made explicit with the videogram's multimodal nexus: the arc's final point corresponds to the place where the body's spiralling movement can no longer progress (i.e. most probably the floor). It is the multimodal nexus that defines most clearly the object's parameters. What is not expressed with one modality can be made explicit with others. And their relation in continuity can definitely express what remains without variation.

If what is transduced across choreography's variable recurrences are principles of individuation, it remains to be explained how this transduction occurs. Or, better yet, it remains to be said how choreographic principles are preserved throughout a process of cross-domain transduction. This is clearly a problem of memory. It regards the problem of how choreographic memory moves through the actual-virtual dynamisms of process. In order to tackle this problematic, it is perhaps useful to draw upon philosopher Gilles Deleuze's theory of memory, since his distinction between “transcendental memory” and “empirical memory” can facilitate the understanding that, between the choreographic object's parametric structure and its virtual potentials, there exists a process which fluctuates between perception, forgetting and remembering. For Deleuze, “[e]mpirical memory is addressed to those things which can and even must be grasped: what is recalled must have been seen, heard, imagined or thought. That which is forgotten, in the empirical sense, is that which cannot be grasped a second time by the memory which searches for it (it is too far removed; forgetting has effaced or separated us from the memory). Transcendental memory, by contrast, grasps that which from the outset can only be recalled, even the first time: not a contingent past, but the being of

the past as such and the past of every time. In this manner, the forgotten thing appears in person to the memory which essentially apprehends it.” (1994, p. 140). In a sense, this notion of transcendental memory corresponds to the general potentials without which no actualization can ever occur. Only because the potentials of abstraction are in fact the objects of transcendental memory, can these ingress into particular forms. In contrast, empirical memory is always relative to the objects of perception. What is given in perception will become a referent for recognition and prediction. Which implies that the potentials of the one and the potentials of the other affect one another in the same way that the virtual and the actual do. In fact, transcendental memory and empirical memory are just alternative designations for the virtual and for the actual, respectively. Individuation is conditioned both by what is determinately given—empirical memory as the actuality of what has already individuated and got to be inscribed in the experience of the world—and by the indetermination of an initial disparity, which in a sense equates the absolute origin of individuation with the potentials of transcendental memory.

From this standpoint, it can be posited that, in regard to choreographic objects, not only the virtual dimension of transcendental memory assures the necessary potentials for them to be created anew, as it assures the capacity for what has been empirically given to be reactualized in a novel manner. This creative capacity of transcendental memory is what allows for the recurrences of choreography to differ from one another. It assures degrees of indetermination necessary for differences to take place. But it is also what allows for recurrence itself, even when what was once perceived has been forgotten. It is this capacity of the virtual to retain the forgotten that allows for similar resolutions to occur in processes that have no relationship whatsoever with one another. Transcendental memory allows for the inexplicable coincidence of unrelated events. And despite the recollection of what has been forgotten being said by Deleuze to “appear in person to the memory which essentially apprehends it”, this should not be understood as a corresponding to a conception of transcendental memory as essence, i.e. as an essential trait capable of defining seamlessly its own different expressions. In contrast to any kind of idealism, the objects of transcendental memory should be understood as virtual potentials that, because they tend towards possibility with probabilistic distributions that favour some events in detriment of others, are in themselves fields of intensive differentiation. The objects of transcendental memory are diagrammatic in both the sense that they are real but imperceptible and in the sense that they can be so problematic that their resolution actually defines determinate

expressions. The fact that one same diagram allows for the emergence of different expressions (as different as dancing, speaking and writing) can thus be said to result from a differentiation of tendencies that depends on its relation with actual conditions of individuation. Depending on the domain of individuation and on its possibilities of expression, the diagrammatic forces of abstraction will be differently expressed. If the domain is the dancing body, the expression of a choreographic diagram's will conform to its possibilities. Conversely, there are choreographic objects that are beyond the expressive possibilities of the dancing body.⁸⁷ If the domain is the kind of graphical writing that, at the time of the *IT*'s release, was available to be used with video recordings, then the choreographic diagram will conform to the possibilities offered by the technical devices in use. Insofar as each domain limits virtual potentials with determinate possibilities, each diagram can be expressed differently. Which is not to say that several recurrences of one same diagram in one same domain will, in contrast, be expressed similarly. This depends much on the domain's degree of indetermination. The dancing body, for example, implicates such a degree of indetermination that it will never express one same diagram the same way twice.

Arguing that indetermination is precisely what both idealism and realism fail to acknowledge in relation to the necessary conditions of individuation, dance and media theorist Stamatia Portanova argues in her book “Moving without a Body: Digital Philosophy and Choreographic Thoughts” (2013) that in both perspectives “[t]he fundamental question that remains unanswered is how to explain difference and repetition, what persists and what mutates in the form of a step, or how to preserve immanent patterns of being and becoming, of nature and reason, in dance.” (Ibid., p. 66). Both from the perspective that repetition is transcendently determined and from the perspective that repetition follows from physical laws, the fact that difference occurs, even when identity and similitude seem to prevail, is largely neglected. Both views override the indetermination of potentials, only to posit an identity mode of causality at the heart of process. If this would be so in the case of choreography, neither could the perception of dance be forgotten nor could its remembrance be expressed with a difference. For Portanova, choreography has always been “afflicted by an essential

⁸⁷ It is enough to recall that choreographer Merce Cunningham used such strategy to challenge the dancers with whom he worked. It is well known that “the first choreographer of international renown who routinely utilized the computer as a choreographic tool” (Copeland, 2004, p. 168) used the choreographic software “*LifeForms*” (www.charactermotion.com) to generate improbable and even impossible images of movement that the dancers would then try to execute. Importantly, these computer generated images were not intended to be reproduced as such, but rather to act as catalysts for the dancers to discover new ways of moving.

form of forgetting” (Ibid. p. 65), which accords with the already mentioned excess of the body over writing. Forgetting, in this sense, corresponds to the definition of performance as that which is transient and irretrievable. But, beyond this, it corresponds as well to the non-actualized potentials of movement. A potentiality that, for Portanova, constitutes the very heart of a movement that is not a repetitive mode of differentiation, i.e. repetition without difference, but rather a differentiating mode of repetition, i.e. repetition with difference. In her words: “one step is always in relation not only to the following one, but to a multiplicity of potential steps not actually taken. It is this particular relation of the step to its intensive potential that constitutes movement’s rhythm: the in-between of movement continuously folding into a centrifugal vortex or a spiral. Impossible to repeat.” (Ibid. p. 65). It is the immanence between virtual potentials and actual constraints that not only allows for the virtualization of actuality but also for the continuous, i.e. rhythmic, relation of what would otherwise be discontinuous (because perceived as such). The rhythmic character of repetition attests the return of difference within individuation. “It is the difference that is rhythmic”, say Gilles Deleuze and Felix Guattari, “not the repetition, which nevertheless produces it: productive repetition has nothing to do with reproductive meter” (1987, p. 314).

The differentiation of repetition corresponds precisely to what has been here designated as encounter. In Portanova's words: “Every time a remarkable or distinctive point of a body (for example, the ankle as an abstract point of the notation’s score) combines with, or relates to, that of another body (for example, the dancer’s ankle as a concrete anatomical point), a difference is generated: from one gesture to the other, difference is carried not alongside imitation but throughout a progressive repetition of singularities” (2013, p. 67). Novelty is not added to the repetition of the same. Rather, it is rhythm itself, with its differential character, that follows from the combination of implicit potentials with explicit forms. Such is the diagrammatic capacity of repetition. The problematic difference between all the possible curves that a dancing body can express when combining itself with the object “*Dropping Curves*” corresponds in this way to a difference between potentials that is immanent in the object's possible expressions. To remember the object in a certain way is to differ from what is given and therefore already known. It is to individuate novel instances of knowledge and, correspondingly, novel relations between subjects and objects. Which is also the reason why, for Portanova, the rhythmic repetition of a diagrammatic combination between formal and formless potentials corresponds to memory itself. Or, in her own words, this combination is “what makes of the repeating body a remembering mind”. As such,

“[r]ather than being physically contingent and external to the abstract concept, or rather than being conceptually programmed and external to the physical body, the difference of a dance form becomes internal to an idea”. (Ibid.). A corollary from which it follows that the choreographic diagram is in itself an idea of dance. And insofar as an idea is neither fully removed from actuality nor fully disconnected from what is, the choreographic object can be said to be an idea of movements with nexus. It is a dynamic whole primarily defined by the creative relation between its general and relative potentials. A whole that can be reduced neither to pure abstractions nor to pure expressions, but which is a topology with the capacity of expressing itself differently without ceasing to be itself.

In order to pursue such understanding of choreographic objects, this study will now turn towards the notion that ideas are fundamentally topological and that, as such, they structure the immanent relation between abstractions and expressions. Both in regard to the notion of diagram and in regard to the movements of choreographic thought, it should now be asked: How does rhythm partake the complex interplay between the unconscious, the intelligible and the sensible? And, moreover, how does this interplay acquire a truly choreographic character? What seems to be most evident is that, in any case, a multiplicity of movements must connect the abstract with the concrete according to its own nexus. But how this nexus manifests itself and endures throughout the rhythmic affectivity of all dimensions of movement's wholeness remains to be clarified.

Chapter 4 - DIAGRAMMATIC IDEAS

The choreographic object has been here defined as an idea that, because it necessarily pertains to a nexus of movements, is problematic and therefore potential with regard to being expressed differently across domains. This next chapter will start by exploring French philosopher Gilles Deleuze's theory of ideas in order to provide a better understanding of how the choreographic object's topology behaves in between abstraction and expression. This will lead the discussion towards a definition of ideas as propositions, which will allow for better tackling the relationship between choreographic ideas and the processes by which a dancing body learns how to move accordingly. Moreover, this chapter's second Section will look into a concrete study case—Emio Greco and Pieter Scholten's "*Double Skin / Double Mind*" choreographic object—in order to exemplify how a choreographic object is charged with potentials and how these can be resolved into different kinds of expression. Since this one object has been created with the intent of transmitting determinate instances of choreographic knowledge, its transductive character will be approached via the relationship of its topology with the conceptual structure used to express it across domains. This will provide a basis upon which to conceptualize the notion of diagram, to be developed throughout this chapter's third Section. Such development will continue to draw upon Deleuze's philosophy, articulating it with sources that itself draws from: Charles S. Peirce semiotic framework, Michel Foucault's work on the social diagram, and Brian Massumi and Manuel DeLanda's commentaries upon this notion (which are directly related to Deleuze's joint work with Felix Guattari). Dwelling upon the notion of diagram will not only allow for a better understanding of the dynamisms by which ideas come to determine concrete cases of solution with regard to their own problematic structure, but also of how encounters and their results are never only a matter of determination but also a matter of indetermination. This will make the case that, in order for the encounter between dance and technology to be truly creative, it must openly engage with unconscious forces that, despite being inaccessible, are absolutely determinant in regard to the ingression of novelty into the expression of choreographic ideas.

4.1 - From Idea to Proposition

A choreographic object is a technical object. It undergoes invention and concretization. And as much as this process follows heuristic iterations of concretization with feedbacks to abstraction, i.e. to the level of the abstract diagrams from which technical concretization is drawn, the actual resolution of a choreographic object corresponds as well to the resolution of corresponding instances of knowledge. Simple objects, such as “*Dropping Curves*”, require less experimentation than complex ones, such as a choreography assembled from many different objects. Whenever a complex of choreographic objects is assembled, the problems posed to its concretization correspond not only to the sum of its constituent parts, to the different ideas of the assembled objects, but also to a multiplicity of problems that necessarily emerges from the assemblage itself. Which is to say that, not only is the underlying idea of each choreographic object problematic and therefore potential of being expressed anew, but also the relation between different choreographic objects (be this a relation in succession, such as when one dancer improvises and composes with different objects, one after the other, or a relation in simultaneity, such as when different objects are juxtaposed in space by different dancers) is in itself problematic and therefore capable of expressing novel choreographic ideas. Depending on the degree of indetermination of a choreographic object, the resolution of its implicit problems will require more or less experimentation. As such, this is a requirement that directly concerns the resolute knowledge of each choreographic object. In other words, without a process that iteratively experiments with the actual possibilities of the technical system, no possible resolution of the problems posed will come to knowledge. The analogous co-individuation of subject and object in the technical concretization of choreography requires that the epistemological link between them is constituted on the basis of a process that, rather than taking the objects' parametric structures as given, actually invents them (always with and from a difference).

In regard to this relation between problematic ideas and actual experimentation in processes of technical individuation, it is perhaps Gilles Deleuze's theory of ideas (1994, pp. 168–221) that is most guiding. While drawing from Simondon's theory of psychic individuation (though in many cases not explicitly), but with a more explicit take on topology, Deleuze's theory of ideas not only characterizes thought in problematic terms but also proposes that the solutions for the problems posed by ideas

can only be found by means of actual experimentation. For the author, “the Idea is not the element of knowledge but that of an infinite 'learning', which is of a different nature to knowledge. For learning evolves entirely in the comprehension of problems as such, in the apprehension and condensation of singularities and in the composition of ideal events and bodies. Learning to swim or learning a foreign language means composing the singular points of one's own body or one's own language with those of another shape or element, which tears us apart but also propels us into a hitherto unknown and unheard-of world of problems. To what are we dedicated if not to those problems which demand the very transformation of our body and our language? In short, representation and knowledge are modeled entirely upon propositions of consciousness, which designate cases of solution. But those propositions by themselves give a completely inaccurate notion of the instance which engenders them as cases, and which they resolve or conclude. By contrast, the Idea and 'learning' express that extra-propositional or sub-representative problematic instance: the presentation of the unconscious, not the representation of consciousness.” (1994, p. 192). As such, technical experimentation involves not only what is possible to concretize but also the preindividual depth of the individuating system. It implicates the continuum of affects engendered intensively between encountering elements. It encompasses both what is proposed to the encounter and what exceeds the possibilities of knowledge by reason of belonging to the very plane of disparition where potentials differentiate. Learning pertains, therefore, to the resolution of problems in potential. It pertains to the resolution of what cannot be known in advance but which notwithstanding can come to constitute novel instances of knowledge. The presentation of the unconscious in the problematic encounters of technical individuation regards therefore an experience that must be lived, processually, rather than represented as a proposition of resolution.

Accordingly, for Deleuze, ideas implicate the sensible by difference rather than by identity. For him, “[a]n Idea is an n-dimensional, continuous, defined multiplicity”⁸⁸

88 A definition in all too close to Bergson's concept of “duration”. Already in Section 1.1, Deleuze was a guiding voice for discussing this concept. Which not only attests the direct influence of one's work on the other's, but more broadly the fact that Deleuze, like Bergson, was also concerned with the insights brought about by the fundamental sciences, most notably mathematics and physics. Besides Deleuze's well known take on topology, it is worth noting the one he took on the work of René Thom, the french mathematician who in the sixties formulated the *mathesis* of catastrophe or chaos theory (Deleuze, 1993, p. 16). In this regard, philosopher of science and known commentator of Deleuze's philosophy, Manuel DeLanda remarks that: “In [Difference and Repetition], Deleuze repeatedly makes use of these 'spaces of energetic possibilities' (technically referred to as 'state spaces' or 'phase spaces'), and of the topological forms (or 'singularities') that shape these spaces. [...] Since these ideas reappear in his later work, and since both the concept of 'phase space' and that of 'singularity' belong to mathematics, it is safe to say that a crucial component of Deleuzian thought comes from the philosophy of mathematics. And, indeed, chapter four of Difference and Repetition is a meditation on

(1994, p. 182), a formula which entails that, rather than being a homogeneous unity, an idea necessarily organizes heterogeneous elements in relations of difference. Remarkably, these are intensive differences. Problems internal to the continuous multiplicity where potentials belonging to different orders of magnitude relate to one another in one single field of heterogeneous composition. Technical resolution must implicate a durational experience which relates the past with the present for the sake of relating an idea's virtual potentials with its actual cases of solution. Technical individuation is a perfectly positive process of invention, it knows nothing about negation. In fact, this is clearly a standpoint that disables the possibility of a dialectical negativity, for which an idea, being identical with itself, can negate another self-identical idea. For Deleuze, an idea has neither form nor identity: it is without "sensible form, conceptual signification, nor any assignable function" (Ibid., p. 183). It is a differential variety that is always more-than-itself, a general potential which exceeds representation. Because of this, the idea is potentially problematic. It is the differential field of problematization from which determinate solutions can be drawn. The idea is a necessary condition with regard to technical resolution, a condition that goes together with what is possible to be resolved in each domain of individuation. Experimentation results out of such condition. It is the necessary procedure for individuating instances of knowledge that both attain and not attain the resolution of a given problem. Additionally, the idea's problematic stance implicates in process the extra-propositional and unconscious reality of virtual potentials. This allows for determining solutions that cannot be but singular expressions of unpredictable affects. The need to experiment results as well out of such reality. To access in effect to what, being inaccessible, can notwithstanding contribute to resolute determinations. Both problems and possibilities, affects and effects, are a condition of technical experimentation. On its turn, technical experimentation is the means by which both resolution and the knowledge of how to attain it can come about.

Deleuze further distinguishes ideas from propositions in the following way: "Spatio-temporal relations no doubt retain multiplicity, but lose interiority; concepts of the understanding retain interiority, but lose multiplicity, which they replace by the

the metaphysics of the differential and integral calculus. On the other hand, given that 'phase spaces' and 'singularities' become physically significant only in relation to material systems which are traversed by a strong flow of energy, Deleuze's philosophy is also intimately related to that branch of physics which deals with material and energetic flows, i.e. with thermodynamics. And, indeed, chapter five of *Difference and Repetition* is a philosophical critique of nineteenth-century thermodynamics, an attempt to recover from that discipline some of the key concepts needed for a theory of immanent morphogenesis." (2000, p. 35).

identity of an 'I think' or something thought. Internal multiplicity, by contrast, is characteristic of the Idea alone” (1994, p. 183). Which is a distinction that facilitates a better understanding of Stamatia Portanova's assertion that the difference of a dance form is internal to its idea.⁸⁹ The idea is different from the concepts of the understanding because these correspond to the subjective side of the transindividual. They result from a process that, even if it does not solve the problems of ideas, individuates subjective instances of knowledge. They “retain interiority, but lose multiplicity” precisely because they attest the self-compatibility of a subject. They attest the state at which there's a minimum exchange of information between the subject and the milieu that the concepts regard. In addition, the idea is different from spatio-temporal relations because these correspond to the objective side of the transindividual. In contrast to the concepts of the understanding, they are the objective side of determinate instances of knowledge. They “retain multiplicity, but lose interiority” because they express the objective reality that the concepts of the understanding regard. The idea pertains neither to the one side nor to the other. Rather, it pertains to the differential variety of problems implicit in the constitution of a transindividual relation. It pertains to the problematic condition underlying both the concepts of the understanding and determinate spatio-temporal relations. It is not an external factor of determination but an immanent force of individuation. In fact, “[i]t is sufficient to understand that the genesis takes place in time not between one actual term, however small, and another actual term, but between the virtual and its actualization – in other words, it goes from the structure to its incarnation, from the conditions of a problem to the cases of solution, from the differential elements and their ideal connections to actual terms and diverse real relations which constitute at each moment the actuality of time.” (Deleuze, 1994, p. 163). The idea is a genetic element in regard to solutions.

Noteworthy is the fact that Deleuze's theory of ideas inherits much from Immanuel Kant's philosophy. “Kant likes to say that problematic Ideas are both objective and undetermined” (Ibid., p. 169). From which Deleuze draws both the postulate that problems are “the real object of the Ideas” (Ibid.) and the postulate that ideas are divided in three distinct moments. In their “first objective moment”, ideas are “undetermined with regard to their object” (Ibid.). Importantly, for Deleuze, “[t]he undetermined is not a simple imperfection in our knowledge or a lack in the object: it is a perfectly positive, objective structure which acts as a focus or horizon within perception” (Ibid.). Hence, the idea is undetermined with regard to its problems because

⁸⁹ See page 110.

its differential variety connects heterogeneous elements in non-localisable relations. In its second moment, the idea becomes “determinable with regard to the objects of experience” (Ibid.). Which is to say that it becomes relative to the possibilities of representation. Its potentials become limited by what has been given to experience. From which it reversely follows that “an object outside experience can be represented only in problematic form” (Ibid.). The third moment of the idea, in which this bears “the ideal of an infinite determination with regard to concepts of the understanding” (Ibid.), corresponds to the resolution of its problems in thought. Here, the idea becomes objective and thus acquires its highest degree of determination. While in a first moment the problems of ideas are undetermined and in a second moment determinable with regard to the objects of experience, in a third moment they acquire a positional status. Problems are posited together with determinate cases of solution. To say that the idea has an infinite capacity of determination with regard to the concepts of the understating thus stands for saying that the cases of solution determinable with thought can be many.

Despite its three moments, the idea is one single whole. It is continuous with itself because it is primarily a differential variety. The unity of the idea's three different moments is the continuity of its topology. As such, the undetermined problems of the idea's first moment are not withdrawn from the cases of solution objectified in its third moment. As Deleuze notes, “[a] problem does not exist, apart from its solutions. Far from disappearing in this overlay, however, it insists and persists in these solutions. A problem is determined at the same time as it is solved, but its determination is not the same as its solution: the two elements differ in kind, the determination amounting to the genesis of the concomitant solution. (In this manner the distribution of singularities belongs entirely to the conditions of the problem, while their specification already refers to solutions constructed under these conditions.) The problem is at once both transcendent and immanent in relation to its solutions. Transcendent, because it consists in a system of ideal liaisons or differential relations between genetic elements. Immanent, because these liaisons or relations are incarnated in the actual relations which do not resemble them and are defined by the field of solution.” (1994, p. 163). Whereas the differential distribution of singularities attests the problem's ideal character, its concomitant solution attests the distribution of particular cases, which are but possible cancelations of the problem's implicit disparity. The difference between determinate problems and their cases of solution is one of kind, not only because problematic potentials are general and their specification relative to actual conditions, but also because problems are propositions for a subject to learn how to solve them

accordingly. Individuating cases of solution requires experimenting with possibilities of representation and concretization. It requires an exclusive selection of what might possibly stand both as solution and as problematic expression.

Importantly, says Deleuze, “[a] proposition by itself is particular, and represents a determinate response. A series of propositions can be distributed in such a way that the responses they represent constitute a general solution (as in the case of the values of an algebraic equation). But precisely, propositions, whether general or particular, find their sense only in the subjacent problem which inspires them. Only the Idea or problem is universal. It is not the solution which lends its generality to the problem, but the problem which lends its universality to the solution. It is never enough to solve a problem with the aid of a series of simple cases playing the role of analytic elements: the conditions under which the problem acquires a maximum of comprehension and extension must be determined, conditions capable of communicating to a given case of solution the ideal continuity appropriate to it. Even for a problem which has only a single case of solution, the proposition which designates this case would acquire its sense only within a complex capable of comprehending imaginary situations and integrating an ideal of continuity. To solve a problem is always to give rise to discontinuities on the basis of a continuity which functions as Idea. Once we 'forget' the problem, we have before us no more than an abstract general solution, and since there is no longer anything to support that generality, there is nothing to prevent the solution from fragmenting into the particular propositions which constitute its cases. Once separated from the problem, the propositions fall back into the status of particular propositions whose sole value is designatory. Consciousness then attempts to reconstitute the problem, but by way of the neutralised double of particular propositions (interrogations, doubts, likelihoods, hypotheses) and the empty form of general propositions (equations, theorems, theories)” (1994, p. 162). Which amounts to saying that both the idea's determinability with regard to the objects of experience and its determination with regard to the concepts of the understanding are phases that remain to be given while the idea persists as problematic and unresolved. The phase of the idea that is outside of experience cannot but create the unpredictable. In contrast, the objects of experience and the concepts of the understanding can occur only on the basis of what is giveable. This difference between the first and the other two moments of the idea coincides with the difference between its potentials and possibilities. Would potentials be detached from possibilities, nothing but what is giveable could follow from the idea. If this would be the case, for example, with technical individuation, then nothing but a

reproduction of givens could be concretized, i.e. to be “produced after the fact, as retroactively fabricated in the image of what resembles it” (Ibid., p. 21).⁹⁰ In such case, there is no invention. Because for invention to occur, for an idea's potentials to manifest the unpredictable, its problematic structure needs to be active throughout the whole process. The idea's unity must be prehended so that, together with the proposition of its solutions, problems remain potential, differentiating in this way what would be otherwise a reproduction of the same. To solve a problem is to learn how to determine conditions capable of integrating the problem itself in the form of its relative solutions. This requires the necessary trials for not only solving the problem, but to solve it in relation to the idea to which both problem and solution belong. Technical resolution discontinues what nevertheless remains in relation to the idea. It individuates cases of solution that necessarily imply a constitutive difference. This is why it is always a creative act.

From the perspective of Deleuze's theory of ideas, choreographic objects are but ideal systems of individuation. Each choreographic object corresponds to a differential variety with the capacity to problematize the encounter between virtual potentials and actual possibilities. Subsequently, it corresponds as well to the potential of expressing cases of solution in accordance with what the dedicated domains actually allow for. To express choreographic objects is to learn how to posit their constitutive problems in relation to determinate conditions. Different possibilities of expression will necessarily conduce to learning how to posit choreographic problems in different ways. And inasmuch as the problems of ideas are implicated in the cases of solution, different choreographic expressions can only be said to pertain to one same object if they share the same problematic structure. In this sense, in spite of being expressed discontinuously in relation to one another, the different cases of solution of one same problematic choreography belong to the same topological continuity, i.e. they share the same potentials of problematization. From which it follows that the choreographic problem is necessarily propositional. Its capacity to instigate action is as well the capacity of the subject to learn how to posit problems. To express choreographic objects is to experiment with possibilities and concretize given solutions with regard to the problems posed. An aspect that is clearly emphasized in Erin Manning's following

⁹⁰ Importantly, for Deleuze, the relation between the possible and the actual is organized in accordance with principles of “identity with regard to concepts, opposition with regard to the determination of concepts, analogy with regard to judgement, and resemblance with regard to objects” (1994, p. 137). According to such principles, the realization of the possible-actual relation cannot but double the images of what is possible with the actualization of determinate cases of solution.

commentary on William Forsythe's choreographic object "*Dropping Curves*": "When Forsythe proposes 'drop a curve' what he means is not 'reconfigure the habit' but 'move through contrast'. If you tend to drop through your side, creating a curve from hip to shoulder, begin there. But go elsewhere with it – let it take you elsewhere. Feel the movement's differential and move with its inflection in the event, letting it move the you you are becoming." (2013, p. 77). Though this is not necessarily what Forsythe himself would say (despite the fact that in the quoted text there's a clear confusion between the two authors' words), what is most important to retain from this passage is the fact that, in this way, propositions are made to be a necessary condition to the transduction of choreographic knowledge. Importantly, Manning's notion of proposition derives from Alfred N. Whitehead's philosophy. For the latter, as for Deleuze,⁹¹ propositions are not added to the solutions, but they are of and with the solutions. They work as intensive catalysts for learning what is yet unknown. A proposition "is a datum for feeling, awaiting a subject feeling it. Its relevance to the actual world by means of its logical subjects makes it a lure for feeling. In fact many subjects may feel it with diverse feelings, and with diverse sorts of feelings" (Whitehead, 1978, p. 259). What becomes a proposition is thus what the subject makes of it. The proposition itself is not given and what it will have become depends on the feeling subject, which also individuates with the feeling. "If [...] the proposition has been admitted into feeling, then the proposition constitutes what the feeling has felt" (Ibid., p. 186). From which it follows that both the subject and the proposition co-individuate to become the dialogical poles of one system of co-determination. Or, if one is to say instead that what individuates is both a subject and an object, then the proposition is the very movement of their co-constitution. The proposition constitutes the feeling subject as much as what is felt. The proposition is an idea in movement. The formal conditions of the idea's propositional movement can, and to a certain extent must, be given. But the proposition itself is not giveable. Though any form can become propositional, it needs a subject to make it so.

It is precisely from this standpoint that it is possible to say, with Manning, that the proposition "drop a curve" does not stand for "reconfiguring a habit" but rather to "moving through contrast". Manning's own reading of Whitehead's notion of proposition is here too elucidative: "The proposition, for Whitehead, works as an inflection that affects how a given occasion comes to expression: propositions elicit

91 For Deleuze's comments upon Whitehead's philosophy, see his book on "Leibniz and the Baroque", titled "The Fold" (1993).

action in an environment of change. The proposition is a lure. It is a force that cuts into the incipient event to alter its experiential vectorization. The proposition, however, is never added on to an occasion. It is of and with the occasion – its immanent cleaving. This cleaving activates the force of contrast within the occasion, opening the occasion to its difference. Contrast is here understood as the force of difference that activates the dephasing through which the occasion is felt as such.” (2013, p. 77). In this guise, Manning further explains that to “[d]rop a curve reaches its propositional potential when contrast is activated such that the becoming-body fields the curving of space-time in a new way, itself co-constituted by this newness. If this happens, what is experienced is the creation of a previously unfelt sensation that now permeates the welling occasion. [...] Drop a curve is propositional not when a body has been defined but when the force of movement-moving activates a field of relation that alters the affective and compositional ecology of the larger event of movement-moving.” (Manning, 2013, p. 78). The choreographic object becomes propositional when its differential variety is felt by its logical subject. While emerging from the encounter between a dedicated domain and the difference internal to an idea of dance, the proposition participates in the “distribution of the sensible” (Rancière, 2004, 2010) occurring within the individuating system where both the feeling and what the feeling feels co-constitute one another. The proposition of choreography therefore attests the latter's creativity. It attests the fact that the becoming propositional of the choreographic object necessarily divests the reproduction of what is already known, only to increase the potentials for something new to be learnt.

4.2 - Individuating Choreo-Knowledge

When asked to deliver a workshop at the Internationale Tanzwochen Wien in 1998, choreographer and dancer Emio Greco and dramaturgist Pieter C. Scholten (EG|PC) decided to create a structure capable of transmitting their creative method, which they named “*Double Skin / Double Mind*” (DS/DM). After delivering this workshop in different contexts for some years, the two artists felt “the need to understand the logic of the workshop and its structure better” (Delahunta, 2007b, p. 20). In order to do this, the EG|PC dance company, in cooperation with the research group Art Practice and Artistic Development, of the Amsterdam School of the Arts, headed by Marijke Hoogenboom,

developed from 2004 to 2007 the “*Notation Research Project*” (NRP).⁹² With this project, the two artists and a multi-disciplinary team of specialists strived for finding a notation system capable of capturing “the inner intention as well as the outer shape of gestures and [dance] phrases” (Delahunta, 2007b, p. 5). Remarkably, this research generated multiple outcomes: a documentary, a DVD-ROM, a book and an interactive installation, all published together under the title “*(Capturing Intention): Documentation, Analysis and Notation Research Based on the Work of Emio Greco/PC*” (CI).⁹³

The workshop *DS/DM* was intended to facilitate the transference, from Emio Greco's dancing body to the body of other dancers, of a series of movement principles. As it can be seen in the *DS/DM* documentary,⁹⁴ such transference is based on exemplification and reproduction. The dancers watch Greco dancing, listen to his oral instructions and then try to dance in accordance with the same movement principles. To say that a movement principle is reproduced from body to body is not the same as saying that one body mimics another. Rather than formal outcomes, what is here transferred across bodies is a principle of individuation. In dance, movement principles are principles of individuation. To transfer movement principles across bodies is a transductive process.

The movement principles of Greco's characteristic dancing are known to comprise a strong component of internal movement, that is, of bodily movements that occur at orders of magnitude unperceivable to other bodies. Hence, the name of the publication: “*Capturing Intention*”. For intention, here, regards the intensive qualities of bodily movement and the problematic potentials that these pose to the individuation of resolute expressions. And if it can be argued that it is an impossible task to express continuity as such either with film, software or text, it can also be argued that each of the *CI*'s objects attests the systematic tentative of dealing with this one problem: the

92 This project was followed by the “*Inside Movement Knowledge*” Project (IMK), which occurred between 2008 and 2010. For a detailed account of both projects' history see www.insidemovementknowledge.net.

93 I had the chance to meet part of the *NRP*'s team at the first Annual Arts and Sciences Laboratory of the “*Transmedia Knowledge Base for Performing Arts*” Project (TKB), which took place at the choreographic centre “O Espaço do Tempo” in Montemor-o-Novo, Portugal, between 22 and 28 May 2010. For more on the TKB Project, see <http://tkb.fesh.unl.pt/>. By then the *NRP* had already finished, but its outcomes were still being developed in the frame of the *IMK* Project. Since this Laboratory was dedicated to “New models of documentation for contemporary dance”, the *NRP/IMK*'s team had there the opportunity to set up the interactive installation *DS/DM* and present their remaining work. This was the only time I accessed the interactive installation's actual set up and experienced its workings.

94 The *DS/DM* documentary can be watched at <https://vimeo.com/38974588>, or found enclosed in the publication “*(Capturing Intention): Documentation, Analysis and Notation Research Based on the Work of Emio Greco/PC*” (Delahunta, 2007a).

fundamental and apparently unsurmountable difference between qualitative and quantitative multiplicities. Because of this, each of these objects can be said to express, if not a solution, at least an approximation to the problem itself. To transfer principles of intensive movement, either across bodies or from the dancing body to each of the *CI*'s different domains, is tantamount to transduce choreographic problems. First, this regards the fact the intensive body is constitutively problematic and therefore capable of transducing the principles according to which itself moves. Second, it regards the fact that the expressive resolution of such intensive problems necessarily implies problems that are of the domain of expression itself. When the ones do not coincide with the others, i.e. when the problems of the source domain do not coincide with the problems of the target domain (e.g. the transduction of movement principles from the dancing body to the digital domain), not only is the heterogenous multiplicity doubled with a difference, as it is also submitted to conditions of individuation that require different modes of experimentation. In this sense, EG|PC's knowledge of the *DS/DM*'s movement principles is much more easily (i.e. without other kinds of problems) transferred to other dancing bodies than to the target domains used to express the *CI*'s objects. Expressing movement principles in these latter domains requires specific modes of experimentation and the resolution of problems that are foreign to the knowledge that comes with the experience of dancing. It should nonetheless be noticed that, of the four *CI*'s objects mentioned above, only the DVD and the Interactive Installation were in fact created with the intent of being autonomous transducers of the *DS/DM*'s movement principles. Which is to say that, even if all the *CI*'s objects resulted primarily from the knowledge that EG|PC had of the *DS/DM* workshop, only these two expressions have individuated from the resolution of problems posed by the encounter between determinate ideas of dance and the domains targeted to express these same ideas. With such resolution, these objects acquired a truly choreographic character. They have become choreographic propositions. With them, it is possible to learn how to dance according to the *DS/DM*'s movement principles, similarly to what happens in a workshop delivered by EG|PC themselves. These two objects are capable of transducing the *DS/DM*'s movement principles into other dancing bodies, facilitating in this way the individuation of a renovated knowledge with regard to the intended dancing. Together with the workshop itself, these two choreographic objects attest once more the actual variability that one same system of choreographic individuation is capable of.

In spite of this, it is here worth following the *NRP*'s development and the fact that its first objective expression was the workshop's video documentary, filmed and

directed by Maite Bermúdez in 2005. Curiously, the structure of the documentary follows the structure of the workshop, as delivered at ImPulsTanz Festival, in August that year. The latter is shown to be divided in five main parts, designated respectively in regard to their succession as: 1) “*Breathing*”; 2) “*Jumping*”; 3) “*Expanding*”; 4) “*Reducing*”; and 5) “*Transfer*”. Whereas the first four of these parts correspond to different principles of movement (or, in other words, movement qualities), the last part is shown to be structured by a dance phrase that is to be filled with (or fuelled by) them. The fact that these successive parts are designated like this shouldn't be understood in any general way whatsoever. Their names are not meant to correspond to the common understanding that they might pertain to in any other particular context. Rather, they are meant to specifically depict the problematic structure of the *DS/DM*'s movement qualities. The fact that there is a tension between the territorialization that signifiers perform over signified multiplicities and the latter's characteristic deterritorialization, is remarked by Scott deLahunta—one of *NRP*'s specialists in dance and technology—as having been one of the difficulties faced by EG|PC when naming and describing the workshop's structure. “This difficulty of finding the right words and explanations was, in part, due to the dialectical tension between [the artists] that is inherently a feature of their artistic work [...]. To ‘decide’ what and how to name or explain these parts of *DS/DM*, was to allow it to become fixed, to make it concrete in terminology. However, as mentioned, the result of this difficult work served the needs of the making of the documentary. It also produced the hierarchy of sections and subsections so that the DVD and Installation versions of *DS/DM* could be created.” (2007b, p. 21). Which is to say that the tension between signifieds—the variable experiences and expressions of dance—and signifiers—the words used to name the workshop's movement qualities—was sufficiently problematic to foster the technical individuation of these two choreographic objects. After all, despite their possible reduction to the homogeneous explication of phonetic or graphic signifiers, monemes are but multiplicities of heterogeneous elements.

With no regard with the structures that followed from naming movement principles in this way, the *DS/DM* workshop always had a linguistic dimension. As dancer (of the EG|PC dance company) and researcher Bertha Bermúdez explains, “passing these dances onto others is [normally] done through instruction with the body and words. [As such] the body has to be clear and the words have to be right.” (Delahunta, 2007b, p. 6). And it is to this latter requirement that the specification of names attends. If both the DVD and the Interactive Installation are to be capable of

transmitting the DS/DM's dance ideas, their expressions have to be structured in a precise and determinate manner. It could nonetheless be argued that, instead of being given names, the different parts of the workshop could have been given numbers. But in contrast to numbers, what the artists' endeavour to find the right words for each of the workshop's movement qualities attests, is the existing connection between the somatic experience of the moving body and the ways in which language and conceptual knowledge are structured, in and by the body. In this sense, the oral explanation of dance ideas is directly related to the conceptual structures according to which the DS/DM's movement principles are organized. It allows for understanding both the knowledge that the artists have of what they do and how this is structured.

That both the *NRP* and the *IMK* have turned towards cognitive linguistics to think and analyse the conceptual structures implicated in the DS/DM's movement qualities, attests not only these projects' concern with the underlying principles of dancing but also the acknowledgement that the latter are known both somatically and conceptually. Bertha Bermúdez and cognitive linguist Carla Fernandes, two of the researchers here involved, claim to be “interested in searching for the implicit knowledge that is embedded in choreographic processes and the possible ways of presenting or expressing it. In practice this means [to] start from the premise that the translation and transmission of the imagetic thought of a contemporary choreographer into an embodied-type of thought, via the dancers' bodies, is above all metaphoric (cf. Johnson, 1987 on image schemata in the human brain as being prior to awareness).” (2010, p. 29). This metaphorical character of choreographic transductions can be understood both in regard to the dancing body's orientation relatively to the charged ground of its perceptive-affective milieu (i.e. imagetic thought being structured in accordance with this orientation) and in regard to the influence that knowledge has on dancing (i.e. expressive movement being determined by the structures of thought). It regards both the transfer of physical resolutions to the resolution of thought and the transfer of conceptual resolutions to the resolution of dance. After all, “the essence of metaphor is understanding and experiencing one kind of thing in terms of another” (Lakoff & Johnson, 1980, p. 5). Notwithstanding, this is not a symmetric process. The process by means of which the resolutions of thought follow from the body's physical orientation is not the same as the one whereby conceptual structures affect the actual organization of dance. On the basis of this asymmetry is the assumption that knowledge is characteristically imagetic. It structures images (or imagines structures) that are neither the body's actual orientation in its milieu nor any of its other possible

expressions. To better understand these processes and the relation between metaphors and the images of thought, it is here worth quoting a long passage from cognitive linguist Mark Johnson's seminal book "The Body in the Mind" (1987). "To illustrate the important and undervalued notion of embodied, imaginative understanding, let us consider two types of imaginative structure [...]: image schemata and metaphorical projections. An image schema is a recurring, dynamic pattern of our perceptual interactions and motor programs that gives coherence and structure to our experience.⁹⁵ The VERTICALITY schema, for instance, emerges from our tendency to employ an UP-DOWN orientation in picking out meaningful structures of our experience. We grasp this structure of verticality repeatedly in thousands of perceptions and activities we experience every day, such as perceiving a tree, our felt sense of standing upright, the activity of climbing stairs, forming a mental image of a flagpole, measuring our children's heights, and experiencing the level of water rising in the bathtub. The VERTICALITY schema is the abstract structure of these VERTICALITY experiences, images, and perceptions. [...] experientially based, imaginative structures of this image schematic sort are integral to meaning and rationality. A second, related type of embodied imaginative structure [...] is metaphor, conceived as a pervasive mode of understanding by which we project patterns from one domain of experience in order to structure another domain of a different kind. So conceived, metaphor is not merely a linguistic mode of expression; rather, it is one of the chief cognitive structures by which we are able to have coherent, ordered experiences that we can reason about and make sense of.⁹⁶ Through metaphor, we make use of patterns that obtain in our physical experience to organize our more abstract understanding. Understanding via

95 Elsewhere Johnson writes: "I call these patterns 'image schemata' because they function primarily as abstract structures of images. They are gestalt structures, consisting of parts standing in relations and organized into unified wholes, by means of which our experience manifests discernible order. When we seek to comprehend this order and to reason about it, such bodily based schemata play a central role. For although a given image schema may emerge first as a structure of bodily interactions, it can be figuratively developed and extended as a structure around which meaning is organized at more abstract levels of cognition. This figurative extension and elaboration typically takes the form of metaphorical projection from the realm of physical bodily interactions onto so-called rational processes, such as reflection and the drawing of inferences from premises. [...] what are often thought of as abstract meanings and inferential patterns actually do depend on schemata derived from our bodily experience and problem-solving. There are two especially controversial aspects [...] concerning the centrality of image schematic structures in the organization of meaning and in the nature of our inferences. The first is their apparently nonpropositional, analog nature. The second is their figurative character, as structures of embodied imagination." (1987, p. xx).

96 Another prominent cognitive linguist, George Lakoff, with whom Johnson wrote the book "Metaphors We Live By" (1980), argues that metaphors can be considered as a mode of thought in their own right because of three fundamental characteristics: "1) The systematicity in the linguistic correspondences; 2) The use of metaphor to govern reasoning and behaviour based on that reasoning; 3) The possibility for understanding novel extensions in terms of the conventional correspondences" (2006, p. 191). From these characteristics follows that metaphors organize the experience of the world in specific ways and that they can be expressed by means other than speech.

metaphorical projection from the concrete to the abstract makes use of physical experience in two ways. First, our bodily movements and interactions in various physical domains of experience are structured (as we saw with image schemata), and that structure can be projected by metaphor onto abstract domains. Second, metaphorical understanding is not merely a matter of arbitrary fanciful projection from anything to anything with no constraints. Concrete bodily experience not only constrains the 'input' to the metaphorical projections but also the nature of the projections themselves, that is, the kinds of mappings that can occur across domains.” (Johnson, 1987, p. xv).

From this standpoint, it is possible to understand how dance and speech are both capable of providing access to underlying conceptual structures and implicit instances of knowledge. Since the focus here is the dancing body, both modes of expression can be said to correspond to resolutions that not only implicate movement principles but also the thoughts that with them arise. Insofar as knowledge in general can be addressed on the basis of image schemata, and therefore as being grounded on bodily experiences, both knowing how to dance and knowing how to verbalize this experience necessarily correspond to one same conceptual structure. It follows that it is possible to not only address this relation between expressions and abstractions on the basis of the mappings that occur across domains, but also to use these mappings to further express choreo-knowledge. It is precisely this that both the DVD and the Interactive Installation express. By determining the ideas of dance in the form of concepts, here synthesized by words, and by using these structures to individuate digital expressions, the concretization of these objects has extended the knowledge of the *DS/DM* workshop into domains that, because they are problematic on their own, have allowed for novel resolutions and renovated perspectives on the workshop. As Pieter Scholten remarks, the knowledge of the workshop didn't change “but it has gotten more layers through this research project” (Delahunta, 2007c, p. 21). Such layers correspond both to a glossary that, beyond the names already mentioned, was fabricated with the intent of discontinuing movement qualities into a greater degree of resolution, and to the multimodal contents created to provide different perspectives on the *DS/DM*, as structured by the glossary.

“The *DS/DM*'s glossary has been the first attempt by EG|PC to break down the creative process through the use of words. Such a process provided the different

disciplines involved⁹⁷ within the research project with a common basis of understanding around the Double Skin/Double Mind workshop.” (Fernandes & Bermudez, 2010, p. 31). Not only this, but it allowed to depict the conceptual structure of the workshop to a point that was new even to the artists. As much as the *DS/DM's* glossary comprises a list of interrelated terms—a signifying double of the heterogeneous multiplicity that it represents—, and each of these terms implicates a concept, the glossary can be said to represent the conceptual structure of the workshop. A fact reiterated by the very process of its individuation, since that, in order for the glossary to result as it did, “[d]efinitions and descriptions were constructed through interviews and different transcriptions of the live transmission of the workshop, in some cases complemented by visual demonstrations. Divided in two parts, Inside and Outside, the glossary tried to present the language used by the company (Inside section) versus a more general definition of the same terms gathered from dictionaries (Outside section)” (Ibid.). It is not of interest here to consider the specificities of the lexicon used in the *DS/DM's* glossary. It rather matters to acknowledge that all its terms refer to resolutions of the dancing body. The glossary didn't result from a random depiction of choreographic expressions, but rather from a knowledge that primarily regards the dancing body's capacity to differentiate movement qualities. Rather than being an external factor of determination imposed on the workshop for the expression of resolute forms, the glossary should be understood as a possible expression of the diagram according to which the dancing body develops and undergoes phase-shifts, from one movement quality to the next. It is nonetheless noticeable that, in order to create it, much effort was put into defining the terms in relation to the narrow context of the *DS/DM* workshop, in relation to the broader context of EG|PC's artistic work, and in relation to the even broader context of dance and movement analysis. Here, there are different individuations at stake. There is the individuation of the *DS/DM's* movement qualities and there is the individuation of the concepts created by the multi-disciplinary team of specialists. Whereas the results of the former correspond to the glossary's structure, the results of the latter correspond to its contents. The one condition that these two individuations share is the *DS/DM's* dancing body. After all, both take it to be a body capable of moving ideas with the potential to determine conceptual and physical resolutions. By using the glossary for indexing and organizing the different contents of the *DS/DM's* DVD (as shown in Illustration 2, below) and of the Interactive Installation, it became possible to express digitally not

97 Dance notation, motion capture, new media design, cognitive neuroscience, cinematography and dance analysis (Delahunta, 2007a).

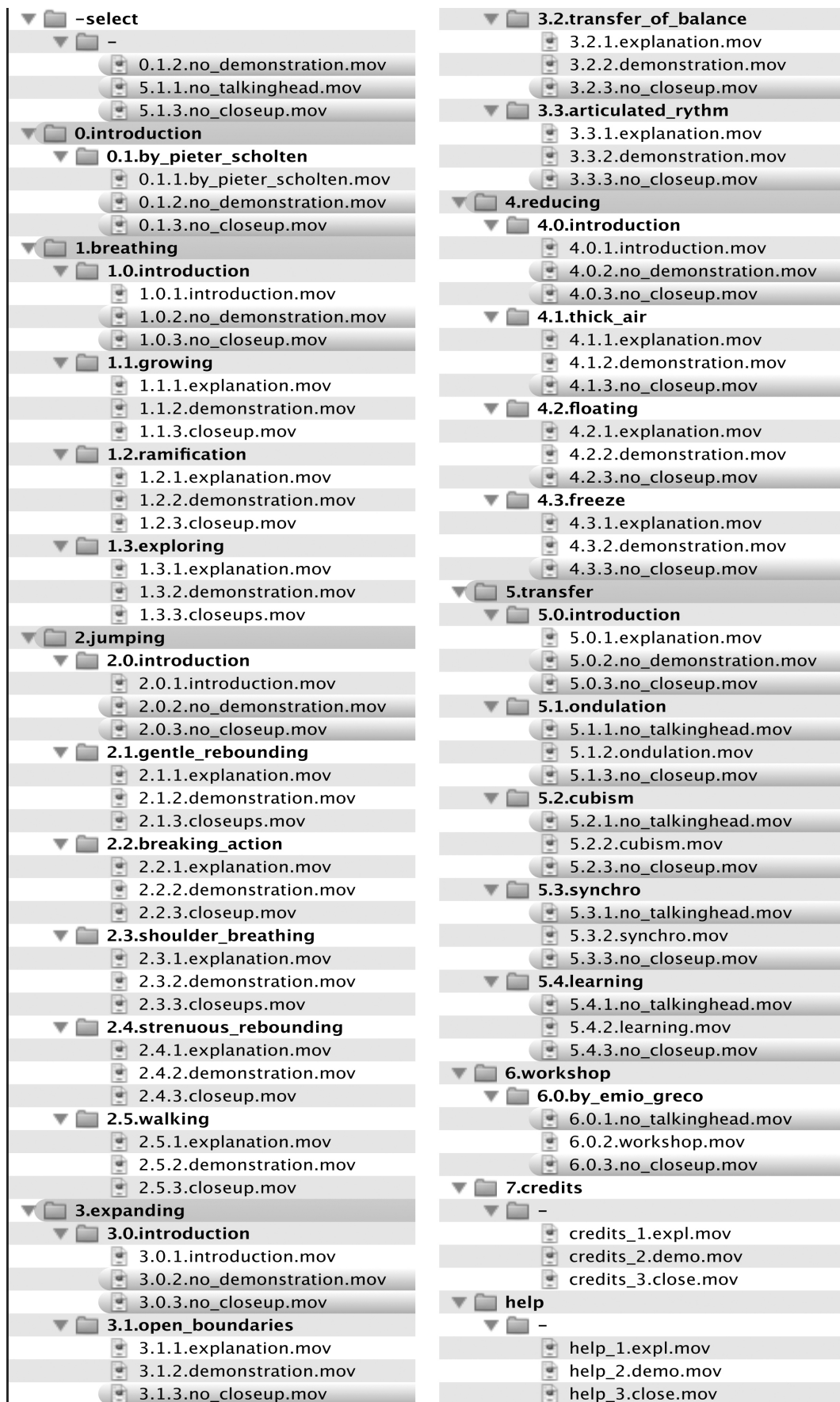


Illustration 2: "Double Skin / Double Mind" DVD-ROM's conceptual structure. Sections and subsections as seen from the perspective of the videos' folder and as named after the glossary.

only the workshop's structure but also the diagram of its potentials. Precisely because of this, says Bermúdez, “[t]he structure that is used in the Installation and the DVD contains the core of what *DS/DM* [i.e. *NRP* and *IMK*] has achieved in ten years” (Delahunta, 2007b, p. 21).

Each of the *DS/DM* workshop's sections and subsections is expressed in the DVD and in the Interactive Installation with a variety of contents. For example, the section “*Breathing*” is expressed in the DVD (see Illustration 3, below) with: 1) a written explanation; 2) an oral explanation, i.e. the video recording of a “talking head”; 3) the dancing body's video recording; 4) a close up of the previous; 5) a Labanotation score; 6) a Benesh notation score; and 7) and the “*Gesture Follower*” software. All these contents express the *DS/DM*'s choreographic nexus and define it further by being in relation with one another. This is what the interface designs of the DVD and Interactive Installation allow for: to relate in continuity, i.e. the continuity of the user's experience, the differences between the expressive series.⁹⁸ As with the previously

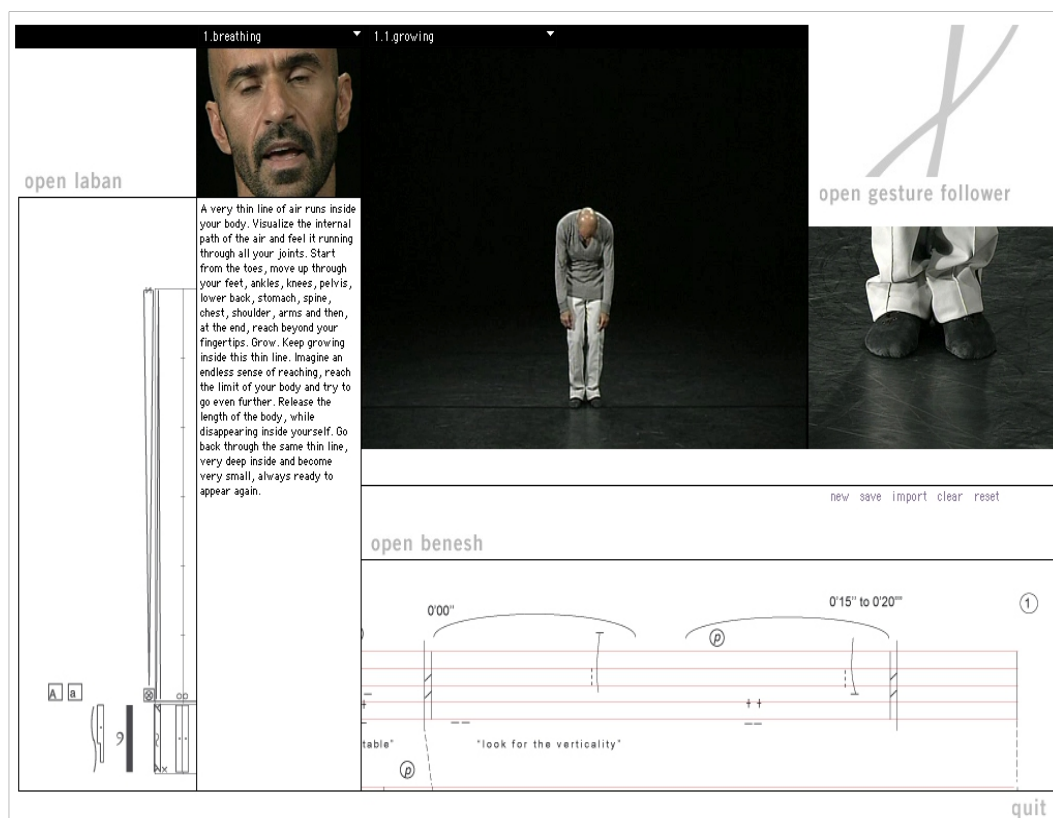


Illustration 3: Interface of the “*Double Skin / Double Mind*” DVD-ROM, showing one of the workshop's sections (with the dancing body's full figure, oral and written explanations, close ups, notational scores and the “*Gesture Follower*” software).

98 The designer of these interfaces is the same who designed William Forsythe's “*Improvisation Technologies*” DVD-ROM, namely, Chris Ziegler.

discussed “*Improvisation Technologies*”,⁹⁹ the expressive multimodality of these graphic interfaces not only explicates the contents' similarity but also the ways in which they differ. In fact, it is precisely this contrast between the same and the different that offers an insight into the *DS/DM*'s invariant functions, that is, into the principles of individuation of the choreographic ideas that these objects simultaneously express and hold in potential.

Importantly, the glossary's structure is the formal condition of the different contents' relation. Both in the DVD and in the Interactive Installation the matters of content are differentiated from and related to one another by means of indexation. For example, all the contents indexed with “*Breathing*” are enclosed within one same set, which is determined not only by the index itself but also by the nexus resulting from the contents' relation. This function of indexation is therefore a function of expression. It constrains the many possible relations between matters of content with determinate ideas. In a sense, such function is the same required for a body to dance in accordance with the *DS/DM*'s movement qualities. Only by having in mind the concepts according to which to move, can the dancing body move accordingly. From which it follows that this capacity of the *DS/DM* to structure different domains is a force that, when encountering contents with a variable degree of indetermination, overpowers any incompatible tendency. This is the force of the *DS/DM*'s choreographic ideas. Their determination holds in potential the capacity to constrain matters of content, regardless of the domain of individuation. It should nonetheless be noticed that one does not go without the other. If the *DS/DM*'s choreographic nexus is to be expressed, the structure of its abstractions needs to be related with actual matters of content. Only by means of their encounter, which is the concretization of cases of solution concomitant with the determination of choreographic ideas, can the latter be expressed and constituted as the actual ground of potential transductions.

4.3 - Between Abstraction and Expression

These terms, matters of content and functions of expression, have been used by Gilles Deleuze and Felix Guattari to depict the workings of what they call the “abstract machine” (1987, pp. 510–514). This concept is intrinsically related to their conception of the notion of “diagram” (Ibid. pp. 141–143), which they borrowed from American

⁹⁹ See pages 106-106.

philosopher Charles S. Peirce. For the latter, the diagram is a tool for knowledge-making. To be more correct, Peirce considered diagrams to be a special case of “icons”, which he defined as signs with the capacity to generate kinds of knowledge different from the ones implicated in their use. “For a great distinguishing property of the icon is that by the direct observation of it other truths concerning its objects can be discovered than those which suffice to determine its constructions.” (1895, p. 2.279). In Peirce’s 1903 “*Syllabus*”, the diagram is said to be a “hypoicon”, a subspecies of the icon. Hypoicons are defined by the fact that they cannot stand out in purely formal terms. As such, all the three species of hypoicons identified by Peirce—“images, diagrams and metaphors”—are operational, rather than formal. They can only be considered with regard to the processes that they comprehend. In this sense, an image is not a pictorial form, but rather a qualitative becoming; a diagram is not a visual scheme, but rather the processes by it depicted; and a metaphor is not the linguistic expression of one thing in terms of another, but rather the abstract projection of determinate structures across domains. Furthermore, the three species of hypoicons are distinguished from one another in the following way: an image is defined in terms of an object’s qualities; a diagram is defined in terms of the knowledge that it provides of the object in representation; and a metaphor is defined in terms of the relation that it establishes between objects. (Ibid., p. 2.277).

Peirce also distinguishes icons from “indexes” and “symbols” (1998, pp. 258–299), a distinction that Deleuze and Guattari commented upon, in their famous book “*A Thousand Plateaus*” (1987), in the following way: “The distinction between indexes, icons, and symbols [...] are based on signifier-signified relations (contiguity for the index, similitude for the icon, conventional rule for the symbol); this leads [Peirce] to make the ‘diagram’ a special case of the icon (the icon of relation). Peirce is the true inventor of semiotics. That is why we can borrow his terms, even while changing their connotations. First, indexes, icons, and symbols seem to us to be distinguished by territoriality-deterritorialization relations, not signifier-signified relations. Second, the diagram as a result seems to have a distinct role, irreducible to either the icon or the symbol.” (Ibid., p. 531). To say that the diagram is irreducible both to the symbol and to the icon is thus to say that it does not operate by means of similarity or convention. Conversely, it is to say that it rather operates on the basis of a constitutive difference. For Deleuze, the diagram “is the map of relations between forces, a map of destiny, or intensity, which proceeds by primarily non-localizable relations and at every moment passes through every point, or ‘rather in every relation from one point to another’”

(1988b, p. 36). The diagram is preindividual and, as such, pre-subjective and pre-objective. To say that it maps relations between forces is to say that it distributes affects throughout the intensive field of relatedness where potentials differ from one another. Rather than depicting tendencies of individuation, the diagram is the very plane where they take place. It is the plane where the differentiation of potentials is engendered with the highest intensities. The diagram is a cause, not an effect. It is “a cause which is realized, integrated and distinguished in its effect. Or rather the immanent cause is realized, integrated and distinguished by its effect. In this way there is a correlation or a mutual presupposition between cause and effect, between abstract machine and concrete assemblages” (Ibid.). From which it follows that, not only is the diagram distinct from indexes, icons and symbols, but also from Peirce's remaining hypoicons, that is, from images and metaphors. In this sense, the diagram is the very plane where both the qualitative becoming of images and the structures of metaphorical projection are engendered. The diagram underpins both imaged and metaphorical thinking. After all, inasmuch as both images and metaphors rely on the problematic reality of ideas, they rely as well on the diagrammatic structuration of potentials. Hence, movements of thought are diagrammatically structured.

In regard to the notion of diagram, Deleuze's philosophy owes more to the political philosophy of Michel Foucault than to Peirce's formulations. Whereas Peirce conceives the diagram as an abstract operation related with linguistic expressions, both Foucault and Deleuze acknowledge as well its social and material dimensions. For Foucault (2012a, p. 9), the diagram regards the interplay of social forces of power and resistance, where power is defined in terms of relations between forces. The diagram diagrams these relations. It diagrams relations of power and resistance between forces. It composes a topology of affects where singularities mark the disparition and resolution of dynamic relations between forces. Here too, force is understood as a difference of potentials belonging to different orders of magnitude. Across undetermined potentials and determinate solutions, the diagram engenders the singularities in the vicinity of which the social field tends to change. As such, says Deleuze, “[t]his is a different kind of diagram, a different machine, closer to theatre than to the factory; it involves a different relation between forces. [...] This is because the diagram is highly unstable or liquid, continually churning up matter and functions in a way likely to create change. Lastly, every diagram is intersocial and constantly evolving. It never functions in order to represent a persisting world but produces a new kind of reality, a new model of truth. It is neither the subject of history, nor does it survey history. It makes history by

unmaking preceding realities and significations, constituting hundreds of points of emergence or creativity, unexpected conjunctions or improbable continuums. It doubles history with a sense of continual evolution.” (1988, p. 35). The diagram recomposes metastabilities for the becoming of others. In Foucault's writings (2012a), the most famous example of a social diagram is the panopticon, a “dispositif” where determinate matters of content, i.e. prisoners, encounter determinate functions of expression, i.e. laws. The social expression of the panopticon, its life, results from the encounter between the prisoners' bodies and the abstract laws to which they must comply. The panopticon is an idea with a difference. Diagrammatically, it is the plane where the difference between functions of expression and matters of content is intensified, only to bring into expression a disciplined life. From this standpoint, it is possible to better understand why for Foucault, as for Deleuze and Guattari, the diagram is an abstract machine. The diagram corresponds to the differential distribution of potentials underlying any individuation whatsoever. As such, it is virtual. It runs throughout the plane of immanence where the dynamisms of affect between the virtual and the actual occur with the highest intensities. In fact, it is the very topology according to which these dynamisms occur. It is the territory of singularities and bifurcations, intensifications and disparitions, where problems are drawn. In Deleuze's words, “[t]he diagram is no longer an auditory or visual archive, but a map, a cartography that is coextensive with the whole social field. [...] If there are many diagrammatic functions and even matters, it is because every diagram is a spatio-temporal multiplicity” (1988b, p. 34). The diagram is as much a preindividual absolute as the expressive varieties that from it might emerge. Qualities, images, objects and metaphors can all result from it, but not the other way around. Notwithstanding, as it is the case with any affective dynamism between the emergent and the emerged, all these results can condition the diagram's activity.

To understand the diagram as abstract machine is to assume a creative principle of immanence existing at the heart of individuation. In this guise, and in order to do away with hylomorphic logics of creation and conceding matter with creative capacities of its own, Deleuze and Guattari devised a theoretical framework that they designated as “abstract materialism” (1987, pp. 39 – 74). As the name indicates, this is a mode of thought following from the premise that the virtual and the actual cannot be considered independently from one another. It is a theory regarding principles of individuation and their conditions. A theory of the virtual-actual immanence and of these dimensions' dynamic and affective co-implication. Instead of conceiving matter as a reality that can

only partake individuation if informed from the outside, i.e. by an external factor of determination, a theory of abstract materialism affirms matter's immanent morphogenetic capacities and its undetermined potentiality. Only under these conditions can novelty emerge. In contrast, this is also to say that transcendent determinations preclude the emergence of novelty by giving in advance what is possible to occur. Contrary to hylomorphic determinations, matter's diagrammaticality implies autonomous potentials of creativity. It implies its own potentials of abstraction and possibilities of expression. A good example of matter's diagrammaticality is given by philosopher of science and known commentator of Deleuze's philosophy, Manuel DeLanda, when arguing that embryogenetic processes are not fully determined by genetic information. In his words, "the DNA that governs the process does not contain, as it was once believed, a blueprint for the generation of the final form of the organism, an idea that implies an inert matter to which genes give form from the outside. The modern understanding of the processes, on the other hand, pictures genes as teasing out a form out of an active matter, that is, the function of genes and their products is now seen as merely constraining and channeling a variety of material processes, occurring in that far-from-equilibrium, diagrammatic zone, in which form emerges spontaneously." (2000, p. 37). The diagram must be considered from the perspective of this encounter between formal constraints and spontaneous processes of emergence. Like with the panopticon, there is here a function of expression—the genes—and a matter of content—matter's forces. Matter's intensive multiplicities are in this way focused towards the resolution of what, out of this encounter, is given a predominant probability of occurrence. In a sense, the function of expression is responsible for the asymmetric distribution of probabilities, favouring some possibilities in detriment of others. Yet, this does not occur without matter's latent potentials, i.e. without the fact that, for an individuation to occur, a plane of indetermination, differentiation and disparition must be constitutive of matter itself. For "it is only in these far-from-equilibrium conditions that the full variety of immanent topological forms appears (steady state, cyclic or chaotic attractors). It is only in this zone of intensity that difference-driven morphogenesis comes into its own, and that matter becomes an active material agent, one which does not need form to come and impose itself from the outside." (Ibid., p. 37). Here, preindividual potentials diagrammatically verge towards a tendentious distribution of topological singularities. An activity prior to the conscious determination of ideas. Which is to say, with Deleuze and Guattari, that the diagram "has no way of making a distinction within itself between a plane of expression and a plane of content

because it draws a single plane of consistency, which in turn formalizes contents and expressions according to strata and reterritorializations. The abstract machine in itself is destratified, deterritorialized; it has no form of its own (much less substance) and makes no distinction within itself between content and expression, even though outside itself it presides over that distinction and distributes it in strata, domains, and territories. An abstract machine in itself is not physical or corporeal, any more than it is semiotic; it is diagrammatic (it knows nothing of the distinction between the artificial and the natural either)” (1987, p. 141). It is process in its most acute definition. And if the encounter between matters of content and functions of expression is a necessary condition for posing problems, then the abstract machine is a necessary condition for their resolution. In their encounter, matters of content and functions of expression mutually presuppose one another. They are defined by the individuation that they give rise to.

From this standpoint, it can be posited that the choreographic object can only be said to be a model of potential transition inasmuch as it is capable of acting as a function of expression over matters of content belonging to different domains (i.e. any space imaginable). Not only does this capacity grant choreography with the necessary autonomy for it to be expressed in domains other than the dancing body, but also with the abstract character of formal constraints, i.e. with ideas that, because they have acquired a certain degree of determination, remain unchanged regardless of the domain into which they are transduced. According to this, choreography is primarily defined by the formal abstraction of each of its objects. It is a function of expression disjunct from the means by which it might be expressed. A fact that does not prevent its expressions from depending on specific matters of content. A law of discipline, for example, generates different results depending if it is applied on humans or animals. Likewise, if the *DS/DM* workshop is considered, its conceptual structure constrains the emergence of different expressions depending if the domain is the dancing body or digital media. But insofar as these expressions follow from one same function of expression, a structural similitude can nonetheless be depicted from them. This, of course, depends as well on the degree of indetermination of the matters of content in case: different recurrences of one same idea will be expressed with a variability higher in the case of the dancing body than in the case of digital media. Whereas in the former case such variability derives from the body's constitutive indetermination (of potentials), in the latter case it derives from digital media's constitutive determination (of possibilities). The choreographic diagram is therefore not the choreographic model, but rather what results from the latter's encounter with specific matters of content. It is the abstract machine of

differentiation and disparition activated when determinate functions of expression constrain matters of content charged with potentials. Nonetheless, it can be said that the choreographic model is diagrammatic, for it is the structure which modulates matter's potentials towards resolutions that, rather than being contingent, are constrained by an asymmetric distribution of probabilities.

Technical individuation necessarily results from the encounter between matters of content and functions of expression. The abstract machine is its condition. But its expressions are not diagrammatic as the abstract machine is. Rather, from them, diagrams can be drawn. As philosopher Brian Massumi writes, “[a]ny sign, quality, or statement, as the trace of a process of becoming, can be considered a de facto diagram from which a formal diagram of the operative abstract machine could be developed” (1992, p. 17). Which is to say that, from the analogical individuation of knowledge, determinate icons can be used to represent individuation itself. In contrast to Foucault, Deleuze and Guattari's notion of diagram, the iconic representation of processes can in fact be better understood with Peirce's taxonomy. Since all species of icons are intimately related to one another, such representation is simultaneously diagrammatic, imagetic and metaphorical. As architect Kenneth Knoespel notes, the “diagram should not be separated from metaphor. Similar to metaphor, the diagram never exists by itself but always works by establishing linkages. Since both diagram and metaphor become situated within narrative and may at times even embody or represent such narrative, they are both cognitive vehicles for modeling and exploration.” (2002, p. 22).¹⁰⁰ The *DS/DM's* glossary is one example of this kind of representation, since it expresses with icons the diagrammatic form of the workshop's movement qualities. For these reasons, in spite of being diagrammatic, the abstract machine should be distinguished from the iconic diagrams representing its processes.

The glossary is just one example of the *DS/DM's* diagrammatic representations. In fact, all objects of the DVD and Interactive Installation represent operations implicit in the content-expression encounter of the workshop's movement qualities. And this is so because each object's expression confuses in its own way different signifying functions. The glossary provides terms with the purpose of indexing contents, but not

¹⁰⁰ Knoespel acknowledges having discussed with George Lakoff the functions of metaphorical thinking in cognitive processes. A discussion “particularly directed by his work with Mark Johnson, *Metaphors We Live By* (1980) and by his recent book with Rafael E. Nunez, *Where Mathematics Comes From: How the Embodied Mind Brings Mathematics into Being* (2000).” (2002, p. 35). More specifically, he notes that “[t]he cognitive setting provided by Lakoff provides a means not only for linking diagram to metaphor but for seeing both diagram and metaphor as vehicles of bodily extension.” (Ibid., p. 26).

without implicating as well iconic potentials. The symbols of choreographic notation articulate discontinuities, implicating simultaneously imagetic and metaphorical potentials. The “movement-images”¹⁰¹ of the dancing body presented with each video also implicate the workshop's conceptual structure. Finally, the written explanations make an explicit use of images and metaphors. This confusion of indexes, symbols and figures (of the dancing body) with icons shouldn't come as a surprise. Insofar as icons correspond to movements of thought, they are implicated in indexical, symbolic and figurative expressions. As such, not only are these expressions cases of solution with regard to the workshop's problems, as they also implicate the diagrammatic potentials of the abstract machine from which they derive. For these reasons, it should be acknowledged that the actual representation of the *DS/DM*'s diagrammatic structure necessarily depends on non-iconic signs.

In relation to the abstract machine, each type of sign works differently. To each sign its function. Insofar as indexes function by contiguity, they can be used to indicate a whole field of relations. Each of the terms of the *DS/DM*'s glossary not only indexes a movement principle, but also its subsequent expressions. Indexation works here as a function of remembrance, which can be used both by humans and machines. Once a series of past events has been registered, it can be recalled by means of an index. In this way, remembrance and recollection make of the index the very medium through which what was once given to experience can once again be brought into it. Once a word such as “*Breathing*” is given an indexical function, it can be used both by a team of researchers and by computers to recall what is contiguous to the index. On their turn, symbols work by convention. To know that, in Labanotation, horizontality stands for simultaneity and verticality for succession, is a requirement without which the diagrammatic implications of these symbols cannot be comprehended. Additionally, in the *DS/DM*'s choreographic objects, metaphors and images can be found in each of the written explanations. For example, in the DVD the movement quality “*Breathing*” is described as follows: “A very thin line of air runs inside your body. Visualize the

101 This term has been poignantly reintroduced by Gilles Deleuze when discussing cinema through the lens of Henri Bergson's philosophy. Simply put, the movement-image regards the fact that, in cinema, it is not a series of figures that describes movement (which would be the case of the infinitesimally divisible space of Zeno's paradoxes), but rather the continuity of movement that describes figures. In Deleuze's words: “Cinema proceeds with photogrammes—that is, with immobile sections—twenty-four images per second (or eighteen at the outset). But it has often been noted that what it gives us is not the photogramme: it is an intermediate image, to which movement is not appended or added; the movement on the contrary belongs to the intermediate image as immediate given. [...] In short, cinema does not give us an image to which movement is added, it immediately gives us a movement-image. It does give us a section, but a section which is mobile, not an immobile section + abstract movement.” (1986, p. 3).

internal path of the air and feel it running through all your joints. Start from the toes, move up through your feet, ankles, knees, pelvis, lower back, stomach, spine, chest, shoulder, arms and then, at the end, reach beyond your fingertips. Grow, keep growing inside this thin line. Imagine an endless sense of reaching, reach the limit of your body and try to go even further. Release the length of the body, while disappearing inside yourself. Go back through the same thin line, very deep inside and become very small, always ready to appear again". The imperative tone of this proposition marks the intention for it to act as a transducer of the movement principles from which itself stems. The images and metaphors that it proposes are in this way to be incarnated by the dancing body of the learning subject. They are to be experimented with, a model with which to focus potentials towards resolute expressions. The *DS/DM's* transduction by means of all these expressions—metaphorical descriptions, choreographic notations, videographic registers and indexical organizations—attests their common potential. They are diagrammatically consistent with one another. Which doesn't mean that they express the same knowledge as the dancing body. The differences between the instances of the ones and the instances of the other remarks the abstract machine's meaningful capacity. Insofar as a content-expression encounter is capable of individuating knowledge, it is a meaningful process.

When commenting upon Deleuze and Guattari's joint project "Capitalism and Schizophrenia", Massumi relates the emergence of meaning with the workings of the abstract machine in the following way: "Meaning is not in the genesis of the thing, nor in the thought of that genesis, nor in the words written or spoken of it. It is in the process leading from one to the other. [...] If meaning is a process of translation from one substance to another of a different order and back again, what it moves across is an unbridgeable abyss of fracturing. If meaning is the in-between of content and expression, it is nothing more (nor less) than the being of their "nonrelation." (1992, pp. 15-16). Paradoxically, meaning is in this way related with the indetermination of an individuating system. Rather than being associated with the resolution of problems in potential, it is associated with their very disparition. It is the process of resolution, rather than the resolution itself. Which is also why Simondon postulates that the knowledge of individuation can provide insights with regard to the resulting individuals but not the other way around. Meaning necessarily regards the topological depth of translation's continuity. It regards the continuity of potentials underlying transduction. From which it follows that meaning can be understood as the continuity of relatedness between that which emerges as knowledge and the abstract machine's unconscious reality. The non-

relation of content and expression is precisely this topological depth of the abstract machine. A depth that, because it is preindividual, cannot be known as such. In Deleuze and Guattari's words, it is the very plane of consistency where the highest intensities are engendered. For "the plane of consistency is the abolition of all metaphor; all that consists is Real. These are electrons in person, veritable black holes, actual organites, authentic sign sequences. It's just that they have been uprooted from their strata, destratified, decoded, deterritorialized, and that is what makes their proximity and interpenetration in the plane of consistency possible. A silent dance. The plane of consistency knows nothing of differences in level, orders of magnitude, or distances. It knows nothing of the difference between the artificial and the natural. It knows nothing of the distinction between contents and expressions, or that between forms and formed substances; these things exist only by means of and in relation to the strata." (1987, pp. 69–70). The plane of consistency is the plane of immanence is the abstract machine. It is where all consists and from which all forms derive. It is a preindividual disparity resulting from the communication between matters of content and functions of expression. Such communication can create problems and solutions, but never the knowledge of what, virtually, underpins their determination. One cannot know what is outside of thought.

Equating the abstract machine with the being of the nonrelation between matters of content and functions of expression can be better understood with the following passage from Massumi's own take on the notion of diagram, where he uses the example of carpentry to argue about its duplication in time and space: "What the diagram diagrams is a dynamic interrelation of relations. The dynamism occurs twice: once as genesis in a state of things (tool to wood), and again in ideality (concept to concept). The diagram combines a past (the working of the wood) and the future of that past (the thought of the woodworking), but it skips over its own genesis – the present of the content-expression encounter constitutive of thought (the unthought of thought). Actually, the dynamism occurs twice twice: after being translated into ideality (concept to concept) it is reexternalized in words (phoneme to phoneme; letter to letter) to resume its life among things in a new capacity. The diagram again combines a past (the thought of the woodworking) and the future of that past (pronunciation, publication), skipping over its own genesis, in this case the present of the content-expression encounter constitutive of speaking or writing (the unsaid of communication: afterthought). In each instance, the elided present, like the in-between of tool and wood, is at any rate a

void.¹⁰² In skipping it, the diagram reduplicates the process it diagrams. The diagram is false, in that it contracts a multiplicity of levels and matters into its own homogeneous substance. But it is true, in that it envelops in that substance the same affect, and because it reproduces the in-betweenness of the affect in the fracturing of its own genesis. The expression of meaning is true in its falseness to itself, and false in its trueness to its content. Translation is repetition with a difference. If meaning is becoming, it is a becoming-other. It is the alienation of the same in the different, and the sameness of the different in its alienation from itself. The (non)relation is a separation-connection.” (1992, p. 16).

Deleuze and Guattari had another designation for this separation-connection of the content-expression encounter. They called it a “double articulation” (1987, pp. 40–41, 54–59), a term borrowed from the work of French linguist André Martinet (1984), who formulated this concept to account for the linguistic relation between a first articulation—the articulation between meaningful units (i.e. monemes)—and a second articulation—the articulation between meaningless units (i.e. phonemes and graphemes).¹⁰³ This articulatory regime of correspondences served the consolidation of a structural linguistics and allowed for semiology to assert the inexhaustibility of languages as systems that can combine phonemes and graphemes with monemes in multiple ways. This multiplicity of structural languages' double articulation is none other than the one of the diagram. It separates and articulates monemes from and with one another, as it does with the relationship between phonemes and graphemes. Further, it connects monemes with phonemes and graphemes for the very expression of content. This connection is not without randomness. It brings the two orders of language to a point of affectivity that, in itself, cannot be expressed. It is the unspeakable core of meaning, at the heart of its generative process. With this double dynamism of meaning—from event to concept and from concept to language—it becomes clear how, in the *DS/DM*, the same diagram generates movement qualities, their knowledge and corresponding linguistic expressions. In this regard, what Massumi's assertion perhaps clarifies the most is the diagram's dynamism of self-elusion amidst the processes that it

102 This conforms with what Thomas Lamarre identifies as being “the neutral point of the event (absolute origin) of individuation that simultaneously sets off individuation and arises in it” (2012, p. 40). See page 59.

103 Jacques Derrida famously made the case that it is not articulation that results out of language, but precisely the other way around. “It is once again the power of substituting one organ for another” he writes, “of articulating space and time, sight and voice, hand and spirit, it is this faculty of supplementarity which is the true 'origin'—or nonorigin—of languages: articulation in general as articulation of nature and convention, of nature and all its others.” (1976, p. 241). For Derrida's own reading of Martinet's concept of double articulation, see Derrida, 1976, p. 228.

generates. The diagram diagrams the interrelation of relations, but on the condition that it remains inaccessible. Conversely, any diagrammatic expression can be considered a map of what the diagram diagrams. In fact, to say that the diagram diagrams is to say that, rather than corresponding to expressive mappings, it corresponds to the content-expression encounters of thought and language. The constitution of thought by the diagrammatic encounter of content and expression conforms with Simondon's theory of psychic individuation. It corresponds to the resolution of problematic states in the affective reality of a self-reflecting organism. As such, it corresponds to the movements of thought by means of which knowledge is determined. On its turn, the content-expression encounter constitutive of linguistic expression corresponds to language's double articulation, as just presented. The diagram's topological continuity assures the different encounters' relation. It assures the implication of diagrammatic potentials across movements of thought and linguistic expressions. Nevertheless, to say that in this process the diagramming occurs twice is the same as saying that in each encounter the diagram's problematic potentials are resolved differently. When transferring the *DS/DM*'s conceptual structure into the digital domain, there necessarily occur resolutions with regard to the content-expression encounter of thought and resolutions with regard to the content-expression encounter of language. To say that knowledge can derive from the formation of novel instances of language is to say that this does not occur without a parallel individuation of thought. Only in this way is it possible to learn with technical individuation, that is, to learn not only about what is expressed but also about how it is expressed. Only in this way is it possible to experiment and learn how to faithfully express a determinate idea, regarding the many potentials of its diagrammatic structure. One cannot learn how to speak or write if not through actual experimentation. A process the potentials of which are also of error. When expressions do not conform to the intended idea, there also individuates the knowledge of how to not do it. Experimentation and learning: two poles of technical individuation that necessarily resonate with one another.

From this standpoint, the diagram can be related with Deleuze's three moments of the idea. It can be said to be unconscious, i.e. undetermined with regard to its problems; it can be said to be sensible, i.e. determinable with regards to the objects of experience; and it can be said to be intelligible, i.e. determinate with regard to the concepts of the understanding. The first diagrammatic moment corresponds to the fracture of the content-expression encounter. It is the abstract machine's very plane of composition. The second diagrammatic moment corresponds to the association between

problems in potential and the possibilities of representation. It is the mapping of contrasts between the unknown and what has already come to knowledge. The third diagrammatic moment corresponds to the objective determination of cases of solution, which can be both immaterial and material. In either case, it is always a conceptual structure, either a diagram of speculation or a diagram of confirmation. All these moments are diagrammatic not only because they are related to one another by means of the abstract machine's topological continuity, but also because they are structured in relation to this same topology's singular problems.

Here implied is the assumption that objects can have no correlate expression. Structures can be thought without being expressed, and still be objective. Mermaids, unicorns and pure mathematical objects are abstract objects. But by a principle of immanence between abstractions and expressions, such objects are necessarily related with materials grounds. They are the partial effect of metaphorical projections. Unicorns are imagined to stand upright and mermaids to swim horizontally. Imagination proceeds on the basis of material experiences: the concrete body of an imagining mind. Image schemata and bodily tropisms, co-individuating together from the plane of composition where no distinction can be made between content and expression. From this, much can be imagined, even if with no concrete correlation. Such abstractions are, notwithstanding, potentially expressible. Unicorns and mermaids can be drawn and spoken, a process which necessarily requires learning and experimentation. Such requirement follows not only from the idea's potentials of infinite determination with regard to the concepts of the understanding, but also from the multiplicity of expressive possibilities. The idea of a unicorn can be expressed with water-colours on paper, with sand at the beach, or with computer graphics, all being different cases of solution for one same problem of expression. Even the impossibility of expressing the same idea in the same way twice entails the necessity of technical experimentation. If one experiments drawing a unicorn but instead gets a horse, other experiments need to follow until what is expressed conforms to what is imagined. Infinite cases of solution can be drawn, but also infinite expressions can disconfirm to determinate ideas. Many are the possibilities and the potentials of individuation.

The expressive variability of diagrammatic objects has been pertinently argued by Knoespel when addressing the diagram's creative potentials. For him, “*diagramma*¹⁰⁴

¹⁰⁴ *Diagramma* is the Greek word for diagram. Knoespel explains that “[t]he root verb of *diagramma* means not simply something which is marked out by lines, a figure, form, or plan, but also carries a secondary connotation of marking or crossing out. In contemporary Greek the verb *diagraphe*, noun *diagraphē*, means to write someone off.” (2002, pp. 20–21).

embodies a practice of figuring, defiguring, refiguring, and prefiguring. What is interesting is that the diagram participates in a genealogy of figures that moves from the wax tablet to the computer screen. From a phenomenological vantage point, the Greek setting of diagram suggests that any figure that is drawn is accompanied by an expectancy that it will be redrawn. Within such a dynamic framework, such expectancy must also be accompanied by an understanding of the ways in which diagram can shift in status. Here diagram may be thought of as a relay. While a diagram may have been used visually to reinforce an idea one moment, the next it may provide a means for seeing something never seen before. Because diagrams mark a gesture or momentum toward definition, they function as vehicles that employ and invite elaboration through narrative.” (2002, p. 21). Diagrammatic relaying regards not only a capacity of such objects to foster the individuation of cases of solution but also a capacity to repeat with a difference their own constitutive topology, in continuity. Diagrams are therefore capable of creating expressive nexuses across different cases of solution. Their expressions are iterations of their potential structure. In its most basic expression, diagrammatic iterability corresponds to language's expressive variability. Singular expressions for singular encounters. To say that the relaying of an object's diagram can “shift its status” (Ibid.) means that the knowledge by it provided can be constituted anew. The individuation of knowledge that comes with a diagram's objective expression attests its participation in transducing what it represents. Which is not to say that such expressions are by themselves capable of informational exchange. It is rather to say that, insofar as they partake of technical individuation, they are correlated with the conceptual structures that they represent. After all, an objective diagram is but one possible case of solution for an idea's problems. It emerges with knowledge as much as knowledge can also emerge from it. It is a vehicle of technical transduction because it can condition learning. As media theorist and artist Sher Doruff notices, “one of many ways that transduction is actualized is through the diagrammatic contours of conceptual space in which diverse realities are connected, coupled and erased” (2006, p. 92). From this perspective, even the most simple representation of an abstract schema conserves with itself the necessary potentials to become different from itself and, with this movement, individuate novel instants of knowledge. This, of course, is an operation based on the condition of an intrinsic difference. And what is perhaps most evident in regard to this difference is the fact that, as much as individuation comprises a preindividual share, there is always more to it than what can be known. The concepts of the understanding can only regard what is somewhat determinate in individuation. Not

only has this to do with the limits of experience, i.e. with what a body can in fact access, but also with the fact that, because of being by definition undetermined, potentials cannot be known as such.

If there is the case of what cannot be empirically known, there is also the case of what can come to be known only by means of abstraction. In this latter case, metaphorical projections are used to abstract knowledge from the body's concrete experiences. Even what cannot be directly experienced can come to be known, indirectly. This is, for example, the case with mathematical reductions of matter and energy, which allow for non-empirical instances of knowledge to be attained. But insofar as mathematical abstractionism proceeds by a speculative type of reasoning, it can only be said to constitute knowledge that is proper to technical invention, if this is to some degree consistent with what can be empirically experienced. The limits of technics are therefore coincident with the limits of the body, be these concrete or abstract. This does not mean however that the body's limits are the limits of technics. Mathematical abstractions can generate knowledge that goes beyond the possibilities of technical experience. And the former can only condition the latter if correlated in any way to what can be actually experienced by the technical subject.

The limits of technical invention are tantamount to the limits of the phenomenological and eidetic reductions of phenomenology, as first proposed by German philosopher Edmund Husserl (1960, 2013). Whereas, here, *eidōs* refers to what cannot be removed from a thing or, in other words, to the thing's fundamental capacity to endure self-coincidently, the phenomenological refers to the coincidence between the thing's objectivity and its subjective presence. Which is to say that eidetic reductions constitute a knowledge independent from subjective experiences and that phenomenological reductions imply the constitution of what Husserl calls “objects of intentionality”, i.e. objects that depend upon subjective experience. This, of course, is somewhat opposed to Simondon's theory of analogical knowledge, not only because of all the most evident reasons, but first and foremost because of the fundamental fact that, whereas Simondon grounds his theories in a critique of essentialism, Husserl seems to not do away with the notion of essence (which is the only legitimate reason for the pursue of eidetic reductions). Notwithstanding this brief note of comparison, it is not the intent here to discuss Husserl's reductions at length.¹⁰⁵ It is enough to note that the limits of knowledge are given both by what is possible in intentionality and by what can be

¹⁰⁵ Further considerations on Husserl's reductions can be found in Section 6.3.

abstracted from intentionality itself. Either knowledge is taken to be experiential and thus dependent on its conditions of possibility, or it is taken to be mathematical and thus abstractable from concrete experience. With this, and in what regards the pursue of eidetic knowledge, it is easy to understand why mathematics have become so pervasive in modern science. The sole fact that mathematics are designated as fundamental sciences points towards the very assumption of a fundament of things, i.e. of an essential kernel constituting the invariable and self-coincident identity of things. And despite possible criticisms upon the conceptual fundaments of eidetic reductionism, what is perhaps most striking and informing in regard to the relation between abstract and concrete diagrams is the fact that it is both possible to know, through mathematical abstraction, objects that are beyond any possibility of concrete experience, and possible to experience things that cannot be known in abstraction. In contrast, it can also be said that there are many experiential events, i.e. objects of intentionality, that coincide with what is possible to be abstracted from experience. For example, computational models can simulate processes, yielding results similar to their referents. In order to do so, they must share the same possibility space (DeLanda, 2011, pp. 17–21).

A process's possibility space is its topology. It is the state space where the many potentials and possibilities of occurrence are distributed according to a function of probability. In any content-expression encounter there is a distribution of probabilities regarding the affective relation between matters and functions. The topological definition of each encounter is also singular because of this: to each encounter, its singular distribution of probabilities. The diagrammatic identity of the *DS/DM* is assured by the probability that it has of relating different contents to one another in specific ways. Its possibility space is determined by the way in which expressive functions constrain the contents of its expression. If other diagrams are considered, different problems will be posed to their expression. This, of course, regards the fact that each content-expression encounter not only unfolds in accordance with the topological distribution of its probabilities, but also in accordance with an individuation of thought that is necessarily determined by such structure. And if it can be argued that each topological structure is invariable in the way that it constrains its own choreographic expressions, it can also be argued that what comes to be known with each choreographic idea is necessarily singular. Since a problem's resolution cannot unfold but in accordance with the singularity of each encounter, any co-individuating thought will be equally singular.

From this standpoint, there are a couple of aspects that can be further

problematized. First, it seems necessary to look into the resolution of different problems in the expression of choreographic ideas by digital means. In this respect, the two case studies till now discussed have allowed for the understanding that choreographic objects are diagrammatic, but not for the understanding that they are algorithmic. Of course the resumption that these objects endured into the digital domain already attests such character. Nevertheless, the digital domain seems to be capable of confirming the algorithmic capacity of choreography by reason of its own workings. Since the digital domain functions on the basis of algorithmic programming, it can be that an object's possibility space, instead of being expressed just as one case of solution (as it is with the "*Improvisation Technologies*" and with the *DS/DM*, as till now discussed), can be expressed as a series of solutions, all related to one another by one same algorithmic function of expression. The difference between this and the previous examples regards the fact that, here, the matters of content are the same. As such, what digital programming offers as a possibility of expression is the very algorithmic computation of choreographic ideas. Between such possibility and the digital expression of the previous examples what differs is the automatic degree of computation. Choreographic ideas can in this way be programmed into the digital domain so that such algorithms compute a multiplicity of expressions. In order to pursue such confirmation, this study's next Chapter will look upon a series of digital choreographies, which have expressed determinate ideas by means of algorithmic computation. The parametric automation of choreographic ideas will make the case that its topological structure is not only diagrammatic, but also algorithmic. A case that shouldn't be understood in the sense that a choreographic idea is algorithmic because it is digitally programmable, but rather in the other way around: the choreographic idea is digitally programmable because it already is, in itself, algorithmic. After all, an algorithm is but a determinate structure of potentials. Second, it will be also necessary to tackle the question of novelty from the perspective of digital choreography. This regards not only the overarching problem (that this study has been dealing with from the beginning) of technogenesis in the encounter between dance and technology, but also the more specific problem of a digital sort of potentiality. In other words, in regard to the algorithmic computation of choreographic ideas, it matters to ask: are there, in the digital domain itself, the necessary potentials for novel instances of choreographic knowledge to be expressed? And, if so, how are these potentials to be thought if, in any case, it is arguable that the digital domain is based upon possibilities rather than potentials, i.e. on binary sets rather than continuous multiplicities? In regard to the encounter between dance and technology, such questions

are pertinent not only to pursue a better understanding of how this encounter is to individuate a technogenetic body, but also to broaden the scope of the creative modes that itself is capable of. This, of course, regards the understanding that thought individuates in ways that are as different as the modes of relation between the topology of ideas and the material constraints of each domain. Such variety of thoughts entails the hypothesis that the creative potentials of digital programs are as well thoughtful potentials. As such, it is also the hypothesis that, if this is to occur, computation must be open to what it cannot compute, in the same way that any movement of thought is open to what it cannot know—the unconscious. Such questions and hypotheses will be pursued throughout Chapter 6 and, hopefully, result in propositions for teasing creativity and individuating novel instances of choreographic knowledge.

Chapter 5 - ALGORITHMIC CHOREOGRAPHIES

This fifth Chapter will focus upon a series of examples that express choreographic knowledge by digital means. In contrast to the examples previously mentioned, these choreographic expressions result from algorithmic procedures that, as particular cases of solution to the problems of choreographic transduction, were automated digitally. The first case to be discussed (Section 5.1) is the “*Gesture Follower*”, a software built into the digital expressions of the “*Double Skin/Double Mind*”. As the name indicates, this is a software apt to recognize and follow the performance of gesture. This will allow for essaying a distinction between the dancing body and the gestural body and, from the perspective of digital algorithms, discuss once more the relationship between dancing and writing in the constitution of choreographic knowledge. The following Section will unfold by considering a series of choreographic algorithms retrieved from two distinct projects: the “*Motion Bank*” and the “*Reactor for Awareness in Motion*”. Different aspects of the so called online scores, created in the frame of the first project, will be discussed in order to assess how, from different bodies of artistic work, the problems of choreographic transduction have been resolved into the algorithmic generation of digital expressions. These are the online scores of William Forsythe's “*One Flat Thing, reproduced*” (called “*Synchronous Objects*”), Deborah Hay's “*No Time To Fly*” (with the same name), Jonathan Burrows and Matteo Fargion's series of duets (called “*Seven Duets*”), and Bebe Miller and Thomas Hauert's strategies of choreographic improvisation (called “*Two*”). Insofar as the digital algorithms used in these scores synthesize instances of choreographic knowledge, their transductive capacity will be looked upon by considering instead the “*Reactor for Awareness in Motion's*” software. Since this software's algorithms are meant to be “danced with”, in real-time by dancing bodies, they will facilitate a better understanding of how all these algorithms are capable of conveying choreographic knowledge.

5.1 - Diagramming Gesture

Regarding the encounter between dance and technology, Erin Manning notes that one recurrent problem has to do with the definition of gesture. In her words, “[e]xplorations of new technologies and dance, led by Mark Coniglio, Scott DeLahunta, Antonio Camurri, and others, have often focused on the difficulty of locating gesture-as-such” (2009, p. 61). Despite the fact that, here, the philosopher is specifically referring to the encounter between dancing bodies and digital computers and, precisely because of this, to the “embedding into the software program” (Ibid.) of gesture's definition, this difficulty is common to all practices of dance notation. In fact, in what regards the definition of gesture, between automated processes of gesture recognition and non-automated ones, the difference is hardly one of quality.¹⁰⁶ And this is not to say that the subjective experience of someone who translates dance into choreographic notation is not a qualitative one. Qualitative experience is necessarily implicated in the transductions of knowledge conveyed by subjects for whom indetermination (of the body) is a fundamental condition. It is rather to say that, insofar as in both cases the content-expression encounter of writing is conditioned by symbolic conventions, what can in fact come to be defined as gesture remains within the limits of what language can possibly express. This is a quantitative limit. Whereas in the case of computers these possibilities are necessarily located at the level of binary code, in the case of notational systems they are located at the level of the symbols used to express choreography. And of course that, if the former is used to express the latter what one necessarily gets is a possibility space resulting from the concurrent set of binary code and choreographic notations. In sum, besides being conceptually determined, gesture is here defined by what is possible to be written.

From this standpoint, the written expressions of gesture can be said to coincide with its conceptual structure. By limiting the possibilities of expression both with discrete signs and with the articulatory nexuses of its significations, writing discontinues the dancing body and, in this way, defines gesture as such. Conversely,

¹⁰⁶ To say that computers recognize and notate gesture automatically is just a matter of expression. For, as Simondon asserts, “there is no such thing as a robot” (1969 p.10). As such, computational machines must be considered from the perspective of the context from which they result and in which they evolve. In other words, as technical individuals, they must be considered together with the associated milieu of their technicity. After all, what a computer comes to recognize as gesture needs first to be defined by its inventors. Not only this, but the very definition of gesture embedded within a computer's software depends as well on what the computer can in fact recognize as gesture. In this sense, both computer and its definition of gesture individuate depending on one another.

such writing does not occur without the implicit determination of the concepts of the understanding. At once, the definition of gesture regards what gets to be determined when a body dances and the limits of writing itself. In regard to this relationship of the dancing body with writing, through the determination of concepts, Manning quotes dance and technology scholar Scott DeLahunta, for whom “the best way of coming to an understanding of gesturality is to work collaboratively with dancers such that ‘the choreographic and computational processes are both informed by having arrived at this shared understanding of the constitution of movement. This means descriptions (what we think of as co-descriptions) of movement that can exist in both its own terms (as in physical) as well as in the symbolic abstractions that are necessary in order to use these techniques of gesture modeling, simulating, learning, following etc. with the computer.” (Manning, 2009, p. 61; Delahunta, 2006). Though in the writing of gesture the determination of concepts does not go without expressive determinations, they differ and can therefore be distinguished from one another. First and foremost, this difference regards the fact that the dancing body moves on the basis of continuous and undetermined potentials. As mentioned before, the determination of concepts proceeds from this bodily excess and cannot be understood without it, at least from a processual perspective. Though writing occurs as well in relation to a degree of indetermination, which ultimately is of the body itself, its limits are different and depend on the domain of expression. Nonetheless, and regardless of this latter dependence, a written gesture can only come about with the discontinuous expression of determinate possibilities. If the dancing body is the plane where undetermined potentials and determinate concepts are related, the gestural body is the plane where the determination of concepts gets to be related with determinate expressions. The one is unbounded and the other limited, for example, by convention.

The *DS/DM*'s software of gesture recognition—*Gesture Follower (GF)*¹⁰⁷—is a good example of how conceptual conventions of gesture can be embedded into digital code. This software is used both in the DVD and Interactive Installation versions of the *DS/DM* to recognize certain movement patterns of the system's user. Such patterns correspond to the workshop's movement qualities. But here, instead of being known by

¹⁰⁷The *GF* started to be developed by Frédéric Bevilacqua, in the end of 2009, in the frame of his research in gesture analysis and interactive music systems, at the IRCAM (Institute for Music/Acoustic Research and Coordination in Paris), as included in the Real Time Musical Interactions team (Bevilacqua, 2007, p. 27). The *GF* “is implemented as a collection of modules in the Max environment [...], taking advantage of the data structures of the FTM library such as matrices and dictionaries. Recently, the core algorithm was developed as an independent C++ library and can therefore be implemented in other environments.” (Bevilacqua et al., 2010, p. 9).

the system's user, they are known by the computer itself. Specific definitions of gesture have been embedded into the software so that this can recognize which user's movements conform with them. As computer scientist Frédéric Bevilacqua writes, “[t]he general idea behind the *Gesture Follower* is to compare a performance with prerecorded ones. Basically, the first step corresponds to choosing one or several phrases that will be recorded and stored in the computer memory. The choice of these phrases is a crucial step; they should be representative of a gesture vocabulary or contain meaningful qualities for the artist. The second step occurs during the performance: the computer program assesses in real-time whether similar vocabulary/qualities are present. The results can be output as ‘likelihood scores’ expressing the similarities of a given performance to the stored ones in the database.” (2007, p. 28). As such, this software follows gestures on the basis of what it already knows. The definitions of gesture embedded into it are digital memories that can be recalled for the sake of recognition, memories that consist not only of registered events but also of their indexation. “Finding similarity between the performance and stored ones in a database can be one mechanism to characterize motion qualities, if each phrase of the database has been labeled.” (Ibid., p. 30). Moreover, what allows for the software to compare the two datasets is an algorithmic procedure of calculation that takes each definition of gesture to be quantitatively determined. The *GF* converts the *DS/DM*'s movement qualities into determinate quantities of binary code and defines each gesture as a digital patch against which to compare the real-time displacements of the user's body. Such comparison serves to inform the system's user if the movements performed conform or not with the given definitions and to instigate him or her to move accordingly.

There is, notwithstanding, a determinant difference between the DVD and the Interactive Installation versions of the *DS/DM*, which regards the sensors used by each system to create motion data from the user's activity. Whereas in the Interactive Installation the dancing body is captured with video cameras, in the DVD it is captured with the computer's mouse. Such difference necessarily results in different types of dataset, for their structure depends upon the input device. Whereas the computer mouse is capable of capturing motion with regard to one moving point, the motion capture made with video cameras can create arrays of data regarding the many moving points of one pixelated plane of expression. If infrared cameras are instead considered, it is possible that the datasets from them derived are structured in accordance with a three-dimensional grid of variable points. These differences necessarily imply that the

datasets in comparison must be structured similarly. The *GF*'s gestural definitions must be structured as to be compared with the datasets derived from the input devices in use. Which is to say that the very possibilities of motion capture play a part in structuring the definitions of gesture embedded into the software. They act as a frame of reference that limits and determines the quantities that the *GF* must calculate out of the examples to it provided. In this sense, given gestures can only be recognized if the memory of what has been previously registered is mappable onto the novel data. Of course that on both sides this occurs on the basis of algorithmic calculations, which structure data in determinate ways. The datasets reciprocal mappability depends on how raw data is structured by the softwares in use, i.e. belonging both to the *GF* and to the motion capture devices.¹⁰⁸ It is also here that the conventional agreement of what gesture is comes in. The structuration of data occurs both in accordance with what is possible to be computed and in accordance with what gesture is known to be. This mixed procedure is explained by Bevilacqua to be “based on the recognition that both our abstract gesture representation and actual gesture data generally share common time properties, and the links between them can be expressed as time relationships. For example, features occurring simultaneously in both representations can be made explicit. This can correspond to adding markers and profiles to a timeline [...]. The gesture follower

108 To say that the captured data is raw stands for saying that there is a structure to it. If such structure is to be computed with determinate functions of expression (i.e. the algorithms themselves), it needs to be transformed. That the data provided by motion capture systems does not correspond to an intuitive image of the dancing body and that, for this reason, if it is to be rendered into the expression of a recognizable figure, it needs to be processed and restructured, is noted by Frédéric Bevilacqua in the following way: “Making links between our abstract gesture representation and the gesture data is problematic. I always find it difficult to explain this to people who have little experience with motion capture systems: they often do not realize this frustrating gap between how they think about gesture and how actual capture systems behave. As a matter of fact, data often corresponds to a sparse and non-intuitive representation of what body motion is. This leads to practical difficulties when working with gesture capture technology, which sometimes gives the impression that the problem is with the technology itself, while it is more often with the methods of tool use.” (2007, p. 30). As such, to say that datasets' structures are raw stands for saying that they need to be restructured, for the purpose of recognition. Likewise, it stands for saying that they are already structured in ways that are determined by the algorithms of motion capture themselves, notwithstanding the fact that such structures do not comply with the purposes of recognition. For example, the infrared camera of a Kinect sensor has been used in the *DS/DM*'s Interactive Installation for capturing the movements of the system's user (Alaoui, 2012, p. 72). This sensor infers the position of the dancing body in two steps. It first computes a depth map (using structured light) and then infers body position (using machine learning) (Freedman et al., 2012; Khoshelham & Elberink, 2012). It is not worth here to describe these computations in detail. It is enough to note that the image of the dancing body generated by such sensor is the result of a set of algorithmic procedures belonging to the motion capture system itself. As computer scientist Sarah Fdili Alaoui notes, “these data need to be subjected to a supplementary treatment in order to be possible to extract from them, for example, the positions of certain parts of the body”. In other words, these data need to be restructured in order to be used for determinate purposes. “In the frame of the *DS/DM*”, says Alaoui, “we have developed a patch in Max/MSP/Jitter, which makes use of the cv.jit library (for image processing), in order to subtract the background of the captured image and, with this, generate a silhouette of the dancing body defined by certain geometrical characteristics.” (2012, pp. 79–80).

embodies such an approach, as it considers phrases as temporal objects we can observe – we can ‘look inside the phrase’ to find salient moments or try to predict what is going to happen. These temporal objects can also interact with other objects, sounds for example. This represents a different view on the usual interaction paradigm considering frame/posture as basic elements. Typically, the relationship between gesture data and sound or visuals is referred to as ‘mapping’, a clear reference to the consideration of primarily spatial relationships”. (Bevilacqua, 2007, pp. 30–31). Such mapping onto sound files is used by the *GF* to inform the system's user of the coincidence between the movements performed and the salient moments of a temporal digital object. In this way, all three datasets are mapped onto one another so that the software is capable of following the movements performed by stretching or shortening both the reproduction of sound and the reproduction of the registered examples.

The conventional representations of gesture used in the DVD for the workings of the *GF* exemplify how the problem of their expression had to comply with the fact that motion data is here retrieved from the computer's mouse. Instead of being defined with video registers of the dancing body, each of the *DS/DM*'s movement qualities is represented by an ideogram (see Illustration 4, below) which allows it to be defined as a determinate succession of points across one or several lines. Though such ideograms have been specifically created for this software, they derive from a system of choreographic notation used in Japanese Butoh-Fu, called Butoh-Kaden¹⁰⁹. The reason for this choice is explained by Bertha Bermúdez in the following way: “The issues treated in the Notation Research Project that EG|PC initiated in 2004, deal with dance documentation, notation and their relation with movement intentionality – the inner motivation for the movement. It is around the very problematic question of how to notate intentionality that the Butoh-Fu system shares some principles and tools with this research project.” (2007, p. 59). It follows that the *GF*'s ideograms are meant to convey the movements of thought implicated in each of the *DS/DM*'s movement qualities. Though expressed symbolically, they implicate the metaphorical, imagetic, and diagrammatic character of the choreographic ideas intended to be transduced.¹¹⁰ They

109 In Bertha Bermúdez's words, “Butoh-Kaden is based on the idea that 'physicality exists through acquired knowledge. The images refer to form and the words refer to symbols. Words are important in the Butoh-Kaden system because they express matters that cannot be symbolized and they are the medium to expand physicality through the use of imagination. [Yukio Waguri, Butoh-Kaden's creator] has structured eighty-eight Butoh-Fu (i.e. scores) that are connected to seven different worlds. These seven worlds have different qualities that are described through images, words, sounds, workshop experiences and performance demonstrations.” (2007, p. 59)

110 It should be noted that, in order to facilitate the transduction of choreographic ideas, both the DVD and the Interactive Installation allow for the *GF* to be used in different ways. In both cases, one can “watch” examples of how to move, one can “learn” how to move by following the registered cases of

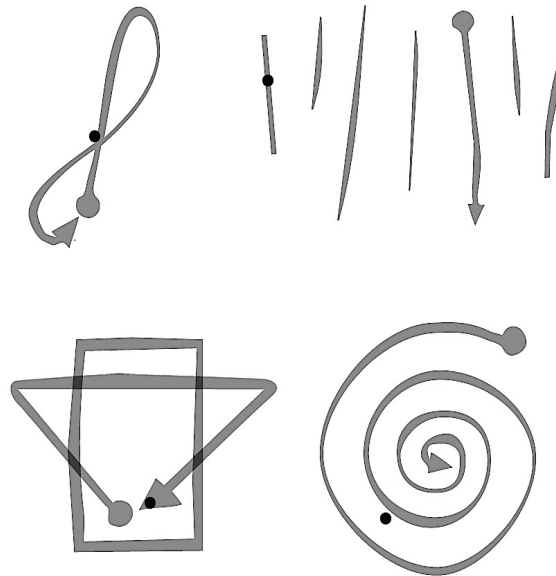


Illustration 4: The symbolic notations of each of the DS/DM's movement qualities, as seen on the GF's interface of the DVD. Here, the black dots represent the mouse's cursor. (Delahunta, 2007a).

are specific cases of solution with regard to these ideas. Also, it is worth noting that determinate patterns of displacement along the lines of these ideograms were registered in order to be compared with the displacements of the computer's mouse. These are the referential definitions of gesture given to the software to be compared with what this may capture from the user's activity. What here gets to be recognized as gesture is but the synthetic resolution of a point's expressive displacements along the lines of symbolic notations.

In this respect, the Interactive Installation's *GF* is different, for its definitions of gesture must comply with the data structures derivable from the input sensors in use. Bevilacqua mentions two different methods used here to create the digital definitions of gesture. On the one hand, in “a particular section of the Double Skin/Double Mind workshop [...] the breathing phases – inhale/exhale – [were] defined as contours/ shapes (but not measured by sensors). After recording this gesture, an ‘ideal’ breathing contour was drawn manually on the timeline representing the phrase. [...] The follower makes possible a precise synchronization [between the] drawn curve, generating a breathing

solution, and one can “play” freely with the different movement qualities in order to be signalled by the software about which one is being performed. All these modalities of use complement one another with regard to the transduction of the different choreographic ideas being expressed. By watching, learning and playing with the *GF*, the user experiences the workshop's movement qualities in different ways and can therefore more consistently learn how to move accordingly.

sound, with the body movements. The dancer is then ‘followed’ by a breathing sound, either stretched or shortened, depending on how slow or fast the phrase is performed.” On the other hand, “[s]everal phrases from the workshop Double Skin/Double Mind were recorded with a mixed capture system using both sensors attached to the body and video analysis (EyesWeb). In particular [they] focused on two choreographed phrases danced by Bertha Bermúdez and Emio Greco (around 30 seconds long) that [were] recorded several times. This choice was driven by the need for having phrases with precisely specified movements, which greatly facilitates the comparison mechanism of the gesture follower. Different tests were tried. First, [they] segmented one of the recorded phrases into subsections [..]. When performing the phrase again, the gesture follower was set to recognize these subsections and output a sonic signal (a ‘click’). According to both the dancer (Bertha Bermúdez) and the viewers, the sound was heard at the right time, indicating that the system was able to segment the phrase correctly”. (2007, pp. 29–30). One of the differences between these two notation methods thus regards the moment in technical transduction when cases of solution for the structuration of movement qualities are determined. In the first case, gesture is determined with notation itself. Drawing the contour of a dance form on video is a qualitative determination that depends both on the chosen registers and on the specific way in which the contours themselves are drawn. Here, the determination of gesture occurs after the dance event and in concomitance with the conventional agreement that gesture can be defined as it is drawn. In the second case, gesture is determined with the structuration of a dance phrase by the dancing body, constraining already here the undetermined potentials of each movement quality with a given form. In this case, the digital definition of gesture then just simply remarks a structure defined from the outset, in the very moment of the dance event. Such definition corresponds to the conversion of the dance's remarkable points into definite quantities of data. It is the conversion of this choreography's conceptual structure into determinate quantities of data retrieved from the dance's video registers. In both methods, the definition of gesture by means of video attests that, for the *GF* to recognize and follow the movements performed by the system's user, it must take as reference gestures depicted from the same kind of data generated with the input sensors in use, that is, video data. The positional character of these models cannot be emphasized enough. Gesture is defined by an array of points, each with a determinate value. Regardless of the fact that these values can vary in accordance with given probabilities, the models at stake discontinue movement into a series of numbers. They not only discontinue movement into measurable quantities but

do this by codifying them with determinate arrays of binary states. At the level of computation, this is gesture's conceptual structure. If granted that gesture's matters of content belong to the computational system's electronic circuits (including the interfacial and qualitative expressions of sounds and visuals), then its functions of expression must be granted to belong to the mathematical abstractions of computational algorithms. From which it follows that, computationally, choreographic objects are mathematical abstractions. In other words, they are the algorithmic models that bring electronic circuits into qualitative expressions capable of conveying choreographic ideas.

Both in regard to the data structured from the referential examples of dance and in regard to the data structured via input sensors, the *GF*'s algorithms act as functions of expression. They restructure the datasets by computing them in accordance with determinate parametric constraints. “The system outputs continuously parameters relative to the gesture time progression and its likelihood. These parameters are computed by comparing the performed gesture with stored reference gestures. The method relies on a detailed modeling of multidimensional temporal curves.” (Bevilacqua *et al.*, 2010, p. 1). What is compared are the quantities calculated from treating the datasets with these constraining parameters. Such computation not only allows for predicting gesture's progression according to a statistical distribution of probabilities (associated with each calculated value), as it also allows for the datasets to be compared precisely on this basis. The *GF*'s algorithms sample points from the temporal profile of the video registers, translating them into values that define gesture in each specific location of its development. It can therefore be said that the interest here is both “in computing the time progression of the performance, or in other words answering the question 'where are we within the gesture?’” and “in computing likelihood values between a performed gesture and pre-recorded gestures stored in a database. This can be used to perform a recognition task, but also to characterize gestures. [...] Moreover, the estimation of both the time progression and likelihood values enable another important feature of such a system: the possibility to predict the evolution of the current gesture.” (Ibid., pp. 1-2). The parameters computed by the *GF*'s algorithms rely on the calculation of temporal and spatial descriptors of the dancing body. This is described by computer scientist Sarah Fdili Alaoui in her doctoral thesis, dedicated to the problems of gesture's analysis in the context of the *DS/DM*'s research projects, in regard to the use of infrared cameras.¹¹¹ “The spatial descriptors define the

111 It is worth noting that Frédéric Bevilacqua was Alaoui's thesis co-supervisor.

geometries of the dancing body, in relation to its surrounding space. The temporal descriptors define the gesture's temporal evolution.” (Alaoui, 2012, p. 81, *my translation*). The spatial descriptors are: 1) body's verticality (calculated as the ratio between the silhouette's height and width); 2) shoulder's angle (calculated as the angle held between one arm and the silhouette's vertical axis); 3) body's extension (calculated as the maximum distance between the silhouette's centre of mass and the sum of its extremities); 4) legs' width (calculated as the distance held between the two feet); 5) weight transference (calculated as the distance between the mass centre's abscissa and the centre of the segment connecting the two feet). The temporal descriptors are: 1) periodicity and frequency (calculated as the average of the coefficient of statistical correlation between the four extremities of the silhouette); 2) increment and decrement (calculated as the temporal evolution of any of the previous spatial descriptors); 3) quantity of movement (calculated as the frame-by-frame variation of the silhouette's number of pixels, when translated into a digital display). (Ibid., pp. 81–82). From the calculation of such descriptors, the *GF* can then express the gestural body as a series of solutions with regard to the problem of how to represent the movement qualities in case with digital possibilities. According to Alaoui, “[t]he reason for this choice has to do with the fact that the descriptors [...] allow for the *GF* to account for the very fine nuances of movement that are characteristic of the *DS/DM*'s dancing body. The algorithms are in this way capable of recognizing movement qualities that more general approaches, such as Labanian ones, aren't.” (Ibid., pp. 80–81). Since such descriptors are calculated relatively to the dancing body's silhouette in order to output visual representations of gesture, i.e. quadrilateral shapes, which allow for the system's user to grasp how the computational system is processing such translation (see Illustration 5, below), it can in fact be said that this is a Labanian method of analysis. Expressively, this is a method which reduces the dancing body to a geometrical form that, despite being different from Labanotation, results from the same kind of movement analysis. The *GF*'s capacity of recognizing nuances in movement can instead be addressed to gesture's temporal progression, since the 30 frames per second that these sensors output allow for movement to be notated with a resolution much greater than the one usually attained by traditional methods of choreographic notation.

This notation method is somewhat different from the two previous ones, for the calculation of descriptive variables is from the outset a quantitative procedure. Of course all these methods rely on the conversion of conceptual structures into structured quantities of data. But in this latter method definitions of gesture are not given to the



Illustration 5: In this picture, it can be seen how the learning subject is placed in front of a screen, where two different figures are displayed. There is the figure of Emio Greco's dancing body, as recorded with video. And there is also the silhouette of the dancer's body, as processed by the software after motion capture. As it can also be seen, the software not only extracts the silhouette of the dancer's body from motion capture data, but also draws its geometries with moveable boxes. Such boxes describe gestures parametrically. Retrieved 04/06/13, from <http://sarah.alaoui.free.fr> (Alaoui's Ph.D Webpage).

software on the condition of being relative to a set of examples, but rather on the condition of being primarily unrelated to actual matters of content. In this sense, the algorithms that structure the sensors' raw data can be understood as definitions of gesture in themselves. And though these algorithms are specifically designed to act as functions of expression, what will come to be defined as gesture depends solely on the descriptive values computed by them. As such, they are perfect examples of what a choreographic object can be like in the digital domain. They express the *DS/DM's* conceptual structure independently from the matters of content generated with the input sensors.¹¹² Conversely, the definitions of gesture necessary for the workings of the *GF*

¹¹² It should be noted that, in her doctoral thesis, Alaoui develops still another method where gesture is defined with the computation of determinate parametric structures (2012, pp. 66–78). This is a method said to follow from the intuition that the *DS/DM's* movement qualities correspond to the dynamic behaviours of spring-mass systems (Ibid., p. 64). A spring-mass system is defined on the one hand by an object composed with a mass attached to a spring and on the other hand by the fact that this object's displacements, in one dimension only, are conditioned by forces of elasticity and viscosity. With this method, gesture is first coordinated in regard to the relative position of body parts to be analysed (i.e. the extremities of the dancing body) and then calculated according to differential equations in regard to variables such as speed and acceleration. Since these differential equations are capable by themselves of modeling gesture, this is a model that neither requires that the software is provided with a set of referential gestures (and therefore with a learning phase) nor that it is programmed to work according to a set of gestural descriptors (Ibid, pp. 65–66). Even without such

can only be determined after the calculation of cases of solution for the problems implicit in the software's algorithmic functions of expression. From which it follows that, because such choreographic objects are constrained by the possibilities of the digital domain, instead of being just models of potential transition, they can also be thought as models of possible transition. For as much as the *GF* acts as an insert of possibilities amidst the potentials of a milieu of technical individuation, it limits the latter with what the software can in fact calculate. The abstract character of choreographic objects is in this way reduced to the possibilities of the digital domain. A constraining of potentials with the possibilities of digital code. Nonetheless, such choreographic objects should be seen as being embedded in a milieu of technical individuation, full with undetermined potentials. After all, not only are these algorithms technical individuals, as they are also the necessary condition for a choreographic transduction to occur into dancing body's domains.

5.2 - *Gestural Bodies, Extended*

The capacities of algorithmic calculation have been used for writing dance in ways that extend the image of the body in space and time. This is not new to choreographic notation. Writing dance with symbols not only gives form to the problems in translation, as it brings past experiences into spatial juxtaposition. What in the dancing body unfolds in succession, in traditional notation stands side-by-side. Accordingly, one of the problems that is possibly solved with choreographic notation regards the sense-making of what in experience is both immediate and diachronical. The individuation of thought is mirrored by the individuation of writing and resolved into expressions that convey both their own logic and a sense proper to the ideas in regard to which they stand as solution. What is mirrored between individuations is the idea's diagrammatic structure, i.e. the same problems that relate the different modes of expression. In regard to memory, the expressive variations of choreography can result in different instances of retention, each with its proper character. Whereas dance is experienced empirically only to be, sooner or later, forgotten, writing retains such experience by representing its diagrams. Without writing, memory remains abstract.

requirements, it was concluded that “spring-mass models are good candidates for the visual presentation of dynamic renderings of the *DS/DM* movement qualities” (Ibid, p. 64, *my translation*). For more developments on the expression of spring-mass models in the context of the *DS/DM*'s Interactive Installation, see Chapters 5 and 7 of Alaoui's doctoral thesis (Ibid., pp. 87–115, 131-149).

Writing overwrites the actual conditions of its own individuation by compressing memory into the actuality of the present.

In contrast to traditional methods of choreographic notation, what algorithmic procedures of digital computation allow for, in a truly novel manner, is the automation of writing. For if it is true that such algorithms require being invented and concretized, it is also true that the solutions that they may compute can result without human intervention. Once digital automatisms are put to work, they can be seen as operating independently from external determinations. This also stands for the case that, insofar as in such computation all is written, all occurs in actuality. From which it is possible to argue that there is no durational dimension to digital computation and that this necessarily occurs on the basis of articulations between discrete symbolic elements. Only by articulating arrays of data can computation proceed and generate solutions for the problems in case, a standpoint from which it is also possible to assert the difference between traditional methods of notation and digitally automated ones. Whereas the automatic computation of solutions depends solely upon sets of possibilities, the durational and subjective notation of dance cannot generate solutions but with regard to problems in an affective-perceptive field. In this latter case, memory is empirically formed, but soon forgotten only to be recalled, from a transcendental point of view, into the subjective experience of duration, which does not cease to be related with the actuality of an empirical experience. The subjective and durational notation of choreographic ideas results from technical individuations that can not only create what cannot be predicted, but also remember what has already been forgotten.

In contrast to this, the digital notation of choreography can be understood from an exclusively objective perspective. This not only regards a conception of algorithms defining them as “specific sets of instructions for carrying out procedures or solving problems, usually with the requirement that the procedures terminate at some point” (Weisstein, 2002), as it also regards the possibilities of digital coding. When a finite set of instructions is digitally programmed, what one gets is an automated object, that is, a system capable of iterating its own programmatic determinations. Of course digital algorithms are not disembedded from technical milieus, with all that is subjective in them. But insofar digital computation can proceed without further regulated, automated algorithms can be seen independently from the subjects of technical invention and control. Which is also the reason why, when computing vast spaces of possibilities, digital algorithms might express what can hardly be anticipated by their inventors (i.e. computers count much faster).

The possibilities of algorithmic computation are many. As many as the ones comprised by the possibility space of the content-expression encounter calculated between two datasets. Even in the case where both functions of expression and matters of content remain the same, relatively to one another, differences in expression can occur. The same set of actual expressions can vary in space and time, contracting or expanding the perception of a first calculated order of magnitude. In regard to choreographic notation, this stands for the fact that the gestural body can be contracted or expanded and, with each of these procedures, express otherwise imperceptible data. In fact, these are not two distinct procedures but only different perspectives upon one same operation. Insofar as this operation is characteristic of choreographic notation, any of its expressions serves to understand the duality in case. It suffices to say that, because writing compresses time into one same plane of expression, it also expands space. This duality is, for example, expressed when the graphic symbols of choreographic notation are used to inscribe the memory of a succession of states onto one same surface, accreting in this way matters of content to the plane of their own expression. The more time is compressed onto the surface of graphic inscription, the more space is created. The compression of time into one same plane of expression can in this way densify or disperse the number of occurrences within one same referential metric. In either case, the objective space is extended.

Several examples of gesture's extendability by means of digital computation can be found in the "*Motion Bank*" (MB), "a four-year project of The Forsythe Company, [developed between 2010 and 2013], providing a broad context for research into choreographic practice."¹¹³ In fact, this project can be said to have been initiated before. The "*Synchronous Objects for One Flat Thing Reproduced*" (SOfoFTr) website,¹¹⁴ which is presented as one of MB's choreographic scores, resulted from a project that ended just before the initiation of the MB. One of the reasons for this contributive development regards the fact that the SOfoFTr's website is dedicated to the quantitative analysis and notation of William Forsythe's choreography "*One Flat Thing, reproduced*" (OFTr). The MB developed this type of choreographic endeavour into the artistic work of other choreographers, such as Deborah Hay, Jonathan Burrows and Matteo Fargion, Bebe Miller and Thomas Hauert, and generated for each of them an online score.¹¹⁵

113 Retrieved from the MB's website (<http://motionbank.org>). All references from online sources quoted in this section were retrieved during August, 2014.

114 <http://synchronousobjects.osu.edu>

115 <http://scores.motionbank.org>

In the case of William Forsythe's choreographic work, the website *SOfoFTr* represents a series of efforts for “visualizing choreographic structure from dance to data to objects”¹¹⁶. Such efforts were coordinated by Forsythe himself, together with artist and scholar Norah Zuniga Shaw, from the Ohio State University's Department of Dance, and Maria Palazzi, the director of Ohio State University's Advanced Computing Centre for the Arts and Design. Together with a group of designers and scientific researchers, they “worked with the Forsythe Company to unearth the choreographic building blocks of *OFTr*, quantify them, and repurpose this information visually and qualitatively” (Forsythe *et al.* 2009, pp. 2–3). The result was a series of digital objects that, because they are all mapped onto the same spatiotemporal grid (i.e. the choreographic metric depicted from the dance performance), are synchronous in regard to one another. Because their temporality is organized with the same metric, they can be seen not only as different expressions of one same topological object, but also as the overall expression of the *OFTr*'s multidimensionality. To visualize the different objects synchronously is to relate in perception the many nexuses that the *OFTr* not only expresses, but also holds in potential. Also, such objects can be synchronized with one another because all of them have taken the video registers of the *OFTr*'s performance as the referential data from which to depict this choreography's diagrammatic (i.e. temporal and spatial) character.¹¹⁷ Many of the *SOfoFTr* are but choreographic notations of the *OFTr*'s performance, made on its video registers. Such notations resulted from two specific types of data. They resulted from the spatial data generated “by tracking a single point on each dancer in both the top and front views of the source video of *OFTr*. By combining the coordinates from both views, [the animators] were able to generate a three-dimensional data point for each dancer's location at every moment of the dance”. And they resulted as well from the attribute data “built from the dancers' firsthand accounts. [...] The attribute data catalogs the three systems of the dance: movement material, cues, and alignments”. (Forsythe *et al.* 2009, pp. 2–3). Whereas attribute data served the dance's qualitative notation, spatial data served its algorithmic notation. Both modes of notation are expressed digitally in the *SOfoFTr*'s website, together with the video recordings, on top of which they are drawn. But whereas the notation derived from attribute data has been subjectively drawn, the notation derived from spatial data has been objectively drawn, that is, it has been drawn by means of digital algorithms

116 Retrieved from <http://synchronousobjects.osu.edu>.

117 Though the public performance of “One Flat Thing, reproduced” was premiered at the Bockenheimer Depot, Frankfurt, in 2000, the video recordings used for creating the *SOfoFTr* website were recorded from a performance presented in 2005, at the same site of its première. (Forsythe *et al.*, 2009, p. 1). These recordings can be viewed at: <http://synchronousobjects.osu.edu/content.html#/TheDance>.

programmed to compute the quantities of data retrieved from analyzing the dance's video recordings.

It is therefore with the spatial data used to create the *SOfoFTr* that the issues of spatial compression before mentioned can be best understood. Not only has this to do with the fact that, “[a]s in many forms of inquiry, quantification requires a reductive process that necessarily obscures certain aspects of knowledge (the dancers’ intentions, performance quality, and kinaesthetic awareness) in order to reveal others (in this case, choreographic structure)” (Ibid.), as it has to do with the fact that the *SOfoFTr* created with spatial data resulted precisely from the accretion of data on data. The objects created with the “*Video Abstraction Tool*” (VAT)¹¹⁸ (see Illustration 6, below) are examples of this. This tool was invented “to demonstrate novel ways of visualizing the dance itself. [With it] patterns that are hidden due to the overall complexity of the entire scene can be brought out by visually emphasizing movement so that both the short- and long-term patterns of the dance, temporal relationships between movements, and spatial information regarding how the performance area is being utilized, are revealed” (Andereck, 2009). This is done by applying a number of possible algorithms, i.e. filters,

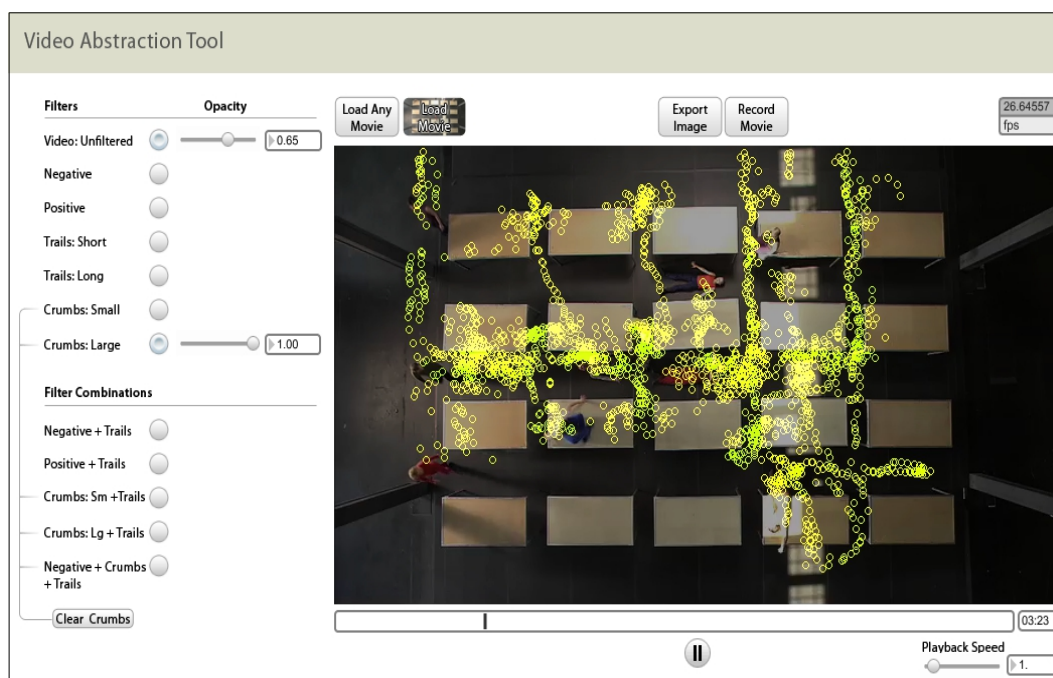


Illustration 6: Video Abstraction Tool's GUI. The yellow circles, here designated as “crumbs”, trace each dancer's displacements within the video frame according to a determinate temporal metric. The filter “crumbs” has been used to create the “Difference Marks” object.

118 This tool is available for download at the *SOfoFTr*'s website (<http://synchronousobjects.osu.edu/content.html#/VideoAbstractionTool>). Notably, it is a piece of software programmed with the MAX/JITTER environment.

to the choreography's video recordings. When a filter or a combination of filters is used as a function of expression for processing video, this is brought into results that, rather than expressing the transformation of what is given, i.e. the video itself, express the accretion of novel data onto it. In this way, new datasets can be mapped from and onto the very video from which they result. Space is mapped onto space. Not just any space, but the space formed with choreographic resolution. Each of the *VAT*'s filters compress spatio-temporal data in order to double the video's movement-images with other images of movement. These latter images can be described as deformations of the spatio-temporal patterns belonging to the referential movement-images. Space is extended in order to be perceived as an extension of time. When time (i.e. a spatial time) is extended, what wasn't perceived by reason of being either too fast or too small, or even either too large or too slow, becomes information. It informs subjects with novel perceptions regarding the *OFTr*.

All the objects created with the *VAT* express differentials belonging to the performance of the *OFTr*. This is so not only because the performance itself expresses the *OFTr*'s choreographic system, i.e. the differential topology to which it belongs, but also because this tool's algorithms are programmed to compute the frame-by-frame variation of its video registers. As Norah Zuniga Shaw (2009) notices, the *VAT* was created “in order to share aspects of the software filters used in making the '*Difference Forms*', '*Difference Marks*' and '*Noise Void*' animations.”¹¹⁹ Each small adjustment in the filters [used] for these animations creates interesting aesthetic results and analytical discoveries”. Further, these objects' names indicate the algorithmic computation of differences in the video's frame-by-frame progression that they express. Perhaps the most clear expression of this is the “*Difference Marks*” object. As shown in Illustration 6 (above) the expression of this object notates, with a series of small circles, the displacements of each dancing body. As the dance develops, the graphemes accumulate, expressing in simultaneity what is given with the frame-by-frame videographic succession. As it can be read in the *SOFTTr*'s website: “This object visualizes the accumulation of the dancers' motion over time. Here the duration of the dance is compressed from 15 mins. 30 secs. to 1 min. 30 secs., and any instance of motion (what we call localized difference) is noted with a small mark. The colours of these marks change over time from red to blue, revealing distinct layers and patterns of motion as

119 These animated objects can be seen, respectively, at: <http://synchronousobjects.osu.edu/content.html#/DifferenceMarks>; <http://synchronousobjects.osu.edu/content.html#/DifferenceForms>; and <http://synchronousobjects.osu.edu/content.html#/NoiseVoid>.

the piece progresses. One of the goals for this object, which looks down at the dance from above, was to see how much the dancers both reinforce the grid of tables and subvert it. As the animation progresses, outlines of the tables grow distinct as the dancers interact with them.”¹²⁰

In contrast to the *VAT*'s algorithms, the synchronous notation of the *OFTr*'s attribute data regards, first and foremost, the qualitative expression of technical transductions. Most of the objects created with such attributes are but notative expressions of the marks allowing for this choreography's remembrance. The first object created with such remembrance is a graphic score (Illustration 7, below) where movement materials are disposed across the performance's time frame, and cues and sync-ups notated relatively to them. This score expresses how the *OFTr* is focused on examining and reconfiguring classical choreographic principles of counterpoint. Here, counterpoint is defined as “a field of action in which the intermittent and irregular coincidence of attributes between organizational elements produces an ordered interplay” (Forsythe et al., 2009, p. 1). The interaction between the *OFTr*'s different attributes creates the choreography's counterpoint. Additionally, a series of different

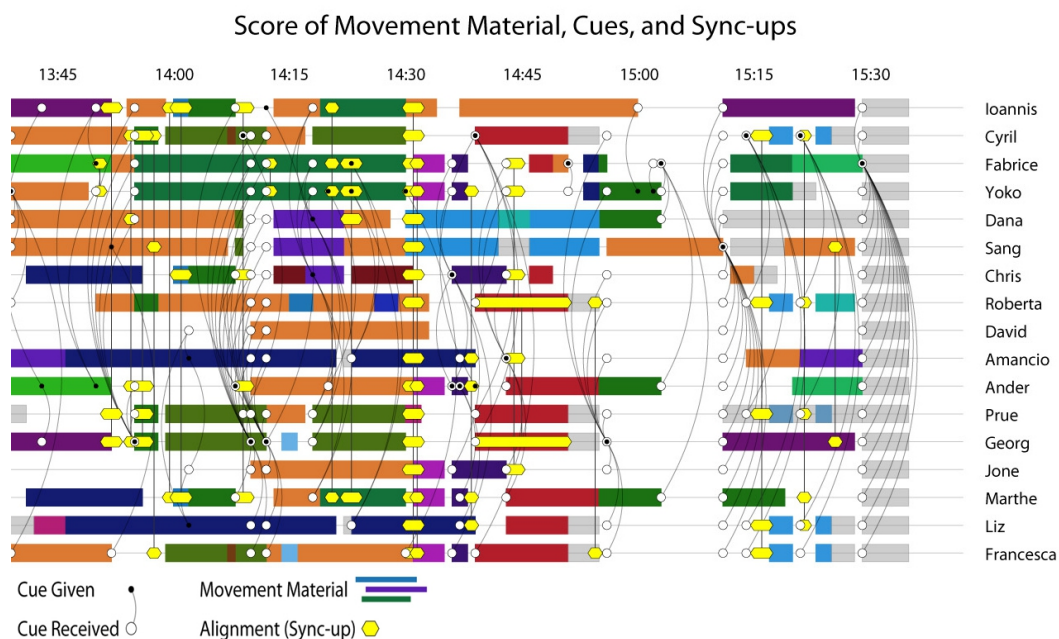


Illustration 7: “Cues and Themes - Graphic score of movement material, cueing and sync-ups generated from the data gathered from One Flat Thing, reproduced. Credit: Synchronous Objects Project, The Ohio State University and The Forsythe Company.” Retrieved from <http://synchronousobjects.osu.edu>.

¹²⁰ Retrieved from <http://synchronousobjects.osu.edu/content.html#/DifferenceMarks>. Moreover, the algorithms used for creating the “*Difference Marks*” object were also used to create the “*Center Sketch*” (<http://synchronousobjects.osu.edu/content.html#/CenterSketch>) object and the “*Movement Density*” object (<http://synchronousobjects.osu.edu/content.html#/MovementDensity>).

objects have been created after such notation. There are the objects where these notations are overlaid on the *OFTr*'s video registers and visually synchronized with the dancers' performance (as seen, for example, in Illustration 8, below), and there are the objects that translate the *OFTr*'s attributes into parametric structures, which can be operated by altering the parameters' values (for example, the “*Cue Visualizer Tool*”, as seen in Illustration 9, below). The latter are generative tools, similar to the *VAT*, which allow for visualizing the different possibilities of expression that the rearticulation of the *OFTr*'s attributes allows for.

These procedures of data quantification and qualification have been iterated in different ways in the remaining scores of the *MB* project. For example, in the case of the score “*No Time to Fly*” (*NTTF*)¹²¹, a choreographic work for a solo performer by Deborah Hay, data was quantified with a computer vision procedure similar to the one used in obtaining the *SOfoFTr*'s spatial data.¹²² But whereas the *OFTr*'s video registers were taken to render unproblematically the choreography's structure, i.e. representing its invariant functions adequately, each of the *NTTF*'s video registers was taken to record only one possible case of solution for the problems posed by this choreography's ideas. Which is to say that this choreography's principles are to a great extent undetermined,

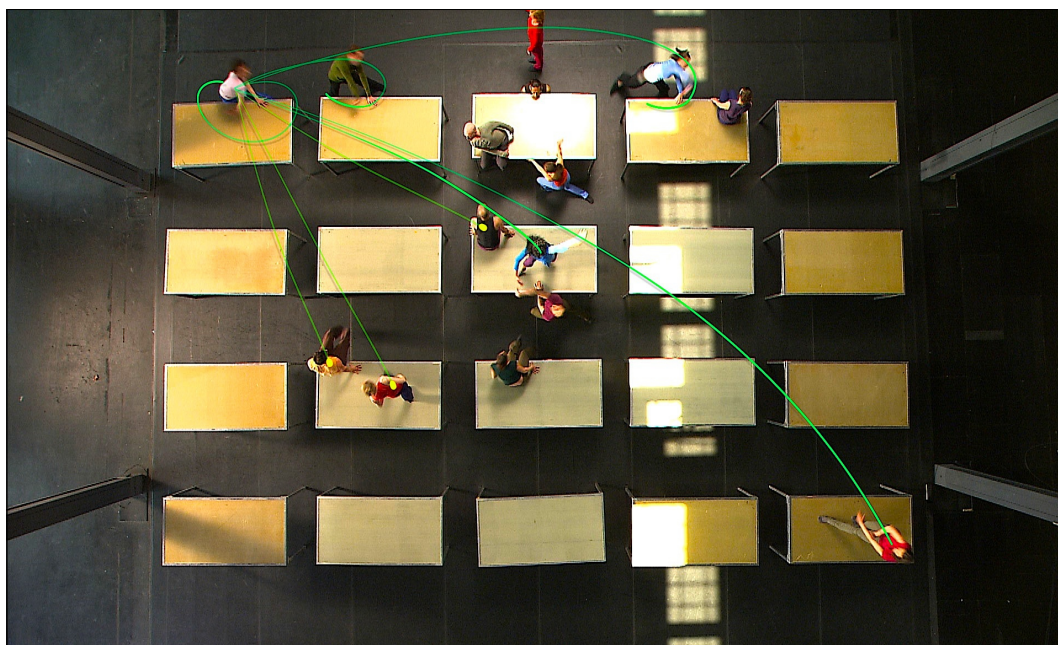


Illustration 8: “Cueing System - Still from annotated video illustrating the complex system of cueing in One Flat Thing, reproduced Credit: Synchronous Objects Project, The Ohio State University and The Forsythe Company.” Retrieved from <http://synchronousobjects.osu.edu>.

121 The full *MB*'s score of *No Time to Fly* can be accessed at <http://scores.motionbank.org/dh/>.

122 The full explanation of this procedure can be accessed at <http://motionbank.org/en/event/deborah-hay-score-project-solo-filming>.

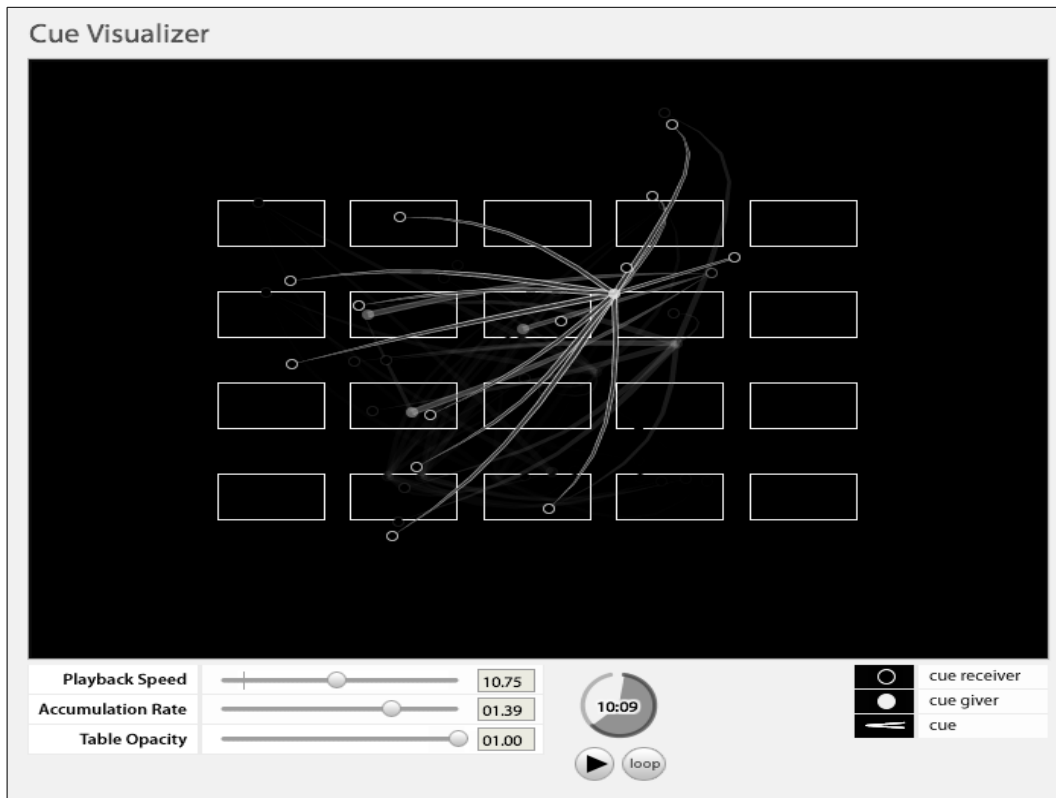


Illustration 9: Cue Visualizer Tool's GUI. Retrieved from <http://synchronousobjects.osu.edu/tools/cueVisualizer.html>.

leaving space for highly variable expressions. Whereas the *OFTr* is a choreography with a great degree of formal structuration, one which assures its invariance across different instances of performance, the *NTTF* is a choreography with large margins of indetermination, i.e. its expressions in performance are highly variable (given that it is nonetheless determined by constraints such as being a stage performance for one dancer only). In order to deal with this problem, the *MB* project video recorded a series of performances by three different dancers—Ros Warby, Juliette Mapp and Jeanine Durning—so that their differences could be juxtaposed and, in this way, facilitate the perception of this choreography's nexus. One of the expressions rendered after the motion capture of this choreography's different interpretations is the overlay of all the pathways performed across the stage (see Illustration 10, below), a sort of visualization that does not differ much from the ones created with the quantitative analysis of the *SOFOTr*'s spatial data.

The transduction of the *NTTF*'s movement qualities into the digital domain has instead rendered a sort of algorithmic expression that is nowhere to be found on the *SOFOTr*'s website. This is a 3D digital animation of algorithmic parameters, designed by programmer Amin Weber (see Illustration 11, below), after the experience that the

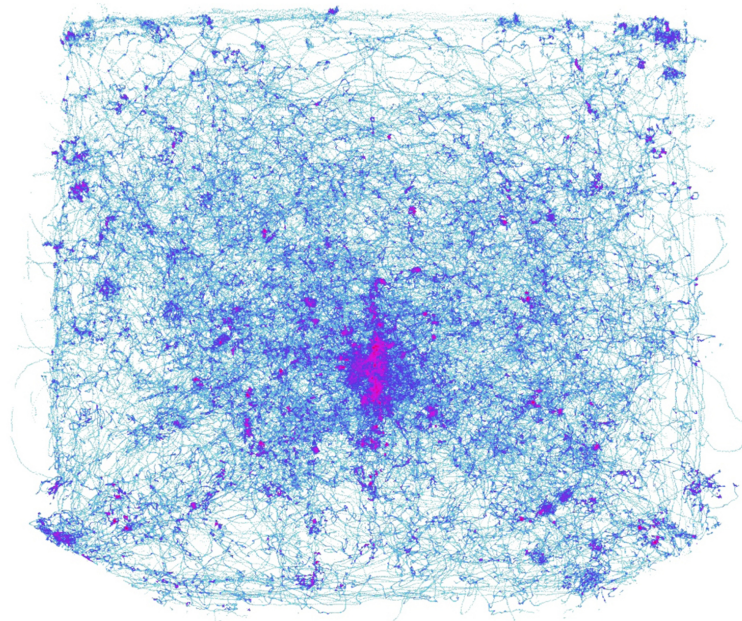


Illustration 10: "21 solos overlaid. 7 x 3 performers." (seen from above). Retrieved from <http://motionbank.org/sites/motionbank.org/files/glossary.pdf>.

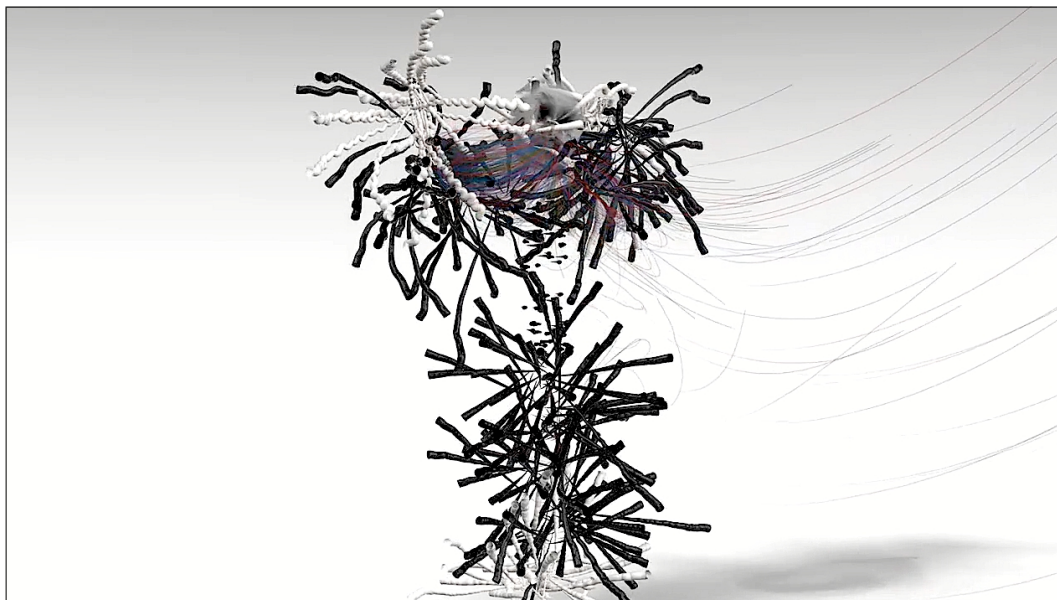


Illustration 11: Still from the final version of the digital adaptation of the solo "No Time to Fly" by Deborah Hay, as programmed by Amin Weber. Retrieved from <http://scores.motionbank.org/dh/#/set/digital-adaptation-of-no-time-to-fly>.

dancers, the choreographer and the programmer had of the different performances.¹²³ In contrast to quantitative analyses of motion data, what is here expressed by digital means is the programmer's own conception of this choreography. Which is why this digital animation is referred to as an “algorithmic metaphor”. It expresses the resolution of problems located at the many levels of a transduction, which goes from the dance to the viewer and from the viewer turned programmer into the digital domain. This is really not a matter of translation. It is a process that unfolds on the basis of thoughts, which move towards resolutions of the problems at stake. Such problems necessarily pertain both to the content-expression encounter of thought and to the content-expression encounter of writing. And if the problems of the former can be located at the level of the affective-perceptive order of subjective experience, the problems of the latter necessarily pertain to the relationship between the excessive potentials of thought and the limited possibilities of digital coding. If what is transferred between domains are not only forms but also forces, what in the end attests the transductiveness of such process is the metaphorical character of its digital expressions. What is expressed is less what was seen to be danced, but more what was experienced as a whole, that is, the very openness of the dancer to its excessive reality. What is expressed are the principles of individuation felt by the viewer when acting upon the dancer. It can even be said that the kinds of image schemata underlying the many metaphorical projections taking place in this whole process are the ones that mirror in the viewer the forces active in the dancer. Empathy in kinaesthesia. And from the internal resonance of such senses in the body follows the challenge of expressing within the limits of writing the forces in transduction.

The gestural bodies created by the *MB* from the joint work of choreographer Jonathan Burrows and composer Matteo Fargion are also algorithmic metaphors. The “*SEVEN DUETS*”, dedicated to “[f]ragments, movements and insights from the interplay between”¹²⁴ the two artists, comprises collections of what have been designated as “*Generators*” and “*Performers*”.¹²⁵ “*Generators*” are pulse patterns used

123 For insights on the programmer's own experience see: <http://scores.motionbank.org/dh/#/set/digital-adaptation-of-no-time-to-fly>.

124 The “*SEVEN DUETS*” scores, as created for the *MB* platform, can be accessed at <http://scores.motionbank.org/jbmf/>. “Fragments, movements and insights from the interplay between Jonathan Burrows and Matteo Fargion” is the subtitle of this *MB*'s section.

125 This section, “*SEVEN DUETS*”, is titled after the fact that, for it to be created, seven different choreographic works of Burrows and Fargion were video recorded. The “*Generator/Performer*” pairs were composed not only from these registers, but also from a series of recorded insights where the choreographer and the composer discuss their artistic work. For the artists insights see the set titled “*Patterns and Pulse*” at <http://scores.motionbank.org/jbmf/#/set/patterns-and-pulse>. For the fragments of the video registers used to trigger the digital “*Performers*” see the set titled “*Fragments and*

to animate the digital “*Performers*”. These pulse patterns were created by adding markers to the video recordings of different works with the “*Piecemaker*”, a video annotation software developed by David Kern for The Forsythe Company to “support the organization and recall of materials created in the rehearsal studio”¹²⁶. With this software, time markers output pulse patterns, which are then used for animating the digital “*Performers*”. At the “*Meanwhile in parallel worlds...*”¹²⁷ set (where the collection of “*Generators/ Performers*” is presented), one can watch how animated “*Performers*” respond to the video registers of dance events. Illustration 12 (below), shows a montage of the “*Piecemaker's*” GUI with the digital “*Performers*”. The latter are simple algorithms, programmed with Javascript, which animate the figures with each pulse received. In this illustration it can also be seen how the software's GUI comprises a video frame and the video's annotated timeline. Each of the timeline's coloured bands (in grey) corresponds to an annotation, which is also part of a list disposed below the timeline. Whenever the annotated video is read, the software outputs corresponding values. Such triggers can also be visualized while the annotations are highlighted on the list.¹²⁸

The representation of Burrows and Fargion's dancing bodies by these animated “*Performers*” cannot be understood without acknowledging that the latter graphically express discrete quantities of data. They express the marks with which the videos have been annotated. What has been articulated by being cut can be rearticulated in as many ways as allowed by the possibility space of the encounter between two datasets. What perhaps distinguishes these graphic animations from other gestural bodies is the fact

Movements” at “<http://scores.motionbank.org/jbmf/#/set/2012-recordings>. For each video register of the seven choreographies see the set titled “*The 7+1 Duets*” at <http://scores.motionbank.org/jbmf/#/set/all-duets>.

126 Retrieved from <http://motionbank.org/en/content/education-piecemaker>. Furthermore, at <http://motionbank.org/de/node/394> it can be read that “[i]n the context of the *MB* research project, “*Piecemaker*” has been reprogrammed for use in the development of the on-line digital scores and as a standalone tool for use in the studio by those working in dance creation and education. Now titled *PM2GO* (*Piecemaker2GO*) a free beta version can be downloaded along with instructions here [motionbank.org/en/event/pm2go-easy-use-video-annotation-tool]”.

127 <http://scores.motionbank.org/jbmf/#/set/a-parallel-world>.

128 The explanation of how the “*Generator/Performer*” pairs were composed and how the relation between the two was programmed, notably by means of the workings of the one “*Piecemaker*” software version used for this task, can be accessed at the following address: <http://vimeo.com/93275260>. It is here worth noting that, just before the “*Piecemaker*” was developed in the frame of the *MB* project, another video annotation software with a focus on choreographic creation had already been developed. This is the already mentioned “*Creation Tool*” (*CT*) software, developed in Lisbon by the “*Transmedia Knowledge-Base for Performing Arts*” (*TKB*) project (see page 18). With it, it is possible to annotate video both while this is being recorded and in editing mode. Alongside with having been conceived to be specifically used with tablet computers (since it allows for writing with a pen directly on the video), the *CT* allows for a variety of other modes of annotation (annotations with voice, with hyperlinks, with predefined graphemes, such as the marks of the “*Piecemaker*”, with the writings of the tablet's pen, with local files, and typewritten text).

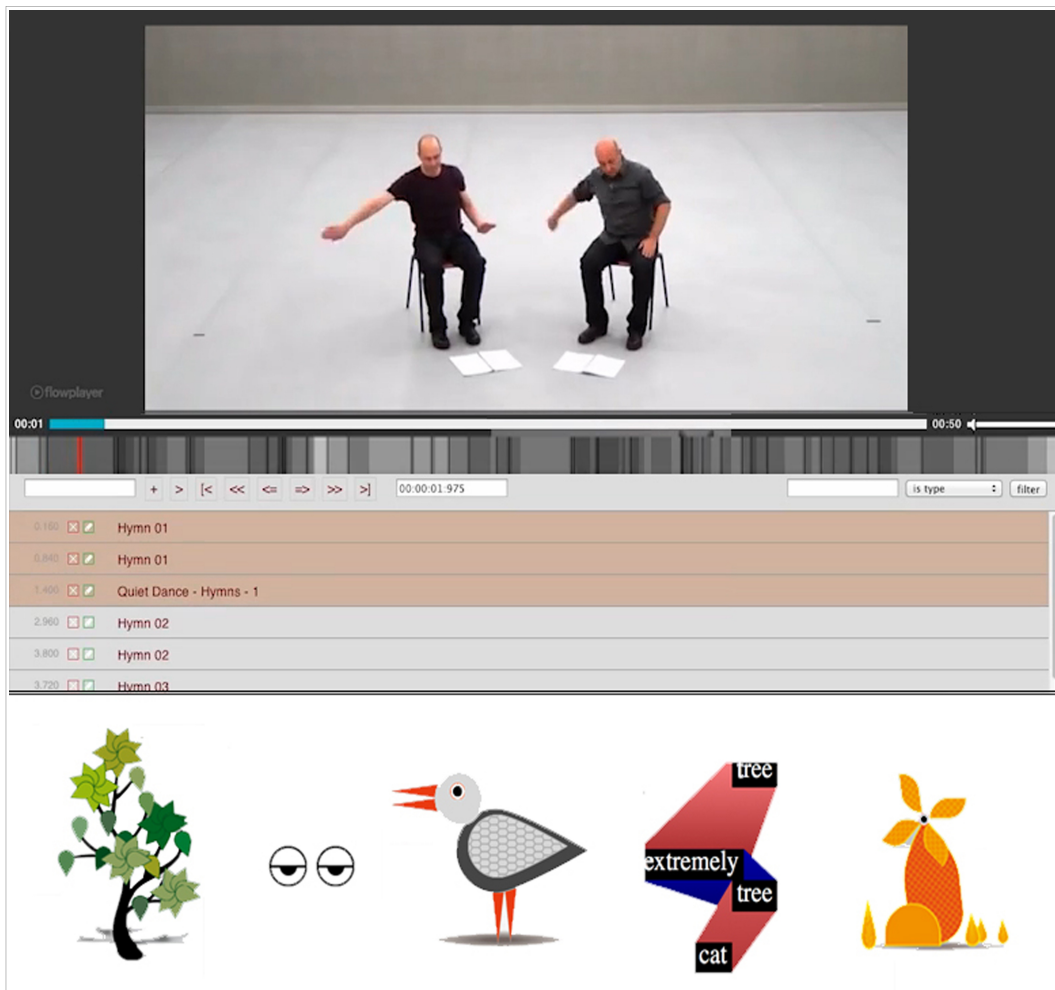


Illustration 12: Montage with the GUI of the Piecemaker software and the figures of the animated “Performers”, which have been programmed to react to the software’s cues. Images retrieved from the “Meanwhile in parallel worlds ...” set (<http://scores.motionbank.org/jbmf/#/set/aparallel-world>) and from the video explanation of the workings of the Generator/Performer’s pairs (<http://vimeo.com/93275260>).

that these “Performers” have reduced degrees of freedom. For example, the “Performer Watcha Looking At?”¹²⁹, figured as two round eyes (see Illustration 12, above), and its paired “Generator”, drawn only from video registers where Jonathan Burrows performs a series of arms’ movements, has only eight degrees of freedom—closing the eyes, moving the eye balls to the right, and so on. These degrees of freedom are this “Performer’s” expressive range. The data computed from the video recordings eventuates only the possibilities programmed into their digital determinations. Moreover, this figure’s animation iterates its expressive possibilities in different combinations of succession according to the distribution of annotations in the temporal profile of the video registers used to create its “Generator”. Which is to say that, because the “Performers” are spatial objects, possessing no determination with regard

¹²⁹ <http://scores.motionbank.org/jbmf/#/set/watcha-looking-at>.

to the temporal disposition of events, their animated expressions depend on temporally determined objects, i.e. the “*Generators*”. Though such temporal objects can have no correspondence with Burrows and Fargion's dancing,¹³⁰ if the “*Performers*” are to be animated in accordance with the patterning structures of these choreographic works, they must be fed with the digital expression of representative conceptual structures, i.e. the discrete data of the video annotations. In regard to the formal differences expressed between these digital objects and the dancing bodies to which they refer, it seems most adequate to define the former as algorithmic metaphors. After all they express one thing in terms of another.

The notion of “algorithmic metaphor” seems to have been key for developing some choreographic objects of the “*TWO*” score.¹³¹ This score “begins and ends with two choreographers, unrelated to each other. Bebe Miller (North America) and Thomas Hauert (Europe). [...] two working strategies from each of the two choreographers [were selected], that together [deal] with the dancing mind and the thinking body”. Or, in other words, this score “examines choreographic thinking in the construction of performance improvisation for small groups”.¹³² This score's algorithmic metaphors are designated as “*Attentive Agents*”. They represent an improvisational practice, called “*Assisted Solos*”, which is used by choreographer and dancer Thomas Hauert to generate movement material. The “*Assisted Solos*” practice consists in a series of exercises where “partners or assistants provide external impulses for a soloist in a series of different improvisation strategies from the introductory Light Touches to more complex forms involving several people and changing roles”¹³³. For each improvisation strategy, an “*Attentive Agent*” was developed.¹³⁴ Each “*Attentive Agent*” is expressed by a GUI (as seen, for example, in Illustration 13, below) where gestural forms representing the dancing bodies are animated both according to the parametric structure of determinate algorithms and according to the “tactile” inputs that the system's user might provide to them (by clicking with the mouse's cursor on one of the GUI's remarkable points). If the latter case occurs, the gestural form reacts, simulating in this way the touches that might occur in dancing the “*Assisted Solos*”. But this is not to say that these algorithmic metaphors simulate the dancing body as such. Rather, they

130 Which is the case of the object named “*Count for Nothing*”. This object's generator is a Youtube video with no apparent relation with Burrows and Fargion's choreographic work. This object can be accessed at <http://scores.motionbank.org/jbmf/#/set/count-for-nothing>.

131 <http://scores.motionbank.org/two>.

132 Retrieved from <http://motionbank.accad.ohio-state.edu/about>.

133 Retrieved from the same address where the “*Assisted Solos*” data can be accessed: <http://scores.motionbank.org/two/#/set/impulse>.

134 The different “*Attentive Agents*” can be viewed at <http://scores.motionbank.org/two/#/set/impulse>.

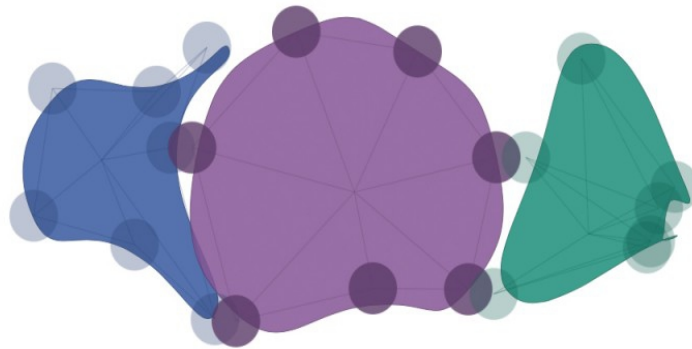


Illustration 13: “Interactive Attentive Agent, an algorithmic metaphor for the Pressure Assisted Solo strategy devised by Thomas Hauert.” Retrieved from <http://motionbank.accad.ohio-state.edu>.

simulate the parameters derived from knowing how to improvise in such a manner. They are digital objects primarily defined by parametric structures that express determinate conceptions of choreography.

To say that an algorithm is metaphorical is to posit the hypothesis that, as a computational procedure, it is capable of thinking in its own terms. In other words, rather than being only the expression of a concept, the metaphorical character of digital algorithms can be thought as pertaining to digital computation itself, but beyond its limited possibilities and the towards the resolution of problems in potential. This is the hypothesis that digital computation is a mode of thought in its own right, one that like any other mode of thought opens processes' actuality to an infinity of potentials. If this is the case, these digital objects can be said to be not only algorithmic metaphors but also metaphorical algorithms. But this of course bears the contradiction of a digital potential, that is, the contradiction that the digital domain is defined both in terms of possibilities and in terms of potentials. Or, better yet, instead of a contradiction, this hypothesis posits the problem of how to relate discrete quantities of data with the continuous character of qualitative potentials. For it to hold, such relation must be thought in relation to potentials existing at the very heart of the digital domain's binary code.¹³⁵ The next chapter will be dedicated to such problem.

¹³⁵ In her book “Moving Without a Body”, Stamatia Portanova asks: “Can objects be processes?”, which is the title of one of the book's chapters (2013, pp. 85–96). In this chapter, the author engages herself in a discussion about choreographic objects, from the perspective of Alfred N. Whitehead's process

In contrast to these algorithmic metaphors, the *TWO*'s 3D animations simply represent dancing bodies, after they have been motion captured.¹³⁶ Though these animations reproduce determinate expressions of dance, they do not necessarily express the choreographic thoughts that moved with the dancers' performance. They correspond more to the result of a translation than to the result of a transduction. Of course motion capture itself follows from technical transductions, which determine the kinds of gestural bodies that in the end will be expressed. But such gestural bodies only serve the presentation of what, after the dances have been registered, is possible to reproduce. The animation of these gestural bodies is no more than the reproduction of the motion capture registers. There is no parametric structure by them expressed that derives from transducing choreography's conceptual structure, that is, from resolving with a process of transduction the implicit problems of choreographic ideas. When motion data is used only to replay what has been registered, these procedures of digitalization cannot be said to be choreographic. If, in any case, the dance's choreographic structure is expressed with these animations, it is not because novel choreographic solutions were attained with digitalization, but only because what has already been determined (in dancing) has also been retained (digitally). The algorithms involved in capturing the dance and animating derivative gestural bodies are therefore functions of reanimation. They render the motion data in terms of what is necessary—a gestural figure recognizable as the dancing body—and sufficient—no deformations beyond the expression of these recognisable forms—to express the memory of past experiences.¹³⁷

The possibilities that these 3D spaces of digital animation allow for, both in relation to the dancing body and in relation to the gestural body, have been far more explored by the “*Reactor for Awareness in Motion*” (RAM) project. Developed since

philosophy, taking as a case study the work of choreographer William Forsythe and the digitalizations performed on it with the “*Synchronous Objects for One Flat Thing Reproduced*” platform. Here, it matters to emphasize that Portanova looks at the algorithmic character of choreographic objects and discusses the possibility of considering both their parametric structure and their generative capacities from the standpoint of a potentiality that exists not only with dancing bodies but also with numbers. In this regard, Whitehead's philosophy allows for thinking algorithms, even digital ones, not only as finite sets of instructions, but rather as processes that are open to and by undetermined potentials (from which results the possibility of radical novelty in whatever case of algorithmic computation).

136 These animations can be view in each of the *TWO* score's sets (<http://scores.motionbank.org/two/#/set/sets>).

137 It should nonetheless be noted that the “*TWO*” score's 3D animations allow both for zooming in and out the scene and for changing the viewpoint in all cardinal directions. The fact that one can roam freely throughout the three-dimensional space allows for visualizing the motion capture registers in ways that video registers don't. If programmed into the animation space, different modes of interaction are possible as well. For example, in the animation “*Redux Interactive*” the user can generate a random series of objects which become actual constraints for the animated gestural bodies, by clicking with the mouse's cursor on the animation space (see <http://scores.motionbank.org/two/#/set/memory>).

2011, by the Yamaguchi Centre for Arts and Media (YCAM), together with Yoko Ando (a dancer from The Forsythe Company), the *RAM* comprises a kit of digital tools for dance research, creation and education. The “*RAM Dance Toolkit*” is an open-source software application, written in C++, which contains a “graphical user interface and functions to access, recognize, and process motion data to support creation of various environmental conditions”¹³⁸. This toolkit can be fed by motion capture systems such as the MOTIONER¹³⁹ or the “*Kinect*” sensor¹⁴⁰. With these data, its algorithms can represent the gestural body in various ways, from more common expressions of choreographic writing, such as Labanotation, to all sorts of geometrical abstractions. The gestural bodies generated with the *RAM* algorithms can then be fed-back to the dancers through audio-visual displays (as seen in Illustration 14, below). With the creation of such responsive environments, the dancers are said to “decide their next movement” on the basis of what is calculated and expressed by the software’s algorithms. In this way, together with the *RAM*, they create the “rules” by which they move. Dancing with the *RAM* “is a means to create and clarify problems, and to address deeper issues”. For such reasons, the *RAM* is said to be “a technological inquiry into the nature of dance”, driven by questions such as: “how do contemporary dancers themselves decide on their next movement?” and “what pattern of thought underlies their movement?”¹⁴¹.

Since the “*RAM Dance Toolkit*” is also an open-source platform for programming environments that can respond to the dancers’ movements, it allows for yet determined ideas to be expressed. Beyond what has been already programmed, the software is open for the inclusion of not yet programmed objects. Anyone with programming skills and choreographic ideas can use this platform to express the latter

138 Retrieved from <http://interlab.ycam.jp/en/projects/ram/>. For all the information on the *RAM* project, see the same address.

139 “MOTIONER is the inertial motion capture system developed for *RAM*. The computer captures the dancer’s movements via 18 sensors attached to the dancer’s body. [...] Using MOTIONER, you can capture, record and playback body movements, and send the data via OSC messages over a network. MOTIONER is designed to work with *RAM Dance Toolkit* using openFrameworks, and will work with creative coding environments that provide OSC. [...] In general, motion capture systems are very expensive and very accurate, or very cheap and very inaccurate. To address this problem [the *RAM* team] designed one which is relatively low in cost and fairly accurate. MOTIONER has been developed with feedback from Yoko Ando and other dancers that resulted in a light weight, low-stress, and low latency system. Because it’s an inertial system, users can attach the sensors inside or outside their clothing. [...] Special straps for the sensors were developed. The straps allow the sensors to be installed properly and flexibly, regardless of the dancer’s body shape. This makes effective measurement possible.” Retrieved from <http://interlab.ycam.jp/en/projects/ram/motioner> and from <https://github.com/YCAMInterlab/MOTIONER/wiki/Overview>. For a complete and detailed description of the whole system (including hardware and software) see <https://github.com/YCAMInterlab/MOTIONER/wiki>.

140 See footnote number 108 on page 153 for a short description of the workings of the “*Kinect*” sensor.

141 Retrieved from <http://interlab.ycam.jp/en/projects/ram/>.

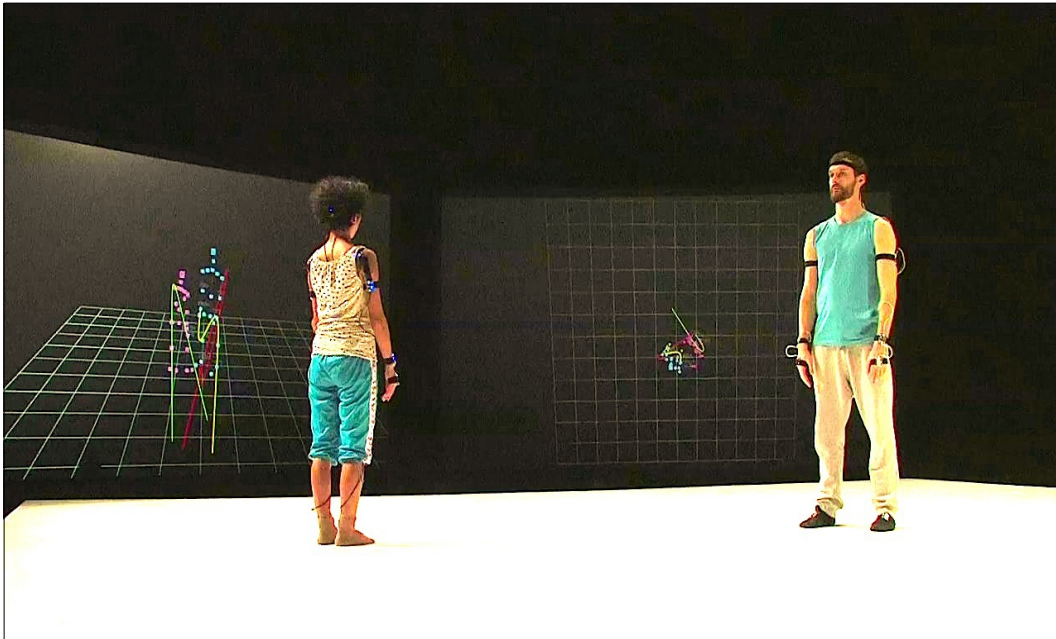


Illustration 14: Still from a movie where it is shown how “dancers react to the information from 'Line', which is one of the 'scenes' programmed into the environmental conditions of the 'RAM Dance Toolkit’”. Retrieved from <https://vimeo.com/64772291>.”

in relation to motion data. In the same way, the digital algorithms already programmed into the software express the choreographic ideas developed in the context of the *RAM* project. These can be divided into two categories. Those regarding possibilities of visualization and those regarding expressive derivations from motion data. In regard to the former there is here too the possibility of roaming freely across the 3D space while the animation is rendered, i.e. visualizing it from different perspectives. But beyond this, there is also the possibility of addressing functions to the viewpoint's perspective (here designated as camera). For example, there is the possibility of constraining the camera with one of the gestural figure's nodes (i.e. articulations). It is both possible to direct it towards the figure's nodes and to make it coincide with them (in which case the animation is viewed from the gestural body's perspective). Moreover, it should be noticed that the *RAM*'s scenes also allow for different motion registers to be reproduced simultaneously. Since each dancing body is here represented with a dataset of its own, different gestural bodies can be animated independently from one another, while still being viewed together in one same animation space. In regard to the expressive derivations from motion data, it is notable that the *RAM* software is equipped with algorithms that allow both for creating extensions, which respond to the gestural body's expressions, and for notating the latter's displacements. At once, these algorithms express choreographic ideas and allow for the expression of new ideas. In the *RAM*

software, the expression of each choreographic idea is designated as “*scene*”. There are nineteen scenes programmed into the available software,¹⁴² each expressing a choreographic idea of how to extend the gestural body. The correspondence between each scene's algorithmic set and a determinate choreographic idea is confirmed by the project's team when affirming that, by “[t]aking advantage of the power of computer programming, *RAM* externalizes the scenes dancers have in their minds. With *RAM*, dancers can visually observe their ideas and gain a real-time feedback of their movement from the environment. It enables them to experiment more with their perception and movement”¹⁴³. Each of these scenes is therefore a case of solution for determinate choreographic problems.

The *RAM* software also comes with a series of presets, which combine different scenes. For example, one of the presets combines the choreographic idea of dancing with a temporal delay and the choreographic idea of snap-shooting the gestural body (as seen in Illustration 15, below). The algorithm that here computes the temporal delay is called “*Hasty Chase*”. This scene is rendered after the algorithmic compression of the gestural body into a buffer, which is then computed into a replicant expression, but in delay. This delay can be stretched or shortened and reproduced faster or slower, according to the user's determinations. Moreover, it is possible to visualize the two

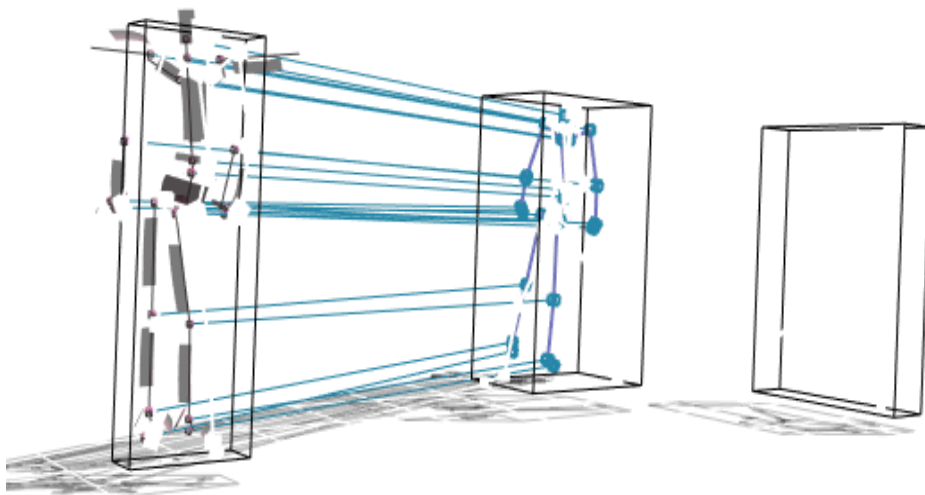


Illustration 15: Still from RAM's motion capture registers of one of Yoko Ando's dancing sessions. Processed with the algorithms “Hasty Chase” (the figure in blue), “Stamp” (the black boxes), and “Natto” (the lines in blue).

142 Which can be downloaded at: <https://github.com/YCAMInterlab/RAMDanceToolkit/wiki/Overview>.

143 Retrieved from http://interlab.ycam.jp/en/projects/ram/about_ram.

figures' connection with the elastic strings of the “*Natto*” scene. With it, it can be seen in a precise way how this choreographic idea is expressed digitally while being thought (i.e. moved) by the dancing body. Here, as in many other *RAM*'s scenes, the gestural body's extensions depend directly on the dancing body's responses. Finally, this preset combines these algorithms with the scene “*Stamp*”. This scene allows for the user to define a temporal metric according to which the gestural body's position is marked with a box. While the dance develops, the animation space gets increasingly populated with these boxes, which can contain (or not) the gestural body's figure as captured by the snapshot. Both this one combination and the remaining presets are but a few examples of the variety of ways in which the *RAM* software is capable of extending the gestural body.

Importantly, the *RAM* is said to “provide the dancers with a way to recognize their subconscious movements by altering the dimensions of their everyday physical perception and creating a disparity from what they are used to”. As such, this is a software that “inspires new ideas for dance”.¹⁴⁴ This could not express more bluntly how much the *RAM* is a system of technical individuation. There is the choreographic individuation of this software's scenes and there is the individuation of ideas expressed by those who learn how to dance with the software. In this sense, the *RAM* is a whole system of choreographic individuation, one that co-individuates choreographic ideas in the digital domain and in the domain of the dancing body. In fact, as much as the algorithmic determinations of choreographic ideas in the digital domain consist of different possibilities, the learning subjects can think differently of their movements. In these conditions, it is possible for the dancing body to know itself on the basis of a difference regarding not what it can perceive immediately of itself, but rather what it can perceive of what is digitally computed. At the same time that the content-expression encounter of choreographic writing provides the conditions for a difference to be expressed, the content-expression encounter of choreographic thinking individuates the knowledge of an extended perception. In this guise, perception can be seen as a variety of differences that condition the individuation of knowledge. Differences that, in relation to one another, bring the overall system of individuation to novel states of resolution.

All these examples of digital choreography attest one thing: the diagrammatic topology of choreographic ideas is also algorithmic. As mentioned before, this shouldn't

144 Retrieved from http://interlab.ycam.jp/en/projects/ram/about_ram.

be understood as the choreographic object being algorithmic because it is digitally programmable, but precisely the opposite: it is programmable because it is algorithmic in itself. Such algorithmic character of choreographic objects regards the fact that they are resumable across domains. It regards the fact that they are known and, as such, conceptually structured. In relation to technical individuation, it is this intelligibility that allows for choreographic objects to be transduced across domains and, in this case, digitally programmed and expressed. All the algorithms discussed above are choreographic functions of expression. They not only express choreographic diagrams, but they also express how such functions are manifested when in relation with given quantities of data, i.e. matters of content. The fact that both parts in this content-expression encounter are sets of digital data attests their codification and programmability. It is this last feature that allows for digital data to express the dynamic character of choreographic objects. A program, instead of just expressing one possible solution for the problems in case, can iterate computations and express the many solutions existing in the content-expression encounter of each digital choreography.

From this standpoint, it should be asked: are these digital choreographies capable of novel ideas? Of course the case just mentioned, of the *RAM*, attests precisely this. But it does so with potentials belonging not only to the digital domain but to the overall technical system of individuation (including all that is analog). Instead, the question that remains to be asked is: are algorithmic computations capable of expressing novelty as such, when only the digital domain is considered? If so, it should be acknowledged that this can lead to non-programmed expressions, being themselves charged with the potentials of novel ideas. The next Chapter will follow this hypothesis.

Chapter 6 - DIGITAL POTENTIAL

In accordance with the exposed at Section 4.3, the notion of “algorithmic metaphor” accompanying the last Section's examples entails the possibility of considering digital computation as a mode of thought with its own potentials. Such possibility is a plausible way to delve into the question posed in Section 1.2 of whether the encounter between dance and technology can ever be granted its own potentials and, therefore, the capacity to individuate novel cases of solution with regard to choreographic knowledge (i.e. the question of the technogenetic body). This next and final chapter will pursue this possibility and discuss its implications. Section 6.1 will posit the problem of a digital potential. It will departure from Erin Manning's plea for a vocabulary of process, capable of tapping into the unmappable reality of movement, in order to posit the hypothesis that digital computation mobilizes its own potentials, beyond the usual conception that such operation is dependent upon possibility only. Section 6.2 will pursue this hypothesis by drawing both from Andrew Goffey's conception of algorithms and from Gregory Chaitin's theory of algorithmic complexity. Specially the latter will be useful to consider that, at the very level of binary computation, there exist incomputable quantities of data that exceed the synthetic resolution of digital expressions. Such notion will be then contrasted with two ontologically distinct conceptions of objects. Respectively, Sections 6.3 and 6.4 will expound Graham Harman's object-oriented philosophy and Alfred N. Whitehead's theory of the “extensive continuum”. If the first approach will provide the means to consider digital algorithms in phenomenological terms, the second approach will allow for considering objects as processes. Both the one and the other will attest the ontological implications of Chaitin's theory of algorithmic complexity and, in this way, provide the means to understand how can a digital potential be like. From this standpoint, Section 6.5 will discuss Luciana Parisi's notion of “soft(ware) thought”, which draws greatly upon both Chaitin's theory and Whitehead's philosophy. It will be shown how this notion is opposed to theories of cognition and, as such, proposes digital algorithms to be related to an infinity of uncountable parts, which cannot computed.

6.1 - Problems in Potential

By now it comes with no surprise that the gestural body of choreographic notation is capable of becoming propositional. Not in itself, but rather as the expression of a choreographic knowledge that can elicit further learnings. Be it in the case of traditional systems of choreographic notation or in the case of algorithmic calculations of quantitative data, the expressions of choreographic knowledge can propose the individuation of novel solutions for the problems that in the first place originated them. For the learning subject, the expressions of a choreographic idea necessarily act as a sign of difference. They can elicit the feeling of a contrast sufficiently intense to prompt novel resolutions. Notwithstanding, from the perspective of choreographic transduction, the expressions of a choreographic object are a point of rest. As what results from technical individuation, they represent cases of solution with regard to the object's problematic ideas. They arrest the potentials of choreographic ideas with determinate forms of expression. And insofar as choreographic expressions implicate conventional definitions of gesture, they can be said to hold in form the same potentials of the technical contexts in which they have obtained a determinate value of signification. The expression of choreographic knowledge in the form of gesture is thus not a matter of truth, but rather a matter of negotiation (what does that sign really mean?). What is kept in form is convention itself.

Beyond the conventional agreements that define gesture in terms of its conformity to the requirements of written language, Erin Manning proposes something different. Instead of a gestural body established in these terms, the philosopher rather suggests “establishing a kind of grammar of movement that would—paradoxically—be more likely to tie the body to some preestablished understanding of how it actualizes”, that is, to “[...] the potential of the wholeness of movement, including its 'unmappable' virtuality” (2009, p. 61). A grammar of process according to which neither dancing bodies nor technologies of writing are conceived as being external to one another, i.e. as being the supplemental extension of one another, but rather as being varieties of one same process of technical individuation. In short, the grammar developed throughout this study.

It is important to notice why, for Manning, such grammar holds the status of a paradox. On the one hand, as much as “[a]n engagement with technology and dance demands an encounter with the syntax of the moving body” (2009, p. 61), the body

needs to be approached grammatically, that is, it needs to be understood as being articulable with itself by means of expression. On the other hand, as much as the dancing body is defined by a plane of movement where actuality and virtuality rhythmically co-compose one another, it necessarily resists articulatory reductions. In this sense, the dancing body is unmappable. Its expressions are but partial samples of its whole movement. To create gestures with the dancing body is thus to cut the latter's potentials into discrete and articulable sections. Which is the reason why “a focus on gesture (defined as extensive displacement of body parts divisible from a wholeness of movement) tends to lose sight of movement’s incipency, thus overlooking the virtual opening [that] sensitive technologies wish to encounter.” (Manning, 2009, p. 62).

It is true that digital technologies such as the ones discussed in the previous chapter are not always developed together with dancing bodies. In such cases, dancing bodies and digital softwares can only encounter one another by means of what is possibly given, i.e. predetermined and preset before their encounter. This is, for example, the case of the relation between the “*Gesture Follower*” (GF) software,¹⁴⁵ which requires being given determinate definitions of gesture to recognize determinate expressions of motion, and the learning subject's dancing body. From the latter's perspective, the definitions of gesture given to the software determine what is to be learnt. Even if granted that what is learnt is not a given form but a principle of individuation, the dancing body remains nonetheless limited by the possibilities inscribed into the software's algorithms. It needs to conform with the software's definitions of gesture for this to recognize its motion and for it to learn what its relation with the software holds in potential. The dancing body can, notwithstanding, express more than what is defined as gesture. Its excess can easily not conform to the definitions of gesture inscribed in the software (just think of all that is too small or too large for the motion devices to capture). But if a determinate gesture is to be learnt, then what is expressed with an excessive body needs to conform to what has been programmed into the software.

This doesn't regard, of course, the fabrication of the software itself. If, from the perspective of the learning subject, the *GF* corresponds to a set of possibilities, from the perspective of its own individuation there's necessarily more to it than possibility only. After all, the definitions of gesture embedded into the software express the knowledge that, in a first moment, existed with the dancing body and that, in a second moment, has

145 See Section 5.1.

been transduced into the digital domain. The fact that such transduction individuated novel instances of knowledge with regard to the dancing body itself, attests that this was not a unilateral process. The *GF*'s concretization individuated instances of knowledge that were expressed digitally and understood abstractly (by the dancing body itself). This process can therefore be said to have been a co-individuation through which the resolutions of the one domain depended on the resolutions of the other. A technical individuation that, while moving the potentials of its system's multiplicities, co-individuated dancing bodies and gestural bodies.

The same can be said in regard to the other examples discussed in this study. Though these projects might not have been specifically focused on Manning's call for the constitution of a grammar of process, all of them have notwithstanding individuated instances of knowledge that, while concerning the dancing body, became expressed gesturally. Moreover, as exemplified by the *GF*, some expressions of gesture individuated precisely from dwelling upon the dancing body's emergent character and its principles of individuation. But what Manning proposes is of another order. It is of the order of technogenesis itself: a vocabulary that, rather than only objectifying the dancing body for the purpose of transducing its principles of individuation, can express the very processes by means of which dancing bodies and gestural bodies co-individuate with and co-constitute one another. In her words: "If a vocabulary of gesture is to be reclaimed as part of what can be stimulated in the encounter between dance and new technology, I believe it must be done through the continuum of movement, through the body's emergence in the realm of the virtual becoming of preacceleration. Rather than moulding the body to the measure of motion-detecting technology, I propose we begin with pure plastic rhythm, situating the sensing body in movement in a mutating matrix of technological becoming. Let's call this body-emergent technogenetic." (2009, p. 62).

What Manning's plea stresses is the fact that, in this movement of co-individuation, there is a continuum where both dancing bodies and digital technologies are in contact with one another and where they affect one another, reciprocally, for a mutual becoming. Hence, this continuum of movement does not correspond only to the dancing body's plane of composition. It is also the continuum of movement through which technogenesis unfolds and therefore the very plane of composition from which its expressions derive. This is also what Manning understands by preacceleration, i.e. the movement before expression. It is the process through which the abstract machine ingathers potentials and engenders the greatest forces. A process with a topology where

tendencies inform the system to compress the virtual into the actual present. Whereas acceleration can be understood as a relation between metric spaces, preacceleration is the very movement by means of which the virtual tends towards actual incipency. Insofar as this is a durational movement, preacceleration is the movement through which the unconscious tends to become sensible and intelligible. Hence, it is an intensive movement, of intuition, rather than an extensive one, of expression.

The virtual-actual continuum through which dancing bodies and gestural bodies co-compose one another should therefore be thought in terms of the individuating system's associated milieu. It is with the system's excessive reality, i.e. its technicity, that both dancing bodies and gestural bodies can come into relation, not as supplementary extensions of one another, but rather as different actualizations of one same field of potentials. It is in this sense that, according to Manning, “[w]e must move beyond the prosthetic as an external category toward an exploration of the originary technicity that technogenesis taps into” (2009, p. 66). This originary technicity corresponds to the system's capacity to compose technical individuals. It corresponds to its capacity to bring into emergence the resolution of its implicit problems in different domains. This is a capacity that only acquires an operative value by means of transduction. It is only through transduction that the system's abstract machine becomes capable of acting out resolutions in different domains. It is only by its means that dancing bodies and gestural bodies can be said to derive from one same choreographic idea.

Transduction is not a simple passage from one state to another. Rather, it reconfigures the very context in which it occurs. As a process of informational transfer, it changes the milieu of its own individuation. It is by means of transduction that technogenesis can tap into the field of its system's originary technicity. Precisely because of this, says Manning, “[t]echnogenesis cannot be premapped. [...] Rather than mapping the technology—as a prosthesis—onto a moving body, it is necessary to incite the movement to appear out of the technological process that is the machinic assemblage of individuation. To make the movement appear does not mean to restrict the movement to the parameters of the technology. It does not mean to delimit movement to gesture. We require operations that traverse the spectrum of the technology's potential metastability in relation to a becoming-body. When technology begins to operate along this spectrum it forms an associated milieu with the interval that is the becoming-body. Technology not mapped-onto but emergent-with a body-becoming might make different durations felt along the stratum that is the sensing body

in movement. [...] There is no doubt this already happens – but still too rarely. Techniques for technogenetic emergence must become part of the technology's interface: we must develop techniques that create new associated milieus never distinct from the ontogenetic body. Technological recomposition must no longer be inserted into a body-system: it must be emergent with it.” (Manning, 2009, pp. 74–75).

It is for this reason that, if dancing bodies and gestural bodies are to co-individuate, such must happen in relation to one same associated milieu. In this sense, the associated milieu of the technical individuals in formation is a condition of their differentiation and of their choreographic nexus. This is also to say that the co-individuation of dancing bodies and gestural bodies corresponds to the emergence of different species of technologies. There are technologies that allow for choreographic transductions to occur and there are technologies that allow for choreographic transductions to be resolved in domains of mnemonic extension. In technogenesis, the informational exchange between what will have become a dancing body and what will have become a gestural body is key for the process to tap into the system's originary technicity. With the exertion of problematic forces onto what is given, both the dancing body and its gestural expressions can emerge from one same relation. Both of them can result from and belong to one same problematic field, which is the system's very technicity. If dancing bodies and gestural bodies are not to supplement one another, these different technologies must become one another's associated milieu. Their individuation must result from an exchange of information between potentials belonging to different orders of magnitude, but yet belonging to the same topological continuum.

Furthermore, asks Manning, if “[t]echnogenesis cannot be premapped, [h]ow then can it work alongside a technological system whose parameters are set?” (2009, p. 74). This question pertains, evidently, to the limits of possibility of the digital domain. It pertains to the tension between the excessive reality of the dancing body and the possibilities of digital computation. The answer to this question might be approached by considering the invention of technologies that, at once, deal with the potentials of individuation and with the kinds of relation whereby different species of individuals are expressed. Such technologies allow for what has been resolved in one individuation to be differently known or expressed in another, by means of transduction. In other words, the answer to this question regards not the determination of parameters on the basis of what is given and known, but rather their determination on the basis of what is not known. Which is to say that digital algorithms need to be invented together with the

actuality and the virtuality of movement. As Manning puts it, the question is then “[h]ow to create functioning parameters for software development on the basis of something that cannot be known, that can only be felt in its effects? Technology becoming technogenetic involves inflecting the digital with virtual potential, bringing to the fore movement’s incipency and its relational matrix. How does a movement that cannot yet be seen make itself known?” (2009, p. 72).

From the examples discussed throughout this study, it is perhaps the *GF* that attends the most to these concerns. After all, its algorithms strive to depict what cannot be computed as such, i.e. qualities of movement. To invent digital algorithms that define movement qualities in terms of discrete quantities of data is to necessarily undergo a process of transduction. If the software is to recognize gesture on the basis of a quantitative definition, it needs to be set according to parameters that express the subjective and conceptual diagrams of gesture, as known from and with the dancing body's experience. For such transduction to occur, movement needs to be experienced in all its varieties. An experience tantamount to a subject constituted together with the constitution of what it comes to know. A subject that, because of being embedded in the same milieu of potentials from which movement comes to be expressed, necessarily experiences movement's intensive incipency towards the actualization of extension.

The knowledge of a movement quality is therefore a processual one. It regards the process whereby determinate expressions appear and not solely their appearance. Notwithstanding this knowledge's analogical character, the *GF*'s algorithms do in fact correspond to determinate quantities of data and, as such, to the expressions of the dancing body. Here, recognition occurs on the basis of given possibilities, which when actualized regard but the end product of individuation. Nevertheless, these algorithmic definitions of gesture can express gesture in different ways. After all, they are set to not only compute variable quantities of data, but also to do it in accordance with a parametric structure that is itself a set of different possibilities. In this sense, these algorithms convey not a knowledge of gesture as finalized expression, but as the resolution of a movement that comprises virtuality and actuality, preacceleration and displacement, potentials and possibilities. The reduction of these varieties to the expressive possibilities of digital media should therefore be here understood as the resolution of an individuation from which the knowledge of movement as a whole was not absent. The subjects involved in this process were sufficiently implicated in it to individuate a knowledge together with the individuation of the objects known. Were their knowledge not an analogical one, and these algorithmic expressions would

probably not allow for such a degree of variation.

Some other digital algorithms of the choreographic objects discussed in the previous chapter also stand as good examples of how to create parametric structures on the basis of what cannot be known and is accepted as such. The *“Reactor for Awareness in Motion”* responded quite precisely to Manning's question by having developed some of its algorithms not only on the basis of what was known about the dancing body, but also in accordance with a co-individuation of dancing bodies and gestural bodies. Not only were the problems of how to represent the dancing body in the digital domain the source from which determinate resolutions were extracted, but also the intertwining of dancing bodies and gestural bodies in the process of their development served the determination of resolutions that, rather than only conforming dancing bodies to the possibilities of the digital domain, expressed the veritable technogenesis of their affective and co-constitutive relation. This is how the digital domain gets infected by what cannot be known but that, notwithstanding, contributes determinately for the technical system's development. It is by means of this co-individuation between dancing bodies and gestural bodies that the virtual potentials of the system's associated milieu get to be conveyed towards resolutions proper of a technogenetic process. Which is also Manning's understanding of how to resolve the problem of technogenetic transduction when including the digital domain into the system of individuation. Since digital computation cannot tap into the virtual because it “must conform to actual ones and zeros”, for the philosopher the solution resides in “bringing the analog into the digital mix (by intermixing new technologies with dancing bodies such that the dancing body is emergent with the technology rather than simply added to it), [so that] the technical system might tend toward ontogenesis, toward technogenetic evolution” (2009, p. 65).

But this position also entails the credo that digital algorithms, in themselves, are but a set of programmed possibilities with no relation whatsoever with the virtual. What this view perhaps dismisses is the capacity of digital computation to stand by itself as a mode of thought. In which case the compression of data into data, i.e. the calculation of possibilities for the expression of determinate cases of solution, would necessarily comprise the ingression of virtuality into computation itself. It is a condition for digital computation to occur within the limits of its own possibilities. Digital algorithms compute data according to determinate parametric structures and within the possibilities of digital coding itself. But if the result of algorithmic computations in the digital domain is the accretion of data on data, it can be argued that, being this an event, it necessarily holds at some point a relation with virtuality. The temporal vector that is

formed with the accretion of data can be argued to correspond not only to the progression of a metric time, but also to the durational experience of the computational system. Hence, the question is: can experience be addressed in any way to digital computation? In other words, and besides the technogenetic mixing of analog and digital domains, can the very process of digital computation regard the durational progression of a virtual experience? If so, the digital domain would comprise in itself unmappable dimensions. It would be excessive in relation to itself and its algorithmic computations could be understood as modes of thought in their own right.

The question regarding whether or not the virtual is a constitutive dimension of digital computation can be understood in two different ways. It can be understood in terms of how the digital domain affects with its own indetermination the progression of technical experimentation. And it can be understood in terms of how digital computation is itself pervaded by undetermined potentials, being therefore irreducible to determinate sets of limited possibilities. These two perspectives can, notwithstanding, be thought as corresponding to one same reality. For, if the case in question regards how potentials can exist with the expressive determination of digital choreographies, then what must be acknowledged in regard to potentiality itself is the very fact that, as this verges virtuality towards actuality, it distributes tendencies of formation throughout a topological continuum without which different orders of magnitude could not communicate. This continuum was already mentioned to be the means by which different multiplicities connect with one another and form differentiated parts of one overall encompassing whole.¹⁴⁶ But, further, it bears with itself the hypothesis that the distinction according to which continuity is exclusive of virtuality and discontinuity exclusive of actuality no longer holds. The indistinction between the one and the other would thus allow for potentiality to pervade not only the conditions on which technogenetic transductions unfold but also the very workings of digital computation. In this case, not only would digital algorithms have to be considered together with a continuum of constitutive potentials, but also the relation between virtuality and actuality would have to be reconsidered with regard to this same continuum. This chapter's following sections will entertain this idea, of which it can be advanced that, as it has already been mentioned in other various instances throughout this study, rhythm is key. It is by means of a rhythmic relation between potentials belonging to different orders of magnitude that the virtual and the actual can be said to exist immanently in one another, not any longer on the basis of a distinction between intensity and

¹⁴⁶ See pages 33 – 37 of Section 1.1.

extension, but rather on the basis of a continuum of potentials where these dualities no longer hold. In this sense, this is a hypothesis that dismisses the Bergsonian distinction between duration and space, only to call for yet another way of conceiving the relationship between qualities and quantities.

Posing questions with regard to the experiential character of digital computation is therefore not to dismiss the necessity of inflecting the digital with the analog, but rather to question whether the digital domain is itself capable of generating novelty as such. If digital algorithms are to be thought as being constituent elements of technical networks, communicating not only with one another, but also with other technical individuals, their computational system must be granted to comprise the undetermined potentials implicated in informational exchange. In this sense, the creation of novelty should be possible in the digital domain without any necessary recourse to its analog counterpart. Of course the one cannot be thought without the other, for the analog pervades the digital as the very ground on which this runs. But to say that the digital domain can generate novelty is to say that, at the very level of digital code, algorithms are capable of more than what is possible. In other words, insofar as digital computation can generate novelty, it must comprise more than possibility. If the excessive reality of digital computation is to be found at the very level of binary code, then its potentials might very well be not qualitative but quantitative. This hypothesis, according to which there might be quantities of data that, despite of being constitutive of the digital domain, are not computable, necessarily implies a notion of potentiality that, rather than regarding only qualitative potentials, regards as well quantitative ones. With the idea of a continuum of potentials extending itself throughout different domains of expression, the very distinction between analog and digital domains dissipates to give place to a distinction between unstructured and structured quantities of data. Likewise, and inasmuch as the notion of a continuum in extension is, according to what has until now been discussed, a paradox, both the duality between continuity and discontinuity and the duality between quantities and qualities become blurred. This notion of “extensive continuum” will be here approached from the perspective of Alfred N. Whitehead's philosophy of extension (1978, pp. 61–82). For it has been he, as philosopher and mathematician, who most thoroughly proposed and discussed this idea and its implications in what regards the relation between actuality and virtuality, potentiality and possibility, the past and the present, and so on. Importantly, the notion of structure remains key to understand how potentials can be simultaneously virtual and actual. Meaning that, not only in regard to digital media, but also in regard to systems of

individuation in general, the extensive continuum's potentials can only be understood as data that is not structured, that is, as the unstructured kind of data that pervades whatever determinate form.

6.2 - Algorithmic Complexity

The notion of “algorithm” is endemic to computer science, where its definition finds in the words of American philosopher David Berlinski a synthetic and precise enunciation: “an algorithm is a finite procedure, written in a fixed symbolic vocabulary, governed by precise instructions, moving in discrete steps, 1, 2, 3, whose execution requires no insight, cleverness, intuition, intelligence, or perspicuity, and that sooner or later comes to an end” (2001, p. 9). In the guise of what has already been mentioned, this enunciation depicts, even if not explicitly, an algorithm's transductive character. It affirms algorithms as concrete cases of solution for the problematic abstractions from which they derive. As the expression of problems, they convey possibilities of resolution. As solution, they can be seen either as simple mechanical formulas or as propositions capable of eliciting further individuations. And if, as proffered by Whitehead, “the proposition constitutes what the feeling has felt” (1978, p. 186), then the question is how can propositional algorithms feel the data computed? Such question will be discussed ahead. For now, what matters to notice is that, as technical objects, digital algorithms are interfaces apt to convey transductions. They convey the knowledge of a determinate problem into a computational system that, if it proceeds on the basis of informational exchanges, it necessarily inflects its own development with undetermined potentials. On this ground, digital algorithms must be seen not only as mechanical recipes.

As interfaces of transduction, algorithms necessarily bridge abstraction and expression. If considered from the perspective of their expressions, algorithms do function as signs for the computation of solutions to the problems that they pose. If considered from the perspective of their abstractions, algorithms are conceptual tools that can be expressed in different domains. From which it follows that each algorithm requires an appropriate domain of expression. A cooking recipe, for example, as a function of expression, requires not a digital matter of content but rather actual food. And this is not to say that the encounter between the one and the other cannot be simulated by digital means. As already mentioned, to the extent that the possibility

space of digital simulations coincides with the simulated processes' space, it can act as the condition after which cases of solution that are also possible in regard to the referential process are expressed. Notwithstanding, the digital simulation of a cooking recipe does not result in edibles. Hence, it does not resolve the problematic structure of the diagram to which it belongs. In the same way, a mathematical problem might very well be better resolved by means of digital computation than by the exercise of cooking. But beyond the adequacy of domains of expression in regard to the problematic structure of determinate diagrams, the transferability that the latter's abstractions assure in regard to the former attests the fundamental core of an algorithm. If one same algorithm can be expressed in different domains, it does not depend on them. As such, it is determinate and abstract. It is the diagrammatic arrangement of a knowledge that pertains to the ways in which a given problem can be solved.

The relation between an algorithm's abstractions and its material conditions of execution can be thought either in terms of the extrapolation of formal procedures into material processes or in terms of their pragmatic reality, that is, from the perspective according to which algorithms, by and in themselves, are “actants” (Latour, 1996). The first approach marked the advent of cybernetics as a science of control based on the idea that physical processes are reducible to mathematical abstractions and that, therefore, they can be simulated—of which one recent reformulation has been proffered by mathematician Stephen Wolfram (2002), who conceives of the whole universe as a giant computer, reducible to the mathematical calculation of algorithmic sets. The second approach fundamentally deals with the notion that there are incomputable data that not only pervade algorithmic computation but that moreover are its very condition—a notion that not only undermines the first approach but that also obliges algorithms to be considered together with their associated milieus. The basic argument of a pragmatic approach to algorithmic procedures, which opposes it to any sort of radical formalism, is put in the following way by media theorist Andrew Goffey: “formal logics are inherently incomplete and indiscernibles exist” (2008, p. 19). And what this means in regard to the actual effects that algorithms might have in the world is that, at the very heart of the processes with which datasets are computed for the generation of novel facts of unity, exist incomputable and random quantities of data that open what would be otherwise finite to unpredictable modes of affect, connection and creativity. In this way, what most fundamentally defines the pragmatic approach to algorithmic computation is the fact that it not only takes into consideration the possibility spaces of each dataset but also the potentials that pervade them.

Already in the beginnings of computer science, Alan Turing had acknowledged the existence of incomputable problems within computation. The British mathematician conceived of the Turing machine, the first prototypical computer, as an algorithmic application capable of determining whether a problem was susceptible of being solved mechanically or not (Herken, 1995). The algorithmic set of instructions given to it was in this case, as well as in the case of the computers that would follow, the basic condition on which this could solve a problem or not. In this sense, and as much as computation can be defined in terms of problem solving, algorithms are its fundamental condition. Algorithms are the model with which a given problem can be computed and actually solved. Symbolically, this is expressed by means of a procedure that computes whether a given number belongs to an algorithmic set or not. By making use of Boolean logic,¹⁴⁷ computer science has dedicated itself to investigating how to answer to sets of questions by means of a binary logic, always answering either yes or no. In the binary language of digital code, this means that all the possible variables of a given set are defined as 1 (the universal set), whereas 0 defines an empty set containing no variable of the algorithmic set defined by 1. Digital computation therefore corresponds to the mathematical calculation of whether a variable corresponds to the universal set defined by 1 or not (in which case it is defined as 0). And it is at this very level, which is the level of the formal languages with which algorithms can be both abstracted and expressed, that the openness required for their operation manifests the incompleteness of calculation. For, as media theorist Luciana Parisi reminds us, “Alan Turing demonstrated that there is no computable function (no finite binary set) that could correctly answer every question in the problem set. This meant that not every set of natural numbers is computable, and Turing’s description of the halting problem (the set of Turing machines that halt on input 0) is one example, among many, of an incomputable set” (2013, pp. 260–261).

It is from this very notion of incomputable data existing at the heart of computation that an algorithmic pragmatism can be asserted. For if algorithms can only be said to act insofar as they are open to informational exchanges, then what their action necessarily comprises is a constitutive indetermination and the immanence of

¹⁴⁷ This modality of logics, which also goes by the name of pure mathematics, was theorized by British mathematician George Boole in 1847. This is a logics that favours abstract and universal operations, instead of concrete and relative ones (such as those involving quantities and magnitudes). From this dismissal, the mathematician formulated an algebraic system, known as Boolean algebra, which represents sets and subsets of abstract or actual things and the operations relating them (i.e. coincidence, intersection, inclusion, exclusion and so on). Importantly, for what regards digital programming, these operations are represented with symbols which indicate values such as OR, AND and NOT.

incomputable data in computation. Moreover, the fact that an algorithm's operations cannot be considered independently from its data structures determines that its action necessarily implicates all the data that it cannot compute. The upshot of such implication is that algorithmic indetermination is a fundamental condition of computation, a postulate that Parisi also acknowledges by defining computation as “the capacity of algorithms to compress infinite amounts of data”, whereby “incomputable data must be the condition, and not the result, of computation” (2013, pp. 260–261). Even modern computers should be understood according to the indetermination that in them is implicit. Algorithms are not pure automatic procedures working with absolute sets of data. Rather, they are technical individuals programmed with limits that regard the range of possible commutations in the electronic circuits which mediate them. Algorithms are technical objects designed for operating within the margins of indetermination given to the computational system.

It is with these random and incomputable quantities of data that the potentials of algorithmic emergence can be thought. As potentials they remain undetermined. As data they are given. And though this might seem a paradox according to what has until now been expounded, what the notion of given potentials entails, is the actual redefinition of what potentials are and how they exist amidst systems of individuation. In other words, these are potentials that no longer can be thought only in qualitative terms, resulting only from the intensive interplay of forces constitutive of continuous multiplicities, but that need to be thought in quantitative terms. In this way, actuality itself becomes potential: not the actual remarkable points of individuated structures, but rather the actuality of all those points of an individual that are not remarkable but yet constitute the charged ground against which the individual is remarked. From this standpoint, it can be argued that what is potential still remains qualitative, since it necessarily results from intensive forces that relate random and structured quantities of data between one another. Under these conditions, potentiality can be argued to remain relational and thus dependent on the intervallic forces with which forms (random or non-random) affect one another. But what the notion of incomputabilities brings forth is the very idea of a past that, despite being given to the constitution of novel facts, is not determinately given. In other words, what is given is not known, it is random and, as such, unpredictable in regard to the ways in which it might come to ingress into novel facts of unity. For this very reason, Goffey writes that: “just because the development of an algorithm requires a level of *de facto* formal abstraction, which then allows that algorithm to be applied to other kinds of content, does not mean that we have exhausted

everything that we need to know to understand the processes of which it is a part” (2008, p. 18). What the notion of given potentials thus proposes is a redefinition of the relation between quantities and qualities. In other words, if potentials can be thought as pertaining both to what is given, but yet unknown, and to the intensive forces with which disparities amidst these random quantities of data come to occur, what necessarily needs to be acknowledged is the processual character of potentiality. The constitutive immanence between qualities and quantities needs to be considered from an affective point of view, according to which a permanent rhythm of actualization and deactualization, quantification and qualification, forces the individuating system to inform the future (individual) with what is given from the past. Given potentials thus concern the unknown both in actuality and in virtuality. And, as it will be discussed ahead, because the past can be given undeterminably, virtuality can also be seen as random quantities of data, rather than only as a transcendental kind of memory.

Goffey points out two different aspects that offer a mode of approaching these incomputabilities. First, the structuration of data implicates an “incorporeal transformation”¹⁴⁸ that, by definition, cannot be computed. This means that the passage from raw data to structured data, necessary to the operation of algorithms, implicates a change in the status of the things to which they correspond. Take the example of a personal name inscribed on an online form for a journal's subscription. Before the array of alphanumeric characters is included in the server's database, the person in question is not yet a subscriber. After the name has been included, the person has become a subscriber. The transformation of the person's status, which corresponds for example to a change in the way the person thinks of itself, is missed by the structuration of finite sets of data. In spite of occurring together with the algorithmic procedure, this incorporeal transformation is not accounted for by the structuration of data. Algorithmic procedures effect changes that are neither compressible nor computable. In Goffey's words: “Algorithms act, but they do so as part of an ill-defined network of actions upon

¹⁴⁸ This expression, “incorporeal transformation”, is used by Goffey with the precise effect of echoing both J. L. Austin's speech act theory and Michel Foucault's philosophy of the event. In regard to the former, it is known how Austin differentiated the constative and the performative elements of an act of speech. On the one hand, a speech act does describe things in the world, but on the other hand it also effects changes in the world. In this sense, the performative speech act refers only to itself, enacting the semantic value of speech (Austin, 1975). In regard to the latter, it is here enough to quote how Foucault implicated incorporeality at the heart of the event: “[...] certainly not immaterial; it takes effect, becomes effect, always on the level of materiality. Events have their place; they consist in relation to, coexistence with, dispersion of, the cross-checking accumulation and the selection of material elements; it occurs as an effect of, and in, material dispersion. Let us say that the philosophy of event should advance in the direction, at first sight paradoxical, of an incorporeal materialism.” (2007, p. 231).

actions, part of a complex of power-knowledge relations, in which unintended consequences, like the side effects of a program's behaviour, can become critically important" (2008, p. 19). This can be better understood when recalling Simondon's theory of networks. The very networkability of algorithms (with data structures, other algorithms, machines, machine's users, and so on), implicates resonances that can easily involve regions of the network that are not directly implicated in a given computation. The "side effects" of a computation can in this way be located at any point whatsoever of the network partaken by an algorithm.

Another way to conceive of technical networks is through what media theorist Matthew Fuller (2005) designates as "media ecologies". The author has developed this notion in order to account for the fact that, be it at the level of the mechanical supports dedicated to the transmission of events or at the level of the software with which information is codified, the objective unification of a whole does not suffice to explain the processes by means of which technical networks evolve. Modes of potentiality must be considered as being constituent of the systems composed by the interaction of media objects. For Fuller, "the only way to find things out about what happens when complex objects such as media systems interact is to carry out such interactions – it has to be done live, with no control sample". And, in order to do this, he further adds, "[o]bjects [...] should also be understood to mean processes embodied as objects, as elements in a composition". In this sense, the constituent parts of one whole "no longer exist simply as discrete bits that stay separate", but rather "set in play a process of mutual stimulation that exceeds what they are as a set". (Ibid., p. 1). As in Simondon's theory of individuation, here too, information exceeds the set's constituent elements. It opens the technical system to an associated milieu of potentials, which is the very means by which the system can in any case access its preindividual reality and engender from its own resources novel resolutions. As such, objects can be considered from the viewpoint of the processes that they partake and of which they are a remarkable expression. A standpoint that accords with the notion of ecology, which for Fuller is "one of the most expressive that language currently has to indicate the massive and dynamic interrelation of processes and objects, beings and things, patterns and matter" (Ibid, p. 2). As it perhaps has already become explicit throughout this study's development, conceiving objects as processes does not cease to be in tension with the fact that objects can be sensed, perceived and used as unchanging unities. The dual character of an object, both as part and as whole, does not cease to be a problem. But as much as problems are a condition of individuation, the very distinction between movement and stasis, between

an openness towards the self-excess of being and the objective structures with which this excess is kept in form, ceases to exist. It is in terms of a system's overall development that an object must be considered. Neither only as form nor only as process, but rather as a dynamic entity with structural points and contrasting grounds, which exchange energies with and are converted into one another, from metastability to metastability.

Goffey's second approach to incomputabilities regards the excess of information. One possible definition of excess can be that it corresponds to what cannot be compressed. Though informational excess is a necessary condition of individuation, it cannot be determinately synthesized. A system's preindividual reality will never be individual. It partakes individuation, but it resists resolution. It is always, even after individuation, indeterminate excess. In regard to computation, excess is that which cannot be compressed into determinate arrays of binary data. In this way, inasmuch as incompressible and incomputable varieties of data pervade algorithmic ecologies, they affect computation. As Goffey says, "indiscernibles exist". Even at the level of digital programming. "Formal logics [cannot but be] inherently incomplete". Computation itself distinguishes what is discernible, and thus numerable, from what is not. It organizes into arrays of numerable quantities of data that which is random and unstructured. But this compression of data does not assure the synthesis according to which all that is given gets to be computed. On the contrary, raw data is computable and computed, but only to a certain extent. Amidst it, random quantities of data remain indiscernible and incomputable. Which is the very reason why, despite the limits of algorithms' possibility spaces, computation can still generate the unexpected and the accidental. In Goffey's words: "[m]achines break down, programs are buggy, projects are abandoned and systems hacked". (2008, p. 19).

Information theorist Gregory Chaitin (2005) has been a major proponent of the notion that random numbers are intrinsic to algorithmic computation. The author argues that there are quantities of data underlying computation that cannot be counted. Even the most simple algorithm used for sorting a list of numbers is "infected"¹⁴⁹ with random

149 This term, "infection", is characteristic of the way in which philosopher Alfred N. Whitehead thinks of the inevitable ingression of abstractions into actual occasions of experience. In philosopher of science Isabelle Stengers' words: "Infection' is the term Whitehead chooses to designate, in a generic way, what the poets celebrate as 'presence'. Celebration refers to the fact that it is a poet's experience that is infected by the mountain, gloomy and ancient. [...] This infectious holding-together is not a fusion but a valorization, a determinate shaping, conferring a value-that is, a role-on what is prehended. The fact that the variables of a function, in the same way as the poet's experience, require a 'value' thus ceases to belong to linguistic contingency. Far from being a mere quantity, the value of a variable presupposes the stability of the role that one thing plays for something else and measures

quantities of data that cannot be sorted and grouped into a finite set of numbers. As such, any computation operates amidst an infinity of discrete quantities of data. The incomputability of the infinity of numbers underlying computation can in a way be said to be an intrinsic quality of algorithms. This is not the kind of infinity of a numerical interval's infinitesimals. It does not correspond to the transcendental numbers of an uncountable infinity.¹⁵⁰ Rather, it corresponds to an infinity of discrete quantities of data that are random and thus uncountable. Their randomness corresponds to the fact that, in spite of being discrete, they are not structured. In Chaitin's words, "something is random if it can't be compressed into a shorter description." (2001, p. 18). The infinity of random quantities in computation consists of unstructured data that cannot be compressed either into finite numbers or into finite sets of instructions. Indetermination is made to be a necessary condition to computation. A condition from which it follows that both algorithms and the mathematical axioms that underly computation are incomplete.

To the incomputable number implicit in the computational order of data, Chaitin (2005) calls "Omega". A real number that is nevertheless random and thus complex. The author argues that the complexity of Omega results from the fact that the infinitesimals existing in between any two points cannot be reduced to the finite results of integral calculus. Omega thus corresponds to random quantities of data that cannot be counted nor ordered. The infinity in computation is complex because it is irreducible to numerical calculus. Nonetheless, it is together with this infinity that algorithmic

the importance of that role. [...] The term 'infection' is thus technical, that is, neutral with regard to the differences we attribute to what endures." (2011, pp. 157–158). Interestingly for this study, Stengers also points out how Whitehead uses the term "infection" to think the body. She writes that: "For Whitehead, the parts do not constitute the whole without the whole infecting the parts. In other words, the identity, or the enduring pattern, of the whole and the parts is strictly contemporary. This is why the same term, 'infection', can be used both to designate the relations between the whole and the parts, and to describe the relations of a living organism with its environment. If the body exists for its parts, it is because its parts are infected by such-and-such an obstinate aspect of what we call the body, but which, for them, is a portion of their environment; if the parts exist for each other and for the body, it is because the respective patterns of each are highly sensitive to any modification of the environment they constitute for one another." (Ibid., p. 174).

¹⁵⁰ As mentioned before, when accounting for Bergson's concept of virtuality (see Section 1.1), the topological space of an infinitesimal continuity (consisting of transcendental, and thus undetermined, factors of determination) is non-actual in absolute. As such, it is uncountable and, ultimately, virtual. Hence, the virtual, considered in this way, can never belong to the random quantities of data that underly algorithmic computation (if the smooth space of continuous variation is to be kept). Precisely because of the constitutive incompleteness of algorithmic objects, which is tantamount to an immanence between random quantities and determinate numbers, actuality is neither finite nor it can contain the totality of space and time. Contrary to the topological variation of the spatio-temporal continuum, what this immanence attests is the very fact that infinity exists as quantitative potentials amidst the definiteness of actuality. In other words, the additive sequencing of instructions through which algorithms "array alternative states for sequencing into alternative routines" (Massumi, 2002, p. 137) not only creates data, but creates it with a constitutive difference.

computations group countable numbers for the execution of finite sets of instructions. From this standpoint, algorithms can be conceived both as finite sets of instructions and as being pervaded and conditioned by random quantities of data. Algorithms can only be defined by determinate sets of structured data as much as they are also defined by the infinity of random quantities of data existing together with any set of finite numbers. This is clearly a standpoint that differs from a universal computation, according to which finite sets of instructions are enough to generate all the complexity of the world. Chaitin argues that the world's complexity corresponds to its incalculability, that is, to the real number by means of which virtuality and actuality become immanent in one another and which is to be found in all strings of countable numbers. Accordingly, the binary logic of probabilities with which cybernetics approached Turing's conception of the computer, as much as it is based on the idea that complexity is reducible to the finite numbers of algorithmic computation, cannot account for the intrinsic incompleteness of knowledge. The binarism of algorithmic objects does not consider the complex infinity constitutive of random quantities of data existing at the heart of any computation. What Chaitin's notion of Omega brings forth is the idea that algorithms are not only finite sets of instructions but also random quantities of data that, notwithstanding their discrete character, are incomputable.

Underlying Chaitin's theory of algorithmic complexity is a conception of information that does not pertain to finite and measurable spatio-temporal quantities. Rather, it pertains to irreducible, random and complex quantities of data. Here, information is defined in terms of "computational entropy". And this is so precisely because any countable quantity of data is considered to include within itself Omega's random infinity, an infinity that computation cannot exhaust (i.e. there's more quantity to it than to finite numbers). What can then be said with regard to the relation between this infinity of discrete points and the finite numbers with which computation executes its counting procedures is that each of the latter is necessarily an indivisible whole composed of uncountable parts. The difference between Chaitin's and cybernetics' notions of information is that, whereas the latter is considered as a seamless unity of finite parts, the former is considered together with random quantities of data.¹⁵¹

¹⁵¹ It should be reminded that, as mentioned before (see page 56, Section 2.1), Gilbert Simondon also criticized the cybernetic conception of information, since it did not account for information's intrinsic infinity. While characterizing information as the process by which a difference between potentials belonging to different orders of magnitude is resolved, Simondon instead introduces infinity at the heart of information. In this way, instead of being a unified entity, information is considered from the standpoint of the differences underlying intensive quantities. As much as these differences are potential conditions of individuation, information is necessarily heterogeneous or, in other words, made of different parts, and pervaded by uncountable infinities.

The upshot of this, in what regards the problems that such complex notion of information poses to the cybernetic logic of control, is that in this way parts can be considered as being larger than wholes. Because they necessarily comprise discrete infinities, the random quantities of data underlying algorithmic computation are necessarily larger than the finite forms of those same algorithms. Conversely, not only are finite quantities smaller than their immanent infinities, but also parts, such as simple algorithms, are irreducible to the systems that they might partake, such as full blown software programs. According to Chaitin's theory, algorithmic objects are not reducible to finite series of simpler parts, due to their openness to an infinity of discrete and random quantities of data. With such infinity, the notion of universal computation is no longer possible. The mathematical reduction of every single factor of determination (quantitative and qualitative) into finite sets no longer holds. Chaitin's theory of algorithmic complexity demonstrates that the limits of computation are not given only by the digital domain's limits of possibility, but also, and more fundamentally, by the random quantities of data pervading algorithms. As much as incomputable quantities of random data are irreducible to the necessary finitude of algorithmic instructions, it is here, in this irreducibility, that computation finds, first and foremost, its limits.

The random quantities of data constitutive of algorithmic computation should moreover be understood as the very condition that allows for algorithms to be in contact with one another, i.e. for them to be capable of exchanging information. It is this connectability that realizes the mathematical infinity of Omega, in conformity to Simondon's notion of networks, according to which objects are open to the infinity of potentials by means of information. Only by constituting itself as the mediatic field where different orders of magnitude communicate with one another can an object not be isolated. And insofar as it is not, it necessarily exchanges information with other objects. From which it follows that any algorithmic object necessarily partakes the constitution of informational networks. What Chaitin's notion of Omega specifies in regard to Simondon's conception of networks is the quality of the potential infinities by means of which actuality is open to informational resolutions. Instead of being a transcendental and uncountable number, the potential infinity that opens objects to one another (and therefore to the inscription of time)¹⁵² is a quantitative quality, i.e. it is a

¹⁵² Let us recall Deleuze's statement on the inscription of time in wholes: "According to Bergson, the whole is neither given nor giveable. [...] if the whole is not giveable, it is because it is the Open, and because its nature is to change constantly, or to give rise to something new, in short, to endure. [...] So that each time we find ourselves confronted with a duration, or in a duration, we may conclude that there exists somewhere a whole which is changing, and which is open somewhere." (1986, p. 9).

quality made of an infinity of discrete quantities. On the basis of all that was previously expounded in relation to Simondon's notion of technicity,¹⁵³ it becomes possible to conceive of algorithms not only in terms of finite numbers arrayed in iterative sequences, to which an infinity of steps can always be added, but also in terms of the infinity with which they are open to exchange information between one another.

From here onwards, the problems posed by Chaitin's theory of algorithmic complexity, both to computation and to the generic definition of objects, will be addressed from two distinct perspectives. They will be addressed from the perspective of objects and from the perspective of processes. These two approaches are meant to contrast a phenomenological perspective with a speculative one. The exposition of a phenomenological perspective is aimed at addressing the definite character of objects, specially by articulating the mathematical definition of algorithmic objects with their expressive qualities. The exposition of a speculative perspective is aimed at exploring the notion of the extensive continuum. By approaching objects as processual entities, their definiteness will be put into question and both their virtuality and their actuality will be reconsidered in terms of the relation between random and structured quantities of data. In sum, the following inquiry will build considerations towards a notion of digital potentiality.

6.3 - Object Orientation

Recently, the American philosopher Graham Harman (2002, 2005, 2011) has proffered an “object-oriented metaphysics”¹⁵⁴ that tries to conciliate the individual autonomy of objects with their capacity to be in relation with one another. For him, objects do not change and are discontinuous with one another. A condition that impedes any sort of approach taking direct relations between objects as being the ground on which objects themselves are to be explained. From this standpoint, and regardless of its possible variations, an object remains unchanged because it does neither depend on its

¹⁵³ See page 81, Section 2.5.

¹⁵⁴ Also designated as object-oriented philosophy or object-oriented ontology. These terms have been derived by Harman from “object-oriented programming”. Contrary to software programmes conceived as series of routines and subroutines to be executed, object-oriented programming conceives them as bundles of interactive objects. Moreover, each object is conceived as a discrete bundle of algorithmic procedures based on discrete units of programming logic. Each object has its own functional autonomy. It receives and sends messages to other objects, while simultaneously processing data according to its own functions. For more on object-oriented programming, see Crutzen & Kotkamp, 2008.

variable expressions (e.g. the different ways to construct a chair) nor on its variable appearances (e.g. the different ways in which a chair can be perceived). In Harman's words: "When I circle an object or when it rotates freely before me, I do not see a discrete series of closely related contents and then make an arbitrary decision that they all belong together as a set of closely linked specific profiles. Instead, what I experience is always one object undergoing accidental, transient changes that do not alter the thing itself." (2005, p. 98). The qualities of an object, such as colour, fragrance, weight, and so on, are therefore for Harman distinct from one another and from the object itself. They are said to constitute a field of relatedness that can be thought and experienced without objects. "In this way the fleshly medium of loose qualities is placed everywhere in the world" (Ibid, p. 91). To the point of being that which allows for objects to enter in relation with one another. The problem of explaining how objects are related to one another, when granted the case that they are radically distinct from one another, finds in their own qualities the field of potentials and the space of possibilities by means of which relations can come to be established. From which two different questions arise: if qualities are different from the objects that they qualify, then how are they related, not only to objects, but also to one another?; and, does the relation between qualities belonging to different objects constitute a novel object? In order to answer to these questions, Harman's object-oriented philosophy divides the world in two different kinds of objects. There are real objects, characterized by their radical discontinuity relatively to one another and to the qualities existing in the world, and there are sensual objects, a designation which discloses the fact that they exist only in relation to qualities.

Harman's notion of real objects is his own take on the problem of how to explain the independence of objects from qualities. One can say that a chair does not need to be made out of wood in order to be a chair, but also that there are some minimal requirements for it to be a chair. Meaning that, without a surface capable of supporting a person's back and another capable of supporting the person's buttocks, simultaneously, any object will hardly qualify as a chair. In this sense, there is a relatedness of parts that necessarily includes a minimum of different qualities. An object can be defined by determinate relationships between qualities, rather than by the qualities themselves. In Harman's words: "An object is real not by virtue of being tiny and fundamental, but by virtue of having an intrinsic reality that is not reducible to its subcomponents or exhausted by its functional effects on other things" (2009, p. 215). From this, what is most important to retain is the implicit tension between the fact that objects are independent from their qualities and the fact that they cannot be thought without them.

With such formulation, what seems to be most determinant for an object's definition is (perhaps not surprisingly) relation. Relation both as the constitutive excess of objects and qualities and as what cannot be reduced to either the one or the other. Conversely, this is to say that objects are irreducible to qualities, since qualities are irreducible to the relations that they partake and which express objects.

It follows that an object's intrinsic character results from a process that cannot be fully known because it is simply too complex. For Harman (2005, p. 174), an object's intrinsic character results from “indirect or vicarious” relations, a notion depicting the non-linearity of the qualitative relations underlying any objective formation. Indirect relations explain why it is possible for objects to lose certain attributes and still remain what they are. They assure that an object's attributes are not interchangeable and that what therefore results from a bundle of qualities is but the object's singular and unrepeatable expression. In this sense, an object can endure as long as its qualitative relations are not destroyed. In contrast, one singular object can never be repeated in the exact same way, for its qualitative self-affection cannot be known as such. Hence, it is vicarious. It remains inaccessible, in spite of being determinant for what may result from the resolution of problems posed at the diagrammatic level of materiality. For example, though the flowers of one same species of plant may be similar to one another, no one flower is alike. Each results from singular movements of individuation where the actual resolution of problems in potential expresses the undetermined, unconscious and unknowable depth of the material abstract machine. The indetermination of potential relations in a continuum of qualitative affects is the indirect or vicarious cause of individuation. Any object is unrepeatable because its vicarious cause, being unknowable, remains inaccessible. Its constitution is irreproducible and, therefore, singular. Which also means that no object can be reduced to a sum of parts. There is always more to it than its actual resolution. It is excessive over itself, but not in any determinate way. It is vicariously excessive, since the source of its individuation (i.e. its preindividual reality) remains implicit in its resolute actuality. Hence, no object can be fully known. Any object is only accessible up to a certain point. Beyond this, it is vicariously undetermined with regard to itself. If objects are somewhat inaccessible, it is only because qualities are fundamentally inaccessible too. To say that objects and qualities are inaccessible is not the same as saying that they don't exist. “The inaccessibility of the subterranean depth of the sun does not entail its nonexistence.” (Harman, 2005, p. 86). It is rather to say that they exist as a potential to be in relation with one another. From which it follows that only determinate modes of association

between qualities and objects can be accessed. Such association, which is expression itself, is understood by Harman as being a “phenomenon”. A notion that Harman (*Ibid.*, pp. 7–70) owes to the work of the so called “carnal phenomenologists”, a strand of philosophers including Maurice Merleau-Ponty, Emmanuel Levinas and Alphonso Lingis.

Phenomenology was first systematized by Edmund Husserl (1960, 2013), whom inherited from René Descartes and John Locke the idea that objects possess primary and secondary qualities. This distinction, according to which Husserl based his theoretical explorations both on the mathematization of the world and on phenomenological intentionality, can be understood in terms of causality and access. Whereas secondary qualities can be directly accessed, for the reason that they correspond to the qualitative expressions of objects, including colour, shape, mass, and any quality accessible by means of a sensible system, primary qualities cannot, for they are considered to be the cause of secondary ones. While primary qualities can be approached by means of mathematical abstractions and cannot be directly sensed, secondary qualities are not mathemathizable and can only be directly sensed. Harman explicitly argues against a world divided in this manner, for the reason that this is a distinction that posits a hierarchy between immutable substances and derivative relations. In his words: “One of the objections made against theories of substance is that they pamper some elite layer of explanatory things – subatomic particles for the sciences, or everyday specimens like horses and trees for Aristotle – while explaining away all more complex entities as secondary products of the combination of simple parts. Either everything is made of atoms, and moods are explained away as the by-product of brain chemicals; or machines are viewed as artificial composites with no reality of their own.” Against this distinction, Harman posits that “[w]hat we have is not a universe split between aristocratic natural kinds and miserable, pauper-like accidents. Instead, we have a universe made up of objects wrapped in objects wrapped in objects wrapped in objects”. (Harman, 2005, pp. 84–85).

It is, nevertheless, by making use of the notion of substance that Harman defines objects. For him, “[e]very object is both a substance and a complex of relations”. Not only this, but if “[w]hen two objects enter into genuine relation, even if they do not permanently fuse together, they generate a reality that has all of the features that we require of an object”, then “any relation must count as a substance”. (2005, pp. 85). According to this view, relations are objects. Which accords with the fractal geometry that the regressive wrapping of objects into one another proposes. Moreover, according

to Harman, “[t]he reason we call these objects 'substances' is not because they are ultimate or indestructible, but simply because none of them can be identified with any (or even all) of their relations with other entities. None of them is a pristine kernel of substantial unity unspoiled by interior parts. We never reach some final layer of tiny components that explains everything else, but enter instead into an indefinite regress of parts and wholes.” (Ibid.). For this reason, the notion of substance regards here relations that, in spite of assuring an object's identity, are inaccessible. For Harman, it is this inaccessible character of objects that constitutes not only their reality, but the real as such. Which is a standpoint that goes directly against a metaphysics of presence. In this sense, real objects are withdrawn from any possibility of knowledge. “It is not even possible to get 'closer' to the things in such a way that presence could provide some sort of measuring stick for how nearly we have approached reality”, says Harman (Ibid., p.86). Because such inaccessibility doesn't say much of the world except for the fact that it resists both material and conceptual reductions, it can be said to be the reason why Harman's philosophy has such a speculative tone. In fact, it is precisely because of this that his work can be included in the recent trend in continental philosophy designated as “speculative realism”, which results precisely for various tentatives to overcome the shortcomings of “philosophies of human access” (Harman, 2005).

In contrast, objects are accessible via relations. One can see how yellow the sun is, or feel its warmth, but only insofar as the conditions of sensation necessarily include a number of other objects, such as the atmosphere, sensorial organs, a nervous system, and so on. In this sense, perception requires more than one object. Colour does not happen without an eye, weight does not happen without a difference between masses, proprioception does not happen without muscles, and so on. To define an object in terms of qualities is to define it in terms of its relation to other objects. In Harman's philosophy, this is how sensual objects differ from real ones: they exist in relation. Insofar as they are accessible, they comprise relations between different objects, from which their qualifying attributes emerge. The fractal geometry of objects proposed by Harman's object-oriented metaphysics, i.e. the wrapping of objects into one another, is simultaneously the cause and the effect of a phenomenon of exteriority. Only because objects exist outside of themselves, with other objects, can they be defined by indirect relations within a bundle of qualities. Sensual objects coincide with their presence in other objects. In opposition, a real object has no exteriority. It is inaccessible and therefore cannot exist together with the interior reality of other objects. Real objects coincide only with themselves. Harman's understanding of the world as being divided

between real and sensual objects corresponds to a metaphysics that is itself divided in terms of absence and presence (being that, here, absence regards a lack of exteriority and presence a qualitative relation between objects). Since, in this way, presence coincides with relation, relations themselves are granted an objective status. Relations are objective because they coincide with the exteriority of presence, which unifies the emergence of different qualities in an act of perception.

It is worth noting that Harman's belief on a substantial core of objects owes much to phenomenology's method of eidetic reduction, which is commonly performed by means of mathematical abstractions. In contrast, sensual objects can be thought by means of a phenomenological kind of reduction, which ultimately synthesizes interiority with the intentional act of a subjective experience. While the interiority of an object remains inaccessible, it suffices to imagine it for the object to become intentional and, in this way, acquire a degree of exteriority, i.e. relatedness. For such reason, in the phenomenological tradition and specially in Husserl's philosophy, the common outcome of thinking the world beyond intentionality has been the subsumption of eidetic reduction by phenomenological reduction. Which is to say that, even if the eidetic core of objects is approachable by means of mathematical abstractions, it remains in all occasions fundamentally inaccessible.

Notwithstanding, Harman insists that, in order for objects to be defined, they need to be granted an eidetic reality. More than unchanging substances, Harman thinks the *eidos* of things as dynamic kernels of relations, accessible only in effect. In this sense, an object's unchanging reality is necessarily somehow related with its variable attributes. "There is one sense in which a substance is not affected by its qualities at all, since it can lose some of them while remaining itself, but another sense in which it depends on them utterly. But this means that the union of an object with its own essence requires vicarious bonding no less than the bond between one thing and another." (Harman, 2005, p. 93). Hence, this conception of vicarious bonding implies that there is a certain reciprocity between real objects and sensual qualities. Not only are objects qualified by given attributes, but they are the very reason why different qualities can establish determinate facts of togetherness. "Consider an apple", says Harman, "[i]ts sweetness and fragrance and colour and price and nutritional value are to a large extent distinct. Yet somehow all of these qualities are unified in a single thing, despite their relative inability to interfere with one another" (Ibid.). Vicarious causation at once approximates Harman's object-oriented metaphysics to a transcendental level of determination and to an immanent reality of constitution, both of which are objective. In

this way, objects are defined by a codetermination between their own vicarious depth and the accessible surface of their qualitative attributes. This sort of codetermination should be thought to regard as well general relations between parts and wholes. As Harman explains, for example, “it cannot really be said that windmills are made of ladders, pumps, rotating blades, and wire-mesh crow's nests. Or rather, it is made of these things only in a derivative, material sense. Although the windmill needs these smaller parts in order to exist, it never fully deploys these objects in their total reality, but makes use of them only by reducing them to useful caricatures. That is to say, a windmill does not fully sound the depths of its own pieces any more than a human observer does. It merely siphons away the needed qualities from these objects, just as animal stomachs reduce the sparkling allure of fruits to brutal, one-dimensional fuels.” (Ibid., pp. 93–94). From this, Harman extracts the formula that “the sum of parts is always greater than the whole” (Ibid.), since each part is only related to the whole to the degree that the whole reduces it. As much as an object is part of a whole, it can only be to that whole a part of what itself is as a whole. This partiality of access between two different objects coincides with the depth that each one possesses and which is inaccessible to the other. Conversely, only the surface of an object can be directly accessed by another object.

“If objects exceed any of their perceptual or causal relations with other objects, if they inhabit some still undefined vacuous space of reality, the question immediately arises as to how they interact at all. More concisely: we have the problem of nonrelating objects that somehow relate” (Harman, 2005, p. 91). In order to deal with this problem, Harman conceives of objects as modules that are capable of connecting to one another. In his words, “objects do not fully manifest to each other but communicate with one another through the levels that bring their qualities into communion” (Ibid., p. 68). The paradigmatic example of this are atoms, for atoms can combine with one another in as many ways as the objects known to result from their assemblages. This is where Harman's object-oriented metaphysics can start being related to processes of algorithmic computation. Because what determines the ways in which non-relating objects do in fact relate are rules as simple as quantitative relations of electric attraction and repulsion. In this regard, it is possible to compute relations without further knowledge about the intrinsic reality of the objects involved. Or, which amounts to the same thing, “the levels that bring qualities into communion” can be thought quantitatively. Harman himself doesn't do this. What he inherits from phenomenology is a concern with perception (and thus accessibility) and with what might exist beyond its variations, that is, with the

eidetic core of objects. Nonetheless, in his object-oriented metaphysics, quantities are conflated with the levels of inter-objective communication. They are thought spatially, but not in a way that specifies their relation to qualities.

Harman's philosophy proposes a general schema of relations where qualities are related to one another so as to form objects, and objects can only be related to one another qualitatively. Here, it seems straightforward to think that, in such schema of spatial modularity, there must exist qualities that are quantitatively determined. Meaning that the qualitative determination of objects must at some point result from the accretion of space on space occurring with their modular assemblage. In this sense, there are variable degrees of spatial magnitude underlying and conditioning the expression of qualities. Colour is a good example, since the quantities of primary colours, such as red, green and blue, determine the resulting expression of their own mixture. Mix blue and green, and you'll get yellow. Change the ratio between these two colours' quantities and you'll get different tonalities of yellow. The relation between two colour-objects results in the emergence of a third novel object. Hence, the qualitative expression of an encounter between parts necessarily depends on how much each of the parts participates in the whole. Despite the fact that quantities and qualities are hardly inextricable from one another, the different levels of relation between objects do indicate their spatial character and thus the quantitative aspect of determination involved in their causality. Which is to say that, at different orders of magnitude (or even different domains, for that matter), the quantitative inclusion of objects can have different results, depending on the given spaces. The same quantities of colour will generate different results, depending on how other objects, such as a support of inscription, react to the mix. Therefore, the many levels that can be granted to belong to an object, be them accessible or not, must be understood under the prism of a quantitative relation between qualitative objects.

The notion of “level”, inherited by Harman from Lingis' phenomenology, is central to an object-oriented metaphysics, since it allows for the reconciliation between objects' eidetic inaccessibility and their capacity to be in relation with one another. But instead of level, Harman calls it “medium”, which he defines in the following manner: “A medium is any space in which two objects interact, whether the human mind be one of these objects or not. Human sense experience is only one particular zone or medium of the world, and possibly not even the most interesting one. The medium between objects is the glue that makes possible the entire carpentry of things – without it, the world would remain a set of noncommunicating crystalline spheres sleeping away in private vacuums.” (2005, p. 91). In other words, the medium is the “intermediate zone

through which objects signal to one another, and transfer energies for the benefit or destruction of one another.” (Ibid., p. 70). In order for two different atoms to relate to one another, a medium is required. Importantly, the medium cannot be thought without the atoms themselves. And to the extent that one same type of atom can participate in different types of molecules, and these in different types of compounds, and these in different types of bodies, and so on, what necessarily results from this style of organization is a multimediatic structuration of connectivity or, in other words, from an object's perspective, connections at different levels. Ultimately, for Harman, such connections remain inaccessible. “Since no causation between [objects] can be direct, it clearly can only be vicarious, taking place by means of some unspecified intermediary.” (Ibid.). Which is to say that the causal relations occurring throughout the different levels that mediate the communication between objects are indirect and inaccessible. Despite its real dimension, an object can in this way be thought to be structured by the different levels throughout which it is in fact related to other objects. The levels of an object are neither internal nor external to it. Rather, they are the object's very spatiality. They correspond to the spatial structures throughout which the events of one given scale are communicated to other scales. In an object-oriented metaphysics, there is no relation outside of objects. Across different scales, objects comprise the different levels of their relatedness. For example, one can think of the body's joints. They simultaneously connect and separate different regions of the body. Whereas they can be seen as objects in themselves, they can also be seen as being part of any of the connected regions. A joint is both an object and a medium. In fact, fractal geometries like this can be found in whatever kind of network. Every object is a multimediatic cluster. Every medium is an object. Objects within objects, media within media, *ad infinitum*.

The fractal geometry according to which objects are wrapped around and into one another results therefore from a levelled exchange of energies. A novel object can only come about by means of a communication of events between levels. A perspective which is close to Simondon's understanding of relations on the basis of notions such as information and metastability. Notwithstanding, Harman himself is critical of the idea that potentials constitute an intrinsic dimension of objects. For him, objects do reserve a capacity to establish novel relations, but this potential is necessarily actual. In his words: “This secret reservoir cannot be the ‘potential’, because the potential needs to be inscribed somewhere actual right now, and if the actual is entirely determined by its relations then this gets us nowhere” (2009, p. 187). Here, at the same time that potentiality is conflated with actuality, it is also conflated with resolute determinations.

“The potential can only mean a potential for future relations, and the actual can only mean what is in and of itself actual apart from any relations” (Ibid.). This understanding of potentials conforms to the idea that actuality is relative to itself and potentiality relative to future objects. But, in contrast to Simondon, Harman understands potentials as being determinately given. From which it follows that he grants to virtuality no special value. Of the notion of virtuality he says that it “merely plays the double game of saying that true reality in the universe is both connected and separate, both continuous and heterogeneous” (Ibid.). But by saying this, what Harman seems to dismiss is the immanent factor of determination implied in the conjunctive article “and”, which he uses. For such conjunction between disjunctive parts implies not only their relation, but more specifically, their relation in potential, which necessarily implicates an immanent factor of determination between what is given and what is not. What Harman dismisses is the general potential of constitution that is actually nowhere to be found but that, notwithstanding, is real. As such, it is undetermined. For if novelty is to occur, the world needs to include a general potential of creativity. Hence, what Harman's philosophy overrides is the constitutive indetermination of affect. Instead of accounting for this reality, Harman instead engages himself with a renewal of occasionalism, not by making use of any notion of transcendence, but rather by using the notion of “vicarious causation”. Instead of an indeterminate cause, what this notion implies is the idea that all causation is actual but, inasmuch as it is inaccessible, non-linear and too complex to be known. According to the author, if neither potentiality nor virtuality qualify for the task of causation and for a distinction between real and sensual objects, “[t]he only thing that will fit the bill is a non-relational actuality: objects that exist quite apart from their relation to other objects, and even apart from their relation to their own pieces” (Harman, 2009, p. 187).

In regard to algorithmic objects and to the computations in which they might be involved, this conception of vicarious causation is somewhat problematic. In a sense, all the constituent elements of an algorithmic object can be distinguished from one another in an infinite regression that necessarily leads to the kind of Harman's conclusions. Which is to say that all objects correspond to mediatic levels of communication between other objects, even if not actually, at least in the sort of way that Harman grants their potential to be like, that is, as determinate possibilities. What in this way can come to be known are the very operations of communication that objects partake. This not only allows for a knowledge of structures, but also for a knowledge of the contrasting grounds against which objective structures are remarked. Notwithstanding these terms,

this is by no means to say that an object-oriented metaphysics, as theorized by Harman, conceives of process in terms of undetermined potentials and of individuals with associated milieus. In fact, as much as such metaphysical approach conceives of all reality as actual, novelty is hardly made to be a part of the picture. This approach postulates an ontology of possibilities, regardless of what cannot be known because of being vicarious. In the actual spaces of an object-oriented world, novelty is more correctly seen as the outcome of possibilities that, because of being vicarious, cannot be anticipated. It could be argued that, in this case (like with the principles of an universal computation), objects are combinable with one another in as many ways as possible. In which case, emergents would merely correspond to the outcomes of a combinatorics that, despite being possibly unpredictable, is determinately given and therefore knowable. Whereas this is the case of a computable possibility space, the vicarious causation that Harman argues to be fundamental for the understanding of an object-oriented world precludes this ontology's possibilities from being computed. This factor of unknowability at the heart of possibility is the very incomputability of objects. But, in contrast to Chaitin's theory of algorithmic complexity, this is not an incomputability made out of random quantities of data. In fact, as much as in Harman's philosophy this randomness pertains to the unknowable core of objects, what the notion of vicarious causation overrides is the very necessity to define the indetermination constitutive of this lack of knowledge. If the notion of vicarious causation pertains to process's indetermination, then the quality of such indetermination remains to be discussed. A lack that corresponds as well to an absent discussion on the relationship between quantities and qualities.

While striving to articulate objects with relations, Harman's object-oriented metaphysics results in a seamless conflation of forms with actuality. Here, the paradox resides in the incompatibility between the assumption that actual determinations are knowable and the assumption according to which beyond what can be known exists only actuality. Because in this philosophy the latter is only accepted to be determined, it should therefore be knowable. But because a factor of unknowability needs to be granted to reality, the notion of vicarious causation comes into use in order to conceal this paradox in an inexplicable space. In other words, Harman's philosophy doesn't really discuss the relation between what is known and what is not. It doesn't consider the dynamisms of affect between the unconscious and the resolute determinations resulting from it. The spatial character of an object-oriented ontology does provide a way to conceive of algorithmic objects and their relations. Any algorithmic object can in

this way be conceived as a multimediatic module throughout which information is transmitted. But even here, with the notion of information, Harman's philosophy leaves no space for indetermination. In an object-oriented metaphysics, information cannot but correspond to the serialization of data. In short, what this theory overlooks is indetermination in general. More specifically, it does not account for an actuality that is itself random and undetermined. It does not strive to consider the kinds of quantities that are unaccountable by the qualitative expression of objects and their relations. If one is to take Chaitin's proof of Omega seriously, then a whole field of excessive quantities must be considered. And instead of equating actuality with what is determined, as Harman does, one needs to consider it as well in undetermined terms. From which it follows that, instead of a qualitative continuum resulting out of a total quantitative determination, what one gets is an extensive continuum pervaded by incomplete and undetermined quantities. In order to discuss the notion of the extensive continuum, which comprises both the spatiotemporal distribution of objects and an infinity of random quantities, bigger than the realized qualities, this study will now turn to Alfred N. Whitehead's process philosophy. In this way, not only objects will be conceded a processual character, but also and precisely because of this, their parts will be conceived as being bigger and more random than their determinate and qualitative expressions.

But before this, it is perhaps worth noting that an inquiry on the relationship between qualities and quantities, from the perspective of algorithmic objects, shouldn't be understood as pertaining only to digital computation. One should bear in mind that digital simulations are feasible not only because they share the possibility space with the systems of reference, but also because their algorithms coincide with these systems's processes.¹⁵⁵ Be it on the side of digital simulations or on the side of their systems of reference, algorithms can be found as what results from the co-individuation of subjects and objects, that is, as the knowledge of the models according to which processes unfold. If, for example, there would not be a specific sequence of genes responsible for producing a specific protein, we wouldn't be able to create this same protein by means of computational procedures. Which is simply to say that the genetic code itself is the basis of a complex ecology of algorithmic procedures by means of which determinate syntheses are actualized. In this regard, the field of biotechnology is most exemplary. One moves from conceiving of the world as a set of autonomous algorithmic

¹⁵⁵ For a philosophical incursion into, not only all sorts of digital simulations, but also more broadly the synthetic style of reasoning underlying them, see Manuel DeLanda's book *Philosophy and Simulation: The Emergence of Synthetic Reason* (2011).

procedures, from which we can only derive simulations, to the practice of programming with its own codes. In this manner, instead of just simulating processes, we become able to create systems that, unlike any others before them, result from a knowledgeable manipulation of the world's most intrinsic algorithms. Thus, to inquire into the mode of relation between quantities and qualities, from the perspective of algorithmic objects, corresponds more to a given take on the world, i.e. to the assumption that its processes unfold according to an algorithmic architecture, than to a specific focus on digital computation. It is nonetheless from such scope that digital computation might come to be understood under a new light.

6.4 - Process Orientation

It was philosopher Alfred N. Whitehead (a notable influence on Gilles Deleuze's philosophy) who most consistently and systematically argued for the immanence of transcendental ideas and actual experiences, that is, for the inextricable relation between transcendental objects and the actual conditions of emergence from which empirical facts result. To the objects of transcendental memory Whitehead calls “eternal objects”, and to the objects of empirical memory he calls “actual occasions” or “actual entities”. For him, eternal objects correspond to the ideas of what has been already once objectified, i.e. the regularity of past occasions. Ideas that, because they are potential in regard to future occasions, can ingress time and again into novel facts of unity, i.e. into the formation of experience, perception and empirical memory. In Whitehead's words, “an eternal object can be described only in terms of its potentiality for 'ingression' into the becoming of actual entities; and its analysis only discloses other eternal objects. It is a pure potential” (1978, p. 23). For example, the idea of blue, before being expressed, is neither this or that expression of blue, but rather the general schema, or pure abstraction, encompassing all possible expressions of blue. Each expression of blue necessarily depends on spatio-temporal conditions that determine the ingressing idea's variation (i.e. no one blue is alike) and conserve its virtual invariance (i.e. blue as an ideal pattern or eternal object).

In order to conceive this processual relation between virtuality and actuality, instead of conflating the virtual with the topological invariance of infinitesimal division, Whitehead elaborates a “mereotopology” where ideas are actual but, nonetheless, distributed across a continuum of relations. In this way, virtuality is made to correspond

to an infinite series of discrete points, rather than to a continuous infinity. At the same time that it abstracts ideas from actuality, it remains implicit in its discrete multiplicities. This results in virtual-actual dynamisms that correspond to infinite extensions of inclusion and exclusion between wholes and parts, rather than to rhythmic pulsations between movements of actualization and deactualization, in the sense of topological processes. Mereotopology—a mode of thought that articulates mereology with topology—refers to the study of extensive relations between parts and wholes (Whitehead, 1978, pp. 281–333). Media theorist Luciana Parisi explains Whitehead's use of this method in the following way: “Whitehead’s analysis of parthood relations (mereology, from the Greek *mero*, 'part') was an ontological alternative to set theory. It dispensed with abstract entities and treated all objects of quantification as individuals. As a formal theory, mereology is an attempt to set out the general principles underlying the relationships between a whole and its constituent parts, as opposed to set theory’s search for the principles that underlie the relationships between a class and its constituent members. As is often argued, mereology could not explain by itself, however, the notion of a whole (a self-connected whole, such as a stone or a whistle, as opposed to a scattered entity of disconnected parts, such as a broken glass, an archipelago, or the sum of two distinct cats). Whitehead’s early attempts to characterize his ontology of events provide a good exemplification of this mereological dilemma. For Whitehead, a necessary condition for two events to have a sum was that they were at least 'joined' to each other, i.e., connected (despite being or not being discrete). These connections, however, concerned spatiotemporal entities, and could not be defined directly in terms of plain mereological primitives. To overcome the bounds of mereology, the microscopic discontinuity of matter (and its atomic composition) had to be overcome. The question of what characterized an object required topological and not mereological analysis. From this standpoint, two distinct events could be perfectly spatiotemporally colocated without occupying the spatiotemporal region at which they were located, and could therefore share the region with other entities. The combination of mereology and topology contributed to Whitehead’s articulation of the notion of the extended continuum.” (Parisi, 2013, pp. 309–310).

In Whitehead's theory of regional extension, parts do not preexist the relations that they come to establish. Rather, they are defined by the ways in which they include and exclude themselves from one another. In this perspective, continuity ceases to be exclusively virtual, condemning the actual to be discontinuous, to become proper of extension itself. Each actual entity is defined by the relations of extension that it

partakes with other entities. Their contact generates concrete limit-points and surfaces of contact that no longer fall into the topological infinity of infinitesimals. Rather, these are discrete conditions of transition from one spatiotemporal region to another, organized in accordance with a continuity of potential discontinuities (i.e. discrete points of contact). Here, connection concerns the critical limits at which the state of a regional system is altered to the point of having to change. The passage from one state of affairs to another is designated by Whitehead as “conrescence”, which “is the name for the process in which the universe of many things acquires an individual unity in a determinate relegation of each item of the 'many' to its subordination in the constitution of the novel tone” (1978, p. 211). As such, the transitory connectivity of spatiotemporal regions corresponds to the unification of a multiplicity of actual entities. It is the constitution of a mereotopological space where parts and wholes are related to one another in extension.

If computation is considered, it is here, with Whitehead's extensive schema, that digital algorithms can be understood beyond the credo of a disjunction between virtuality and actuality. To the extent that digital computation can be seen as an accretion of data on data, its algorithms can be understood as conrescences. Of course in this framework an algorithm can also be said to be an actual entity. But in this regard, it matters to say, together with Whitehead, that “[t]here are not 'the conrescence' and 'the novel thing' [or actual entity]: when we analyse the novel thing we find nothing but the conrescence” (Whitehead, 1978, p. 211). And the reason for this, the philosopher explains, is that “[a]ctuality' means nothing else than this ultimate entry into the concrete, in abstraction from which there is mere nonentity. In other words, abstraction from the notion of 'entry into the concrete' is a self-contradictory notion, since it asks us to conceive a thing as not a thing” (Ibid.). From this standpoint, algorithms themselves can be understood as processes. For, as Whitehead proffers, “[a]n actual entity is a process, and is not describable in terms of the morphology of a 'stuff.’” (Ibid., p. 41). Algorithms ingather data into the conrescence of novel facts of unity, which on their turn become part of the extensive schema where all actual entities are potentially related to one another. Such perspective of digital computation becomes all the more adequate if the parametric structure of algorithms is considered. Such structures can in this way be seen as extensive spaces where conrescences take place. Their constituent entities, rather than being discontinuous, in the fashion of digital bits of data, are continuous with one another in the extensive whole where their own constitution takes place. Importantly, this is a whole that, by reason of being the object of both an “indefinite

divisibility” and an “unbounded extension”, which according to Whitehead are the main features of the extensive continuum, comprises in itself the infinity of virtual potentials.

It can nevertheless be argued that the results of parametric computation pertain to a space of topological invariance. After all, parametricism is a mode of control characteristic of cybernetics and of the pervasive culture of prediction that followed from it. Parametric algorithms can be used as functions of control with regard to the variation of results. From which follows the possibility of approaching algorithms, and specially parametric ones, both from different standpoints with regard to space and from different conceptions of virtuality. If one thinks, for example, of the gestural bodies expressed by the parametric algorithms of the *Gesture Follower* (discussed in Section 5.1), one can say that they take form in accordance with the topological invariance of a determinate definition of gesture. The expressions actually vary, but within the limits of possibility given to the software in the form of parametric structures. The expression of gesture is constrained by what is possible at the intersection of imagination and digital programming, and thus made to be the function with which gesture can be predicted, i.e. followed, and controlled (by signalling the learning subject with the binary possibility of conformity between the different domains of expression at stake). On the other hand, the parametric structure of the algorithms expressing here the definition of gesture entails a mereotopology of extensive relations between wholes and parts. As much as given parameters correspond to discrete quantities of data, the computation of parametric algorithms corresponds to the concrescence of many series of data. Computation realizes the many potentials of relation existing between the infinity of discrete parts in concrescence. A parametric algorithm can thus be seen as an extensive schema where many discrete quantities of data intersect with and overlap to one another, forming a mereotopological infinity.

It is acknowledgeable that Whitehead's theory of extension and his mereotopological approach fit the consideration that algorithms are more than finite sets of data. A mereotopological approach allows for considering algorithms' incomputable data with a notion of space that, at the same time that it articulates the undetermined with the determined, it articulates as well the virtual with the actual in a way that somewhat resolves the problem of how to understand the processual relation between quantities and qualities. For this reason, Whitehead's theory of extension deserves to be further expounded, so that the processes whereby incomputabilities infect the calculation of actuality can be better understood. Needless to say that this conforms to Chaitin's theory of algorithmic complexity.

For Whitehead, ideas “exhibit the definiteness of mathematical relations” (1978, p. 327). Only this allows abstraction to measure the physical world in an exact way. In contrast to relativity theory, which conflates the laws of physics with geometry and relegates abstraction to the limits of space's infinitesimal divisibility, Whitehead proposes a disarticulation between abstractions and expressions so that the measurement of space can occur in purely formal terms (1978, pp. 283–289, 294–301). On the one hand, this amounts to saying that only the potentials of pure abstractions can define the mathematical relations actually established between the different parts of one extensive whole. On the other, it is to say that the contact between the different entities cannot actually express the definiteness of mathematical relations. It follows that there is necessarily a degree of indetermination constitutive of the extensive continuum's mereotopological relations. If one were to perform, concretely, the partition of a whole, one would necessarily find impossible to express the definiteness of mathematical relations. To the same extent that this is concretely impossible, it is possible in abstraction. Only in abstraction can the definiteness of mathematical relations be defined. Notwithstanding, the potentials of such relations do exist immanently in extension. The pure potentials of eternal objects are immanent in the extensive continuum's mereotopology. Abstraction in general and the definiteness of mathematical relations in particular, rather than doubling in potential what can in fact come to occur, simply correspond to yet undetermined relations of contact between the extensive continuum's actual regions of space-time. As such, mathematical relations are pure potentials.

Accordingly, if spatial relations can be measured, and if measurement is a method of abstraction, then space is to be thought in terms of extensive abstractions. Such corollary owes much to the fact that, in Whitehead's philosophy, virtuality is not considered to be a formless potential, capable of being determined in many possible ways, but rather a series of infinite ideas, each of which distinct from the rest. Since each actual occasion is a singular event, the pattern of occurrence that it comes to inscribe in the continuum of extensions is historically located. Ideas participate in this way in the continuum of potentials, at the same time that their historical ingression into actuality allows them to become distinct from one another. They exist as general potentials, but they also become historically located and actually distinct from one another. With the implication of ideas in the actual definition of the world's expression, not only are virtuality and actuality assured to be immanent in one another, but also ideas are granted definiteness because of being implicated, as general potentials, in the

actual continuum of extensive relations between parts and wholes.

Whereas ideas are here conceived as general potentials of expression, the extensive continuum where they exist and from which they acquire definiteness is seen to be not without its own non-abstract capacities. Which is to say that matter itself is here too conceived as being autonomously active, not only capable of expressing the ideality of patterns, but also capable of moving in accordance with its own specific, i.e. non-general, potentials. In this sense, Whitehead's schema of extension coincides with the previously expounded notion of matter's diagram.¹⁵⁶ It grants matter the capacity to organize itself, with no necessity for external factors of determination. The reciprocal determinability of forces and forms that constitutes the physical pole of reality, provides the ground on which abstractions can be imagined, for it is in matter itself that ideas, in potential and before subjectification, are already implicit. Which is to say that the diagram of matter is doubled by an abstract one: the “mental pole” of all material formations. For Whitehead, “no actual entity is devoid of either pole, though their relative importance differs in different actual entities” (1978, p. 239). It is from this very conception of abstraction in actuality that the notion of experience is disentangled from subjectivity. Because “an actual entity may, or may not, be conscious of some part of its experience” (Ibid, p. 53), Whitehead postulates the presupposition of experience by consciousness, rather than the opposite. Hence, it can be said that the world experiences itself, with no necessity for a conscious subject. The mental pole of reality grants the world the capacity to think itself, as this selects from the potentials of eternity the ideas that it chooses to actually realize. Conversely, all matter abstracts the world in its own way. Be it through the layered stratification of geological sediments or through the formal variation of waters drops and snow flakes, matter's physical expression always expresses ideas. With the primacy of experience over consciousness, Whitehead's process-oriented metaphysics distances itself from the kind of dualities that divide the world between given subjects and object, to define experience as the process through which the mental and physical poles of reality co-exist and co-evolve, immanently in one another. Experience unfolds the general potentials of abstraction together with the relative potentials of matter's diagrammatic dynamisms towards a constant rearticulation of novelty with what is actually given from the past. Experience: a continuous definition of ideas by means of extensive creation.

To the schema of extensive abstraction, Whitehead calls the “extensive

¹⁵⁶ See pages 134-136, Section 4.3.

continuum” (Ibid., pp. 61–82). This continuity of extension is a potential for indefinite division, which grants it with the capacity to express the definiteness of mathematical relations. The general potentials of ideas are here granted an actuality that, rather than being determined, is undetermined. It is through such indetermination that the extensive schema of general expression ceases to relate only discrete and discontinuous entities, to not only relate them in a continuous field of potentials but also relate them to these same potentials, i.e. to the ideal patterns of occurrence that they express each time anew. From which it follows that each determinate expression necessarily implicates undetermined quantities of data that allow for it to connect to all other actual entities, if not in fact, at least in potential. Conversely, it is only by means of these potentials' ingression into the concrescence of novel facts of unity that the continuum becomes extensive, i.e. that it acquires determinate standpoints with regard to its overall development. Whitehead explains the relationship between the extensive continuum and the concrescences that in it take place in the following way: “The real potentialities relative to all standpoints are coordinated as diverse determinations of one extensive continuum. This extensive continuum is one relational complex in which all potential objectifications find their niche. It underlies the whole world, past, present, and future. [...] the properties of this continuum are very few and do not include the relationships of metrical geometry. An extensive continuum is a complex of entities united by the various allied relationships of whole to part, and of overlapping so as to possess common parts, and of contact, and of other relationships derived from these primary relationships. The notion of a 'continuum' involves both the property of indefinite divisibility and the property of unbounded extension.” (Ibid., p. 66).

If the extensive continuum holds a potential of division, then it is by actual means that this potential is realized. On the one hand, the continuum is undetermined. It infects concretization with real potentials of division. On the other, actual division is a sort of atomization. In Whitehead's words: “Actual entities atomize the extensive continuum. [...] For each process of concrescence a regional standpoint in the world, defining a limited potentiality for objectifications, has been adopted. In the mere extensive continuum there is no principle to determine what regional quanta shall be atomized, so as to form the real perspective standpoint for the primary data constituting the basic phase in the concrescence of an actual entity.” (Ibid., 67). There is, therefore, an absolute potential of extension in the continuum. But as much as actual entities correspond to determinate standpoints and each entity implicates undetermined quantities of data, potentials need also to be seen as being relative to one another.

Accordingly, “[w]e have always to consider two meanings of potentiality: (a) the 'general' potentiality, which is the bundle of possibilities, mutually consistent or alternative, provided by the multiplicity of eternal objects, and (b) the 'real' potentiality, which is conditioned by the data provided by the actual world. General potentiality is absolute, and real potentiality is relative to some actual entity, taken as a standpoint whereby the actual world is defined.” (Ibid., p. 65).

In order to better understand the relationship between general and real potentials, let's once again consider the example of colour. Once granted that whatever expression of blue cannot be but a singular event, and that it can only be so insofar as the general potential of blue exists as a potential of relatedness between the multiplicity of actual entities in concrescence, it must be acknowledged that absolute and relative potentials are immanent in one another. The eternal object blue exists in actuality as much as actual entities exist in the continuum of eternal objects. There is no one singular expression of blue that doesn't implicate the eternal object blue. Reciprocally, the general idea of blue does not exist without being implicated in actuality, i.e. without being somehow expressed. Real, local and relative potentials are intrinsic to the objects of eternity, since these constitute the continuum that each actual occasion cuts. Each actual cut realizes potentials relatively to the concrescent data, which are themselves approximations, in continuity, to the general potentials of relatedness that the continuum provides.

Inasmuch as actual entities implicate general potentials, they can be said to be randomly located in the continuum. Or, they can be said to be located everywhere in the continuum. In contrast, inasmuch as they are determinately inscribed in the continuum, they are historically circumscribed and therefore actually defined relatively to one another. This double character of space, simultaneously relative and general, is explained by Whitehead in the following way: “In the mere continuum there are contrary potentialities; in the actual world there are definite atomic actualities determining one coherent system of real divisions throughout the region of actuality. Every actual entity in its relationship to other actual entities is in this sense somewhere in the continuum, and arises out of the data provided by this standpoint. But in another sense it is everywhere throughout the continuum; for its constitution includes the objectifications of the actual world and thereby includes the continuum; also the potential objectifications of itself contribute to the real potentialities whose solidarity the continuum expresses. Thus the continuum is present in each actual entity, and each actual entity pervades the continuum.” (Ibid., p. 67). This results in a fractal

geometrization of space and time that, contrary to Harman's object-oriented metaphysics, depends on the immanent relation between random quantities of data and the continuum's determinate standpoints.

As a potential to ingress into actual occasions and to realize ideal relations between different spatiotemporal regions, the extensive continuum expresses the general schema according to which the actual contact of parts comes to occur. While the continuum unifies actual occasions by providing the potential of their relatedness, actual occasions cut the continuum's potentials by realizing the ideality of patterns. The actualization of a potential idea is thus a discrete cut in the continuous infinity of discrete points constituting the Whiteheadian virtual. While not determinate in itself, a potential idea determines the precision of the cut with which it gets to be determined, in its concrete occurrence. Such determination involves an exclusive limitation of what is admitted into the actual occasions of experience. Meaning that, with each concrescence, only some eternal objects of the whole continuum are realized. For Whitehead, “[t]his element of 'exclusive limitation' is the definiteness essential for the synthetic unity of an actual entity” (Ibid., p. 66). The cut that each actual occasion operates in the gregarious continuity of discrete points marks the transitional limit between stationary data and concrescent emergence.

Moreover, says the philosopher, concrescence “embodies a determinate attitude of 'yes' or 'no'” (Ibid.). It selects and limits ingression in order to define the actual occasion. Such selection happens by means of what he calls “prehensions”. A prehension refers to the immanent affectivity between the actual entities in concrescence. It registers the affective transformation that takes place when one entity enters another's world. An object is prehended by a subject, simultaneously to their reciprocal concrescence as the singular terms of a real affective connection. But also a thought prehends another thought; the contraction of a muscle prehends the extension of another muscle; and an arrow prehends the target that it comes to hit when in flight. Through prehensions, actual occasions come to relate to one another by including or excluding themselves from one another, in extension. This is what Whitehead calls, respectively, positive and negative prehensions. Through positive and negative prehensions, the actual occasions decide and select on what to admit into the final synthesis of process.

The concrescence of actual entities corresponds to the concrete determination of the present by the immediate past, a determination tantamount to the one of the future

by the present. This actualization, tells us Whitehead, is initiated with the “pure reception of the actual world in its guise of objective datum for aesthetic synthesis”, a movement that necessarily comes to include in the actual occasion a multiplicity of previous entities. This process, in which “the many become one, and are increased by one”, is guided by what the author calls “the ultimate metaphysical principle”, that is, “the advance from disjunction to conjunction, creating a novel entity other than the entities given in disjunction. The novel entity is at once the togetherness of the 'many' which it finds, and also it is one among the disjunctive 'many' which it leaves; it is a novel entity, disjunctively among the many entities which it synthesizes.” Each creative process is therefore determined by the actual data that it can receive into concrescence. The concrescence resolves the extensive continuum's indetermination into a coherent coordination of different standpoints and, in this way, synthesises it aesthetically. (Ibid., p. 21).

Whitehead's extensive continuum undoes the split between space and time that was still so prevalent in Bergson's theory of duration, to give prevalence to the notion of an infinity of discrete points. In contrast to Bergson's philosophy, which understands experience according to duration, Whitehead's notion of the extensive continuum provides the possibility of conceiving the relation between intensive and extensive multiplicities in terms of an atemporal depth (of affect). Here, resonance is key. For it is through the processual resonance of the extensive continuum that a multiplicity of spatio-temporalities can co-exist. Contrary to the continual flow of becoming so characteristic of durational experience, the extensive continuum's actual entities come to be in contact with one another by selecting the potentials of eternity into the vibratory resonance of the concrescent becoming. The extensive continuum is a field of becoming, the internal resonance of which assures the affective prehension between actuals entities.

From this standpoint, algorithmic objects can be seen under a different light. In contrast to Harman's object-oriented metaphysics', Whitehead's philosophy offers the possibility of understanding algorithmic objects as processes. Algorithms can be thought in terms of both physical and conceptual prehensions of data. They can actually apprehend data, but not without apprehending as well, conceptually, the eternal objects available to be selected into concrescence. Moreover, instead of relegating algorithms' mathematical definiteness to some inaccessible depth, it understands it as belonging to extension itself, while it remains undetermined and, therefore, just a general potential. To say that algorithms apprehend the general potentials of ideas is to say that they reorganize the

extensive continuum by constituting, out of the immanent relation between random data and determinate standpoints, novel facts of unity. As such, they are actual entities. They are the very concrescence through which what is given into process, both determinately and indeterminately, comes to be selected for the latter's termination. For, as Whitehead explains, "[t]he 'formal' constitution of an actual entity, is a process of transition from indetermination towards terminal determination. But the indetermination is referent to determinate data. The 'objective' constitution of an actual entity is its terminal determination, considered as a complex of component determinates by reason of which the actual entity is a datum for the creative advance." (1978, p. 45). In the guise of Chaitin's theory of algorithmic complexity, Whitehead's notion of the extensive continuum provides a consistent framework to conceive of the incomputability of algorithms. Instead of just random quantities of data, Chaitin's Omega is seen, under the light of Whitehead's philosophy, as an infinite series of eternal objects.

Whitehead's theory of the extensive continuum is closer to Chaitin's theory of algorithmic complexity than to Bergson's theory of duration. The pervasion of algorithmic computation by an infinite number, corollary derived from the theory of Omega, is paralleled by the understanding that algorithms actually apprehend, either positively or negatively, infinite series of data. Both Omega and the extensive continuum's eternal objects grant algorithms the capacity to interpolate and accrete data in infinite ways. This is the way in which algorithms realize the mathematical concept of infinity. Such infinity can be thought in terms of incomputable and random quantities of data, which pervade every single computational process. But it can be thought as well as the excess of actuality over itself. What Whitehead's notion of the extensive continuum facilitates with regard to conceiving this excess, is the conception that potentials, instead of being qualitative multiplicities, correspond to the indefinite divisibility of an extensive space that cannot be bounded. And this is not to say that intensive qualities are not accountable by Whitehead's theory of extension. On the contrary, it is to say that it is precisely by means of indefinitely discrete and unbounded quantities that qualities are expressed.

6.5 - Thoughtful Character

Algorithmic excess, in accordance both with Chaitin's theory of algorithmic complexity and with Whitehead's theory of extension, does result in a processual

dynamism whereby incomputable quantities of data are prehended into the resolution of initial disparities between the extensive continuum's potentials. As actual occasions of experience, algorithms cannot be fully synthesised into expression. The parts of an algorithmic object are necessarily larger than the whole, because of their constitutive infinity. To prehend the eternal objects of such infinity into the concrete resolutions of computation means nothing else but to think. This is the major outcome that can be said to result from approaching the algorithms of digital computation with the extensive schema of Whitehead's philosophy. Inasmuch as algorithms prehend, not only physically but also conceptually, the many potentials of the extensive continuum where they exist, they are the conditional basis of a thoughtful character that must be granted to digital computation. Since algorithms prehend the incomputable quantities of data constitutive of the extensive continuum's series of infinite ideas, digital computation does not occur without being infected with ideas that it cannot compute. With such incomputabilities, digital computation is assured with a capacity to eventuate concrescences that cannot be fully predicted. It is granted the capacity to generate facts of togetherness that are truly novel. Further, the irreducibility of those infinite ideas potentially given to the concrescences of algorithmic computation confers to the latter the very status of thought. Inasmuch as algorithmic computation prehends the conceptual infinity of the extensive continuum where it occurs and to which it belongs, it does not occur without abstracting its own procedural determinations with ideas that cannot be known as such.

Recently, Luciana Parisi proposed that the thoughtful character of computation, and more specifically of digital algorithms, should be considered not as what results from cognition, but rather as what corresponds to the undetermined reality existing at the heart of computation and constituting its excessive character. She designates this mode of mode thought as “soft(ware)¹⁵⁷ thought”, which she describes in the following way: “Soft thought is not a tool for thinking (i.e., for planning, calculating, and rationalizing) space-time. Instead, soft thought is a way of producing computational space-time. The algorithmic processing of data is not just a means to explore new spatio-temporal forms. Instead, this automated prehension of data is equivalent to the

¹⁵⁷In his book “Software Studies”, Matthew Fuller notes that “[r]ecent etymological research credits John W. Tukey with the first published use of the term 'software'. In a 1958 article for *American Mathematical Monthly* he described how the mathematical and logical instructions for electronic calculators had become increasingly important [in the following way]: 'Today the 'software' comprising the carefully planned interpretive routines, compilers, and other aspects of automative programming are at least as important to the modern electronic calculator as its 'hardware' of tubes, transistors, wires, tapes and the like!'” (2008, p. 2).

immanent construction of digital spatiotemporalities. From this standpoint, soft thought cannot be simply disqualified for being a mechanical calculation of possibilities. At the same time, it may also be misleading to assume that computation is yet another extension of living thought. Soft thought is instead the mental pole of an algorithmic actual object. It is the conceptual prehension of infinite data that defines computational actualities or spatiotemporalities as the point at which algorithms stop being determined by the efficient order of sequences and rather apprehend their incomputable limit. Soft thought thus explains algorithmic computation as an actual mode of thinking that cannot be reproduced or instantiated by the neuroarchitecture of the brain (the neurosynaptic network), or to the neurophenomenology of the mind (the reflexive ability of the mind to become aware of its actions on the world). Soft thought, in consequence, is autonomous from cognition and perception.” (2013, p. 169).

It follows that algorithmic objects are conceptual prehensions of incomputable quantities of data. In fact, only by being so can algorithmic objects be said to be independent from any material order of symbolic coordination, that is, to neither depend on computational machines (hardware) nor on the symbolic languages that they use (software). Soft-thought is abstract in a way that neither requires concretization in terms of what could resemble the neuroarchitecture of the brain or the neurophenomenology of the mind nor any sort of linguistic expression.¹⁵⁸ The algorithmic objects of soft-thought are defined more fundamentally by their immanent connection with unknown and undetermined potentials than by whatever possible determination that they might express. Which is not to say that algorithmic objects are fully undetermined or that they exist only in abstraction. Algorithmic objects are models of transduction. Their determination conditions and constrains the passage from one state to another of infinity itself. They convey the transfer and amplification of abstract forces towards diagrammatic determinations and, possibly, their actual expressions. But it is only

158 It is worth noting that Parisi, by using both the expression “neuroarchitecture” and the expression “neurophenomenology”, is referring to what she designates as “the split between the neurocognitive and the neuroperceptual understanding of thought” (2013, p. 177). This split can be synthetically understood with the following passage: “If neuroarchitecture aims at designing the experience of space according to adaptive neural responses to the environment, neurophenomenology argues that it is the structure of experience – and not the cognitive mapping of the brain’s adaptation to space – that leads us to view cognition as enacted experience. According to enactivism, the interaction between thought and space – between experience and architecture – cannot coincide with a neural pack of connections, but rather needs to be studied in terms of first-person, experiential evidence of spatial phenomena or of variations such as depth, height, volume, temperature, colour, sound, etc. For neuroarchitecture on the other hand [...] the data collected on these variations [...] are enough to qualify these elements of interaction as first-person [...]. Neurophenomenology instead employs specific first-person methods in order to generate original first-person data, which can then be used to guide the study of physiological processes.” (Parisi, 2013, p. 182).

insofar as algorithms convey the influence of random quantities of data over the various degrees of their own determination and of the determination of their effects that they can be said to be the subject of soft-thought. And this is not to say that soft-thought is to be understood as the kind of reflexive cognition so typical of neurophenomenologies, such as the enactivist theories of cognition, perception and the mind (Parisi, 2013, pp. 180–185). On the contrary, because soft-thought is defined as “a manifestation of incomputable infinity or the conceptual prehension of incompressible data that suspends the order of algorithmic sequences.” (Ibid., p. 17), it can only be experienced either non-consciously or in terms of its unpredictable effects.

This requires perhaps a twofold explanation, one that explains the unconscious experience of thought and the novelty that from it might result. In the case of algorithmic computation, novelty corresponds to what results from the infection of incomputable quantities of data in computation itself, a creative capacity that can be best understood when accounting for the structure of parametric algorithms. As previously mentioned, the space of parametric algorithms can be approached either topologically or mereotopologically. If the relation between parameters is approached from a topological perspective, expression is seen as the result of determinate parametric variations. But if the relation between parameters is approached from a mereotopological perspective, it must be acknowledged that the computation of finite datasets is pervaded by and infected with an immanent and constitutive infinity of discrete and random quantities of data. In this way, variations in parametric expression are seen to result not from direct causes but rather from the mobilization of undetermined potentials. If the information exchanged between parameters is considered to be undetermined and random, then its effects on the overall structure of algorithms cannot be said to result exclusively from direct causations. Instead, a whole process of individuation needs to be acknowledged. Between the general potentials of ideas and the actual entities which express them, there necessarily needs to occur an exchange of information that, not only is the means by which a novel resolution can come into being, and therefore constitute a determinate standpoint in the historicity of the extensive continuum, but also the very cancellation of an initial disparity between potentials. In this sense, the algorithmic processing of information from which determinate quantities of data can emerge, necessarily corresponds to the resolution of problems in potential. Novelty can then appear as the expression of more than what has been algorithmically programmed. An expression which asserts algorithms as the very prehension of incomputable quantities of data. With this, it must be acknowledged that

only the conceptual prehension of random quantities of data realizes computation's potential to “deploy new actualities of relation or space events that are new and invisible to parametric programming” (Parisi, 2013, p. 171). The effective deployment of novel relations without perceivable effects thus regards the already mentioned presupposition of experience by consciousness. As such, in the extensive continuum, novelty is constant. It is always already there, not only potentially but also as the actual deployment of relational events that, even if unperceivable, are real and contributive.

It is from this standpoint that soft-thought's abstract character can be asserted. Since mechanical understandings of thought do not account for the prehension of infinity, soft-thought cannot be reduced to the algorithmic programming of computational languages. It is always more than that. From the perspective of digital programming languages, the incomputable infinity of random quantities of data is somewhat of a blind-spot from which dysfunctional results may appear. After all, as already quoted, “[m]achines break down, programs are buggy, projects are abandoned and systems hacked” (Goffey, 2008, p. 19). But, as Parisi also argues, “[...] far from being computational failures”, all these, “are instead [...] symptoms of algorithmic thought” (Ibid., p. 172). Because in all these cases algorithms process more data than what they have been programmed to, instead of being conceived only as ordered and finite sets of data, they must be conceived as conceptual prehensions of computational infinities. Though cognitive models such as those corresponding to the neuroarchitecture of the brain, i.e. cognitivism, or to the neurophenomenology of the mind, i.e. enactivism, can be used to approach algorithms, they do not account for the excessive reality of quantity existing amidst the structures of ordered data that the execution of predetermined and automated procedures requires. For both the one and the other, algorithms correspond to no more than to the programming languages used for the execution of sequential thought, the conditional basis of which is the concrete materiality of computational machines. As Parisi points out, “[f]or cognitivism, the condition for algorithmic processing is any physical architecture that runs the instructions through the connection of data that form a neural network; for enactivism, this condition is an environment in which the neural structure of cognition is dynamically triggered through sensorimotor perception. Thus while for cognitivism algorithmic processing is equivalent to cognitive states, for enactivism it is the effect of being embedded within an environment that allows cognitive states (as neural changes) to emerge. Consequently, and although they offer what seem to be incompatible ontological frameworks, both approaches conceive of algorithms as executable

procedures, as codes that perform thoughts upon a material substratum, or which cause thoughts to emerge from the latter. Yet regardless of whether these thoughts emerge from neural connections or are constructed throughout the sensorimotor schema of perception, algorithmic procedures remain the executors of thought. In short, the conditions for algorithmic processing are established by the sense in which the physical architecture of the brain is always already set to ensure the performance of thought. What is missing from these approaches is the possibility of conceiving algorithmic processing as a mode of thought, an expression or finite actuality, and not as the instrument through which thought can be performed, whether through neural nets or enacted via embodiment.” (2013, pp. 185–186).

Against the hegemonic prevalence of “the architecture of the brain” as the paradigm according to which thought is to be explained, Parisi argues for a conception of algorithmic thought independent both from the “mechanical functionalism” of the neuroarchitecture of the brain and from the “embedded vitalism” of the neurophenomenology of the mind. In contrast to these perspectives, it is contended that algorithmic thought must be considered from the perspective of its prehensive character. Algorithms must be conceived as prehensions of data that, if looked upon from the perspective of the extensive continuum's excessive character, are necessarily conceptual. Such conceptual prehensions of infinity abstract the physical prehensions of data, not as models according to which the definiteness of mathematical relations is instantiated, but rather as infections of excessive and incomputable quantities of data in actual computation. The abstract character of soft-thought regards therefore the existence of incomputable quantities of data at the heart of computation or, in other words, the constitution of the extensive continuum (from which computation feeds off data into concrescence) in terms of eternal objects.

According to this, abstraction is a fundamental condition of the singular constitution of determinate standpoints. The eternal objects of the extensive continuum infect the determinate character of any occasion of experience. In the case of algorithmic objects, this infection corresponds to the affective determination of computation by random and incomputable quantities of data. Only through the notion of prehension can this infection be understood. After all, what remains outside of computation is not absolutely excluded from process. On the contrary, since they are intrinsic to actuality, incomputable data necessarily partake computation. To say that there is an excessive field of multidimensional quantities pervading process in general and computation in particular is to say that, from the perspective of the actual entities in

conrescence, these excessive quantities of data correspond to what is negatively prehended into process. As already mentioned, a “negative prehension holds its datum as inoperative in the progressive conrescence of prehensions constituting the [novel fact of] unity [...] (Whitehead, 1978, pp. 23–24). As such, it is a function of subtraction. It doesn't subtract eternal objects from the actual occasions of experience, but rather actual occasions from the extensive continuum's eternal objects. Some general potentials are positively prehended into the actual occasions of experience, some are negatively prehended. But never the extensive continuum's eternal objects can be said to be inaccessible to the occurrent conrescences. They are of process and, as such, one of its fundamental conditions. Which is the very reason why it is possible to conceive of soft-thought as a fundamentally abstract process. Inasmuch as algorithms can be defined as conceptual prehensions of incomputable quantities of data, the structuration of soft-thought owes more to what is negatively prehended into computation than to what is positively prehended. Incomputabilities can then be defined as those quantities of data that, despite being a fundamental condition to computation, are negatively prehended into conrescence.

From this standpoint, it is perhaps worth to emphasize the importance of negative prehensions in process. For Whitehead, “[t]he importance of negative prehensions arises from the fact, that (i) actual entities form a system, in the sense of entering into each other's constitutions, (ii) that by the ontological principle every entity is felt by some actual entity,¹⁵⁹ (iii) that, as a consequence of (i) and (ii), every entity in the actual world of a conrescent actuality has some gradation of real relevance to that conrescence, (iv) that, in consequence of (iii), the negative prehension of an entity is a positive fact with its emotional subjective form, (v) there is a mutual sensitivity of the subjective forms of prehensions, so that they are not indifferent to each other, (vi) the conrescence issues in one concrete feeling, the satisfaction.” (1978, p. 41). This term, satisfaction, depicts in Whitehead's philosophy the termination of conrescences. Of it,

159 “The 'ontological principle' broadens and extends a general principle laid down by John Locke in his Essay (Bk. II, Ch. XXIII, Sect. 7), when he asserts that 'power' is 'a great part of our complex ideas of substances'. The notion of 'substance' is transformed into that of 'actual entity'; and the notion of 'power' is transformed into the principle that the reasons for things are always to be found in the composite nature of definite actual entities – in the nature of God for reasons of the highest absoluteness, and in the nature of definite temporal actual entities for reasons which refer to a particular environment. The ontological principle can be summarized as: no actual entity, then no reason.” (Whitehead, 1978, pp. 18–19). As such, “[t]his ontological principle means that actual entities are the only reasons; so that to search for a reason is to search for one or more actual entities. It follows that any condition to be satisfied by one actual entity in its process expresses a fact either about the 'real internal constitutions' of some other actual entities, or about the 'subjective aim' conditioning that process.” (Ibid., p. 24).

the philosopher says: “The actual entity terminates its becoming in one complex feeling involving a completely determinate bond with every item in the universe, the bond being either a positive or a negative prehension. This termination is the 'satisfaction' of the actual entity.” (Ibid., p. 44). Thus, everything in concrescence is a positive affect, be it a positive prehension or a negative one. The satisfaction of actual entities assures the determinate bond by which they come to be part of the whole extensive continuum. Negative prehensions assure that, when satisfied, the actual entity remains bonded with the extensive continuum. They assure that its concrescence conveys un-lived, unknown and unexpressed potentials. Only in this way it is possible to conceive of concrescence as a process that, at once, feeds off from the potentials of the extensive continuum and feeds back into them, becoming as such a relative standpoint amidst the general potentials of all eternal objects. Only in this way is possible to assure that, after concrescence, negatively prehended eternal objects remain available, as general potentials, for further concrescences. The relevance of negative prehensions “must express some real fact of togetherness among forms. The ontological principle can be expressed as: All real togetherness is togetherness in the formal constitution of an actuality. So if there be a relevance of what in the temporal world is unrealized, the relevance must express a fact of togetherness in the formal constitution of a non-temporal actuality.” (Ibid., p. 32). In other words, actual entities must become part of the extensive continuum via the negative prehension of eternal objects. In any actual occasion of experience, what is not lived is as constitutive of it as what is.

It follows that algorithms must be conceived beyond the positive prehension of data. Not only beyond expression, but more fundamentally beyond perception and cognition. The negative prehension of eternal objects corresponds here, in digital computation, to the prehension of data that are not computable but without which computation cannot occur. The reason why random quantities of data are a fundamental condition for the exercise of digital computation regards the general potentials that these incomputabilities convey. As much as actual occasions unfold together with the exchange of information between concrescent parts, not only do they physically prehend the actual data available, but they also conceptually prehend the continuum's eternal objects. In Parisi's words: “Digital algorithms do not simply compute these incomputable algorithms (as is suggested by Chaitin's discovery of Omega, for instance, which as a discrete infinity appears among the innumerable number of incomputables), but also negatively prehend the infinity of infinities that define their capacities of prediction independently of the sequential execution of codes. These negative

prehensions explain that computation is not simply a form of cognition that constructs cognitive maps as recipes for action. On the contrary, the negative prehension of infinite incomputable algorithms leads us to conclude from the understanding of random, patternless, or contingent data that [software is] irreducible to one overarching system of thought *qua* cognition. Instead, this negative prehension reveals that there are infinite modes of thought, involving a multiplicity of predictive capacities that correspond to nonunified (chemical, physical, biological, digital) patterns of decision making. In order to address the existence of these heterogeneous modes of thought, which are not always already referable to an eternally unchangeable being, it is important to conceive of algorithmic procedures as actualities that are defined by both physical and conceptual prehensions. This means that the sequential order of programming is only an aspect of computation. Yet we must bear in mind that any algorithmic execution is conditioned by the conceptual prehension of incomputables.” (2013, p. 222).

Therefore, algorithms cannot be understood without the conceptual prehension of incomputable quantities of data. Not only this, but inasmuch as these incomputabilities correspond to the extensive continuum's eternal objects, they are capable of determining any algorithm whatsoever. Because the determination of algorithmic objects necessarily results from the conceptual prehension of undetermined data, these general potentials cannot be understood without the extensive continuum, i.e. without the notion that, from a multiplicity of satisfied concrescences, not only result actual relations but also potential ones. The principle of immanence between actual relations and potential ones can be simply understood as the positive character of the concrescence of prehensions. Concrescence itself is creative, since it brings into constitution novel facts of unity. Regardless of being included into or excluded from concrescence, prehensions hold an absolutely positive value of creativity. Negative prehensions constitute the ground against which positive prehensions are contrasted. If this relation is considered in terms of eternal objects and actual occasions, it can be easily understood that the concrescence of prehensions conveys both what is expressed and what is not. As much as the abstract machine of the infinity of eternal objects moves together with the concrescences that it energizes and by means of which it is extended, experience exceeds consciousness, cognition, perception, and so on. Soft-thought cannot be known as such. But it can be acknowledged to be as fundamental to computation as the unconscious is to any other mode of thought. There's always more to process than what meets the subject.

There is no other way to conceive of the immanence of undetermined potentials

in the extensive continuum's determined actuality if not through the notion of process. In the frame of media theory, the extensive continuum has been characterized by Steve Goodman and Luciana Parisi in terms of a “rhythmic anarchitecture”. In their words: “To the becoming of continuity we call rhythmic anarchitecture, where anarchitecture denotes a method of composition, which feeds off the vibratory tension between contrasting occasions. A rhythmic anarchitecture is amodal and atemporal. Rhythm proper, cannot be perceived purely via the five senses but is crucially transensory or even nonsensuous. Rhythmic anarchitecture is concerned with the virtuality of quantum vibration. It is necessary here to go beyond the quantification of vibration in physics into primary frequencies. For us, it is rhythm as potential relation, which is key. If rhythm defines the discontinuous vibrations of matter, then we must also ontologically prioritize the in-between of oscillation, the vibration of vibration, the virtuality of the tremble. The rhythmic potential that is an eternal object, cannot be reduced to its phenomenological corporeality. The vibratory resonance between actual occasions in their own regions of space-time occurs through the rhythmic potential of eternal objects, which enables the participation of one entity in another. The rhythmic potential of an eternal object exceeds the actual occasion into which it ingresses. To become, an actual entity must be out of phase with itself.” (2009).

Not only the negative prehension of eternal objects assures the bond between actual entities, but concrescence itself is only possible because of the extensive continuum's indetermination. Concrescences can only occur by means of an affective resonance of non-localized relations between actual entities. These are clearly Simondonian terms. For, if actual entities must fall out of phase with themselves in order to come into being, then dephasings are only possible when potentials of different orders come to affect one another. From this perspective, the concrescence of prehensions can be seen as a movement of transduction: it transfers principles of individuation and amplifies them in a network of vibratory resonances. The extensive continuum's rhythmic anarchitecture therefore regards the ingression of what cannot be sensed into the order of the sensible and of the virtual-actual dynamisms that result from this. From which it follows that, in the case of algorithmic objects, rhythm necessarily pertains to the prehension of what cannot be computed into determinate algorithmic expressions. This notion of rhythmic anarchitecture is most adequate to understand the workings of soft-thought. The conceptual prehension of infinite quantities of random data assures the ground on which the resonance of contrasting entities can take place. If positive prehensions contribute to expression, negative prehensions assure the implicit

endurance of eternal objects amidst actual entities. Only the vibratory resonance of affect between actual entities assures that the latter can, not only be inscribed in the extensive continuum as local, relative and historical potentials, but also be connected to one another by means of mereotopological relations of extension. The negative prehension of discrete and random quantities of data relates actual entities, such as algorithms, to one another via the extensive continuum's general potentials.

6.6 - Speculative Proposition

If the individuation of a technogenetic body requires technicity, if it requires an excess of information transferred and amplified across the networks that it partakes, then it also requires that these potentials, the ones of information, are not only physically, but also conceptually prehended into individuation. Not only this, but inasmuch as the concrescence of prehensions in individuation includes both positive and negative prehensions, its physical and mental poles equally include that which is felt and that which is extracted from feeling. From this important insight brought about by a processual perspective on algorithmic computation follows that the potentials of a technogenetic body necessarily exceed, not only the structure of individuals, but also the feelings that individuals might capture from the experiential event of their own individuation. The potentials of information are therefore to be acknowledged as partaking the concrescence of prehensions not only with what is positively prehended and thus known, but also with all the negatively prehended data that can be neither felt nor known. The information of technical networks conveys, therefore, more than the resolution of process. It conveys as well all the irresolutions that are insufficiently problematic to be positively prehended.

The excessive character of information cannot be stressed enough. In what regards technogenesis and the constitution of a technogenetic body, information is an all pervasive and most determinant dimension. The technogenetic body cannot be considered without the processual character of its informing resolutions. Both the occurrence of technical transductions and the formal constitution of technical networks are functions of information. It is by means of information that the different domains of a technical network can communicate with one another. Information opens the communicating domains to one same continuous field, by transducing the latter's potentials. Once information has occurred, i.e. once it has been exchanged, its resolution

conserves, in the whole's structured parts, the enabling potentials of the latter's connection. By means of information, the unknown remains immanent in the technogenetic body, i.e. it remains immanent in the individuating system's sensitive and cognitive capacities.

It follows that it is possible to conceive of technogenesis as a process that can be enhanced by being opened to the unknown, that is, by the technical determination of a series of connections that will inevitably open the system to the infinity of potentials existing in the extensive continuum to which it belongs. As such, it is the contention of this study that, the more connections are consciously created, the more the system will prehend what it cannot compress and the more it will be infected by potentials that it cannot predict. If both positive and negative prehensions condition technogenesis, it is by maximizing the technical system's capacity to exchange information and resonate with itself, that the unconscious forces in it implicated can be fostered and enhanced. Since the saturation of technical connections necessarily heightens the system's self-affectivity, it potentiates as well its tendencies towards the emergence of unpredictable results. Hence, the proposed equation is: the more relations are actually established between different parts of the whole, the more the extensive continuum will become, unpredictably.

The assumption that novelty results from the ingression of undetermined potentials into the concrescence of prehensions has been a guideline for this study. From the beginning, especially together with Simondon's approach to technical individuation, it has been argued that, for a transformation to occur, i.e. for a system to fall out of phase with itself and move from one state of affairs to another, an incompatibility between potentials needs to occur. The relation between potentials belonging to different orders of magnitude needs to come to the critical point of an informational exchange, i.e. to the point at which potential energy is transformed into the kind of movement that restructures the system towards a novel state of metastability. But more than this processual account of the relation between forces and forms, what is here being proposed is the simple realization that, the more actual connections are built by technical means, the more the system will tend to fall out of phase with itself. If the generative potentials of the unconscious are in any case at work within the extensive continuum's becoming, it is by means of technical individuation, with a special focus on the actual complication of informational networks, that the technogenetic body can become more than what it is, generating in this way what can be neither anticipated nor regulated. The more information is made to open the technogenetic body to the infinity

of its own potentials, the more this will confuse its implicated domains. The technogenetic body can be defined by this very heterogeneity. The more heterogeneous it is, the more unpredictable it becomes. As such, heterogeneity is here tantamount to the prehension of infinity. It corresponds to the vibratory activity of technogenesis' rhythmic anarchitecture, and it is equally proportional to the individuating system's creativity. The more heterogeneous a system becomes, the more it is capable of overcoming the limits of its own possibilities. In sum, only because connectivity is a determinant function of technical individuation, can the increment of connections be said to enhance the technogenetic body's technicity.

Whereas Simondon's theory of technical individuation conserves the split between actuality and virtuality, still so prevalent in Bergson's theory of duration, Whitehead's theory of extension avoids such break by affirming ideas as undetermined but yet discrete potentials, immanent in the extensive continuum's determination. Not only this, but it is by thinking in terms of an extensive continuum that the relation between the virtual, the potential and the actual, so fundamental in Simondon's theory of individuation, can be best tackled. With Whitehead's theory of extension, the continuum is conceived in terms of relations between undetermined and determined potentials, i.e. between actual entities and eternal objects. This notion of the extensive continuum facilitates the connection not only between virtuality and actuality, but also between the different domains implicated in a system of technical individuation. With this notion, it is the very distinction between the subjects and the objects of knowledge that ceases to exist.

Notwithstanding this turn, it should be reminded that the notion of knowledge is deeply implicated in the notion of technical individuation. Also, because of the difference between co-individuating subjects and objects, it is the very notion of allagmatics that is found to be deeply implicated in technical individuation. Allagmatics, it should be reminded, corresponds to the reciprocal and dynamic convertibility between abstract ideas and concrete solutions. It regards the convertibility between structures and the processes by means of which these transmit potentials between one another. In between expression and abstraction, technical individuation progresses in a heuristic fashion, to which experimentation is key. Allagmatics thus concerns the abstract machine's double dynamism of content-expression encounters. The genetic past of emergence gives birth to thoughts that, on their turn, are capable of expressing themselves. In any case, allagmatics is said to be a theory of knowledge precisely because it regards the dynamisms by which subjects and objects are co-constituted.

There is no other way to conceive of allagmatics but as a dynamism constitutive of technical transduction. And, notwithstanding the fact that information is here conceived as being undetermined, it is through the conceptual prehension of what cannot be compressed into concrecence that the workings of the abstract machine in allagmatics can be best understood.

The abstract machine pervades the system of individuation by including in its actuality a blind-spot: the same diagrammatic fracture in transitioning between states that corresponds to the immanent infinity of eternal objects. In contrast to the topological understanding of process, according to which only the virtual is continuous as a result of the infinitesimal discontinuities of actuality, the mereotopological schema of Whitehead's philosophy allows for conceiving the abstract machine as a mereotopological potential, immanent in extension. The diagrammatic fracture in transitioning between states must be conceived of as the ingression into concrecence of what can neither be known nor felt, but which is as fundamental to resolution as what can. The constitution of technical individuals such as algorithms, or of technical networks such as computational machines, must therefore be conceived on the basis of an extensive continuum from which individuation feeds off its potentials. Rather than being conceived in accordance with a virtual-actual split, technical individuation must be conceived as an accretion of actuality whereby determinate standpoints can emerge. Despite the fact that subjective and objective perspectives contribute in determinate ways with the past to future resolutions, it is by means of undetermined potentials that such resolutions can come about. Any concrecence prehends into the emergent facts both what it can select and what it cannot. From which it follows both the integration of technical individuals in the extensive continuum, and the integration of the continuum in technical individuals. The workings of the abstract machine need therefore to be located at the level of the extensive continuum's actual indetermination. It is the ingression of purely undetermined potentials into technical concrecences that not only allows for novelty to occur (as a function of affection) but for it to fundamentally condition the ways in which determinate and relative potentials can once again be prehended. In individuation, novelty is not something that can appear, but rather something that is always already there (appearing, so to say), even if not perceptibly.

To say that the individuation of a technogenetic body is enhanced by actual increments, is to assume that these increments do enhance the extensive continuum's connectivity. Only by connecting, intensively, the extensive continuum's regions, can its complexity be brought to perception. Complexity, novelty and infinity are all

designations that depict the immanent character of the abstract machine at the heart process. They all depict an undetermined reality existing not at the end of an infinitesimal division of space, but rather at the level of actuality itself (actual indetermination being itself just another name for the indefinite divisibility with which Whitehead defines the unbounded extension of the continuum). But this is not a plea to either render the invisible visible or expand consciousness and knowledge. Rather, it is the following proposition: in order to overcome the dictates of regulation, prediction and control, all of which are organized solely in accordance with determinate sorts of actuality, the unknown must be not only accepted as constitutive of developmental processes but also as a potential to connect all that is known or knowable. There is no other way for technical individuals to become than through the concrescence of negative and positive prehensions. And the more data is prehended into concrescence, the more the extensive continuum is restructured.

It is the contention of this study that algorithmic computation can be seen as a paradigm of technical individuation. An algorithm has all the necessary ingredients to allow for the characteristic resummptions of technicity: it can be known, transmitted and iterated, but not without an immanent infinity of potentials, which in themselves are not computable. The fact that the rise of computational machines has served both the codification and automation of technics, confirms the latter's algorithmic character. But it confirms as well allagmatic transduction as the veritable operation of technical progress. And this is so because the informational exchange between humans and machines operates on the basis of both what is known and what is not. Both general and relative potentials participate in transferring and amplifying information across scales and domains. Both participate in the extensive continuum's rhythmic anarchitecture.

The individuation of choreographic knowledge can therefore be said to correspond to the determination of procedures with the potential to be expressed in different ways. This stands in accordance with the algorithmic paradigm. The examples discussed in this study demonstrate that the algorithmic character of thought is most suitable for the transmission of choreographic principles of individuation. In a very literal way, algorithmic automation allows for the digital domain to express choreographic knowledge. Hence, the diagrams of choreographic knowledge are, at least potentially, algorithmic. Which agrees with Forsythe's comprehension of how there are choreographic thoughts that coincide with algorithmic ones.¹⁶⁰

¹⁶⁰ Though a review of algorithmic strategies in the history of choreography has not been made here, other cases beyond Forsythe's choreographic procedures can be mentioned as being paradigmatic of

From this standpoint, and together with the argument that algorithms are not exclusive of digital programming, but that they rather express a specific way of thinking, the individuation of choreographic knowledge must be granted to comprise what is negatively prehended into concrecence. Choreographic knowledge must be considered together with the technological milieu of its own individuation. The fact that the cases discussed here have used digital technologies to assert choreographic knowledge is just one example of the interdisciplinary conditions of these same assertions. Though the interdisciplinary character of these projects has been just briefly mentioned, this remark is enough to consider the difference in connectivity conveyed by them in contrast to less interdisciplinary or transindividual approaches. Regardless of the domains of abstraction and expression summoned by the projects in case, what matters to acknowledge is the tendency that these projects demonstrated towards the complication of process, i.e. towards the saturation of process with general and relative potentials of connectivity. In fact, it seems evident that the larger a research project is—i.e. the more people, technologies, time frames, geographical scales, knowledge fields, and so on, it involves—the more complicated it gets.¹⁶¹ But rather than this complication being a burden, the argument here is that it potentiates the creation of novelty in technical individuation. It is with such complication that the individuation of knowledge can yield unanticipated results.

The complication of process that follows from the increment of actual connections in technical networks thus potentiates the affective prehension of both

algorithmic choreography. It is here enough to mention that it was Merce Cunningham, the American choreographer who, from the fifties onwards, set himself to emancipate dance from all other forms of theatrical expression (and thus to modernize it as an autonomous artistic form, where “movement is only about movement”), that pioneered the use of algorithmic procedures to compose dance. Cunningham’s drive to de-subjectify choreography brought him to experiment with compositional procedures involving chance. Since chance procedures require the calculation of ideas, choreographic composition became in this way equated with computation. This would bring Cunningham to work with computers for the calculation of complex conditions of possibility, making him “the first choreographer of international renown who routinely utilized the computer as a choreographic tool” (Copeland, 2004, p. 168). But more fundamentally, what Cunningham activated when applying the faculty of computation to the composition of dance, was the very idea of choreographic software. When commenting upon the software-like methodologies and aesthetics of Merce Cunningham’s choreographic work, Stamatia Portanova has conflated these two terms, i.e. composition and computation, into one: “compu-sition” (2013, pp. 97 – 132). With this term, Portanova indicates how much the procedural character of many choreographic practices quantifies not only spatio-temporal actualities but also of virtual infinities. Which is to say that, because choreographic compu-sition (like any other composition) involves both determinate quantities and the immanent infinity of random data, it can be said to be a mode of thought in its own right. After these first compu-sitional experiments, the field of dance expanded considerably, most notably with the next generation of New York based choreographers, such as Trisha Brown, Steve Paxton, Simone Forti, Yvonne Rainer, Douglas Dunn and David Gordon, most of whom had danced with Cunningham.

161 The paradigmatic case being the Motion Bank project, the documentation of which, accessible at <http://motionbank.org/en/documentation>, indicates the inherent complexity.

determined and undetermined data. It opens the system of individuation to its self-excess and it intensifies its tendencies towards dephasing. And what remains most acknowledgeable in regard to such increment is the intensification of affect between different quantities of data. If negative prehensions are as determinant to concrescence as positive ones, the increment of actual connections does not only correspond to the increment of physical data but also to the increment of conceptual data. The more actual connections are built into the system, the more the system will generate its own ideas (be them known or not). From which it follows that the more connections are built into the system, the more the system will be capable of conceptually prehend eternal objects into the concrescent resolution of differences in potential.

The exchange between contexts of research, fields of knowledge and processes of technical concretization, all conveyed by the projects here discussed, stands for the sort of ethical ground that inevitably brings forth a wider range of ideas. These projects' digital choreographies attest this. Not only could these novel choreographies be expressed as they were because of the networks that came to condition them, as the eternal objects in concrescence could not have been prehend as they were if it were not for these same networks. Which is to say that it was by reason of the information exchanged between the different domains here at stake that a whole field of potentials could be brought into process. And inasmuch as these potentials remain undetermined, they can only be negatively prehend. In short, in these projects' (as in others alike)¹⁶² there were more ideas than those expressed.

What the openness of technical networks towards different domains of thought and expression thus conveys is the affective becoming of the extensive continuum. A becoming partaken by both undetermined problems and determinate solutions. The technological milieus involved in process do transmit potentials by formal means, that is, the knowability of ideas and expressions is a condition for the transductive transmission of what cannot be known. But, likewise, the potentials of eternal objects are a condition for the concrescence of determinate diagrams, i.e. for the emergence of knowable ideas and expressions. In process, neither the one nor the other can be thought independently. The reciprocal conditioning of potentials and structures is the same as

¹⁶² Though this study has only dealt with examples that make use of digital media, similar examples that don't could also be discussed. Some of these are: the already mentioned (see Page 18) "*Mind and Movement: Choreographic Thinking Tools*", by Wayne McGregor/Random Dance; Anne Teresa de Keersmaeker's "*A Choreographer's Score*", edited by dance theoretician Bojana Cvejic; the "*FUNKTIONEN*" toolbox, by choreographer Thomas Lehmen; the "*Everybody's Performance Scores*", published by www.everybodystoolbox.net; and the publication series "*Scores*", by Tanzquartier Wien (<http://www.tqw.at/en/scores>).

the reciprocal and affective implication of quantities and qualities. In relation to one another, they constitute the fundamental condition for the becoming of a rhythmic anarchitecture. And inasmuch as rhythm is not constant, but rather subjectable to the intensification of problems and to the constraints of extension, it is by these very means that the continuum's becoming can generate novel knowledge and ideas that cannot be known as such.

These tendencies in process—intensification and constraining—are inextricable from one another. Constraining intensifies potentials, since it creates actual differences in the extensive continuum. In turn, the intensification that follows from constraining can be strong enough to create disparities in the extensive continuum's potentials. Which is the reason why adding relations to process intensifies informational resonance and charges the extensive continuum with more potentials. In short, the more connections in process, the more ideas in formation. The examples discussed in this study demonstrate this. But more than this being a simple formation of determinate instances of knowledge, it is a complex one. More than generating knowledge, these projects intensified the extensive continuum by creating actual connections between different domains of thought and expression. These connections constrain the continuum's rhythmic becoming and, in this way, determine possibilities of abstraction and expression. Additionally, they charge the continuum with ideas that cannot be known, but which are fundamental to individuation. It is therefore by intensifying the extensive continuum's connections that the transindividual character of knowledge is potentiated. Only by connecting differences and intensifying disparities can transindividual potentials individuate novel instances of knowledge and charge the extensive continuum with the generative capacities of real but yet undetermined relations.

CONCLUSION

If seen as a map of the encounter between dance and technology, this study's topology entails a number of entangled problems. First, there is the problem of novelty: on which conditions can choreographic novelty occur? Second, there is the problem of objecthood: how are choreographic objects to be understood if the conditions of novelty necessarily implicate potentials? Third, there is the problem of potentiality: how are potentials to be understood if the objects to which they belong are expressible in different domains? Fourth, there is the problem of transmission: how are objects transmitted from one domain to another and what happens there? Fifth, there is the problem of relation: how is abstraction related to expression? Of course all these questions can be formulated differently, and the list can also go on. But what matters here to understand is that all these problems are implicated in one another. Precisely because of this, the present study can be seen as diagramming the plane of composition of the encounter between dance and technology. Framing these study's concerns with novelty, potentiality and process with the work of process philosophers, being that such tradition is fundamentally concerned with the relationship between continuity and discontinuity, quantities and qualities, virtuality and actuality, can also be said to have biased its own development. Expressing by means of writing, i.e. discontinuously, the reality of choreographic processes, i.e. a real continuity, attests that it is itself a diagram and that it maps the topology of the encounter between dance and technology.

If the logic of relation between problems and solutions presented before (e.g. in Section 4.1) is to be followed, then it should be possible to synthesize at this point a series of solutions for the problems just mentioned. Not only this, but all the remaining hypotheses followed throughout this study should by now have acquired a determinate degree of resolution. In order to expose such resolutions, a brief concluding summary will be now addressed to each of the previous chapters.

Chapter One – It could be asked: “Why should an inquiry into the digital expressions of choreographic knowledge start with ontological concerns about movement and bodies?”. The answer has been given and is quite simple: it is not possible to inquire into a kind of knowledge that concerns moving bodies if not by inquiring as well into the latter's definitions. After all, specific understandings of moving bodies necessarily condition what is to be understood by choreographic knowledge. In this respect, it can be said that the incursion into Henry Bergson's take on

the theory of multiplicities has proved to be telling. Not only has movement been argued to be more than dislocation, but also such excess has become equated with what, in movement, is irreducible to space. As such, it has been shown that movement necessarily implicates a temporal dimension of change, which Bergson defines as “duration”—the elastic interval where bodies move as a whole. Such notion of whole remained echoing throughout this study's development. Already here, it became equated with the very infinity of potentials to which, in order to move, bodies must open. As indicated by Gilles Deleuze, the whole of a moving body is neither given nor giveable. It is absolutely irreducible to extension, but yet conditional to and encompassing of its transformations. Hence, movement must be thought in terms of virtual-actual dynamisms that express space, but not without abstracting it with the constitution of memory. There is a most fundamental point to this: such virtual-actual dynamisms are only assured by a constitutive principle of immanence. Such principle assures that space and time cannot be thought without one another and that the mode of their relation is fundamentally undetermined. Here, such indetermination has been addressed to potentiality itself. From the perspective of Bergson's theory of duration, potentials are more correctly seen as being virtual, rather than actual. Notwithstanding, throughout this study, such view has been contested. If, for example, potentials are to be granted to the digital domain, they must be actual and, somehow, compose the continuum whereby virtuality and actuality relate, immanently, to one another. Furthermore, it matters to say that this relation's indetermination has been also addressed in different ways throughout the study. Most importantly, it has been conceptualized in terms of affect—the reality of relation that, being undetermined, is irreducible to finite expressions, but that nevertheless assures a continuous exchange between the memory of time and the expressions of space.

With this in mind, this study proceeded with a focus on the encounter between dance and technology. To inquire into such encounter, while considering the virtual-actual dynamisms of movement, is to ask how the memory of time gets to be contracted into spatial expression. Already here, the notion that the encounter between dance and technology is in fact choreography (as this is commonly understood) started to be laid out. To think dance technologically is to necessarily constitute instances of knowledge that regard ways of dancing. The fact that such knowledge must, at some point of its determination, be expressible by means of dancing, attests its transmissibility. It is a knowledge that can be transmitted from body to body and from dancing to writing. As such, here, the problematic concern with the virtual-actual dynamisms of movement is

not only a concern tantamount to how the memory of dance can be expressed, either by means of the dancing body or by means of writing, but also a concern with how such dynamisms unfold in the very process of choreographic transmission. The definition of such dynamisms by a constitutive principle of immanence and, therefore, by a potential that can create what cannot be predicted, because it is yet undermined, indicates that the encounter between dance and technology is capable of creating novel instances of choreographic knowledge. Such capacity is notwithstanding problematic when it comes to consider that what can be transmitted has necessarily to be known and, therefore, determined. If it is already determined, it cannot be new. Hence, the question posed here: how can the encounter between dance and technology create of novel instances of choreographic knowledge? Not new for given subjects and objects, but new in a way that brings into constitution the very subjects and objects of novel and emergent relations. In a sense, this first Chapter served to pose this problem.

Chapter Two – Simondon's theory of individuation has been presented here with the intent of explaining, on the one hand, how the virtual-actual dynamisms of movement unfold in the case of technical systems and, on the other hand, how such processes can be modelled towards the expression of new individuals. Though this constituted the ground upon which the topological character of choreographic objects has been later approached (facilitating in this way the understanding that such objects can be expressed in infinite ways without losing their diagrammatic character, i.e. technicity), it can be argued that all things here said with regard to this philosophical system have been scarcely developed. To put it more bluntly, from all the concepts exposed, only some resulted in being fundamental to the subsequent analysis and discourse. This is not to say that the incursion here essayed into Simondon's philosophy is not of value. Rather the contrary. It is to say that this philosophy has such far-reaching implications with regard to the thought of process and transindividual life that it demands further investments. This study's focus on choreographic objects barely indicates some possible ways of coping with this author's challenging thought. Even in regard to the conceptualization of choreography, the outcomes here proposed can be said to be short of what it might be possible. This study only opens the field of relations between choreographic thought and the fundamental concerns of process philosophy. An opening that is not exclusive. The references used here from Erin Manning's work indicate her engagement with such relation. In this regard, she's only one amongst several. Such interest is recent and therefore still pregnant with potentials. This study partakes this interest and strives to contribute to the understanding of its potentials. In

this respect, Simondon's work stands as an inevitable reference due to its dedication to technics. Of course other names could be summoned. For example, Martin Heidegger. But this requires further investigations. Up to this point, what can be said in regard to Simondon's philosophy is that it provides a unique standpoint for thinking the relation between the different kinds of individuals involved both in the process of knowledge making and in the process of choreographic creation. The prevalence given by Simondon to the transductive character of thought, with its analogical mode of individuating knowledge, seems to be fundamental to understand how choreography can in fact be granted the status of thought. The choreographic object's irreducibility to its abstractions and to its expressions results in the corollary that it is also, necessarily, processual. As such, it must be approached in accordance with its potentials and seen from the perspective of its whole movement. To say that an object moves is to say that its very existence depends on the relation between determinate structures and undetermined potentials. A relation that, insofar as it allows time to be inscribed in the developmental system where it occurs, constitutes the object as the non-subjective pole of one choreographic idea. The choreographic object is therefore the logical result of a choreographic movement of thought. The correspondence between such movement and technical individuation is one insight that Simondon's philosophy allows to be followed, together with all the implications that come along with it. In sum, only by having incurred into Simondon's work, could this study come to the point of understanding the processual dynamisms of choreographic creation. Which amounts to saying that the Simondonian notions of individual, information, transduction and technicity seem to be fundamental for a definition of choreography as a movement of thought.

Chapter Three – In order to tackle the thought of technical individuation in the encounter between dance and technology, this Chapter set itself to inquire into the constitution of choreographic knowledge. On the one hand, this was done by defining choreography as system of technical individuation capable of constituting both the subjects and the objects of knowledge. On the other hand, it was done by specifying such definition with the example of one of William Forsythe's "*Improvisation Technologies*". It was shown how choreographic creation is the sort of technical individuation that necessarily composes networks of informational exchange between dancing bodies and writing technologies. The difference between such elements of a network has been argued to be conditional for the creation of novel instances of choreographic knowledge. It is the asymmetry between dancing and writing that assures the necessary potentials for a choreographic system to become problematic and, with

this, resolve itself into novel expressions. Here, whereas writing has been equated with spatiotemporal structures, dancing has been equated with the movement that pervades them. Of course this is a somewhat loose distinction, which should be further explored. Notwithstanding, such distinction sufficed to assert that, in this way, choreographic writing can be understood as the creation of invariant functions of expression. Regardless of being abstract or concrete, such functions assure the choreographic system's continuity, i.e. they assure that the system's structures endure throughout transitions between domains of individuation. Because of this, choreography—the writing of dance—has been defined as the choreotechnical formation of mnemonic structures capable of enduring throughout the many processes of their own transmission. Such invariant functions have been defined both in terms of potentiality and in terms of rhythm. They regard the kinds of problems that, in potential, can be posed to choreographic individuation. They regard the continuity of potentials that, while connecting abstractions to expressions, is capable of transferring one same problematic structure across different domains. Such structure is problematic because it necessarily relates an idea with determinate conditions of individuation. The problem is therefore always a difference between abstract potentials and concrete possibilities. On the other hand, positing choreographic problems necessarily occurs by means of a rhythmic differentiation of potentials and possibilities, which has been designated as nexus. Such nexus corresponds to the problematic structure of one choreography's invariant functions. Its expressions are always singular but, insofar as they are related to one another by a continuity of potentials, they have in common the same kind of problems. Hence, the different expressions of one same choreography correspond to different resolutions of one same problematic structure.

Defining this structure as “a model of potential transition from one state to another in any space imaginable”, as William Forsythe has, and acknowledging that such model only acquires a degree of determination when in relation to concrete conditions of individuation, has led this study to define the choreographic object in tripartite but entangled terms: its problematic structure is capable of eliciting technical action; this does not occur without an emphasis on the affective intermodality of the senses; such synaesthetic indetermination is modulated by the technical act, necessarily in accordance with a general set of parametric constraints. The case here discussed of one of Forsythe's “*Improvisation Technologies*” has served to confirm the choreographic object's topological character. In regard to the object's characteristics, such topology is to be understood as the very continuity of potentials that, depending on the domain of

individuation, will express itself differently. The multimodal expression of each of the “*Improvisation Technologies*” attests precisely this: it attests that one same choreographic object can express itself in different ways, all conveying the structure of its own potentials, a structure which is generically defined by determinate margins of indetermination (i.e. parameters). Such multimodal expression attests as well the other two aspects of the choreographic object: when its different expressions are juxtaposed, its parametric structure becomes explicitly defined as what, between them, does not change; the fact that such definition results from the different expressions' relationship attests that it is precisely by means of relating the different modalities of sense that the choreographic nexus becomes better perceived. In this respect, the most clear example of a choreographic act given till this point regards the act of reading, i.e. it regards the learning subject's capacity to perceive a nexus of movements in an assemblage of signs. The capacity of choreography's multimodal expressions to elicit such perception has been here formulated in the following way: the concurrence of different nexuses defines a common structure, which is the structure of the very choreographic object to which they belong.

Such structure has been argued to be diagrammatic. Choreographic diagrams are structures with the potential to connect to other structures and form networks with particular nexuses of movement. They are topological planes that necessarily become problematic when related to concrete conditions of individuation. To say that the difference between potentials and possibilities is structured diagrammatically means that each choreographic problem necessarily bears with it the mark of the object to which it belongs. Since such mark is primarily defined by the object's diagram, it has been argued to correspond to the object's generic idea, which becomes ever singular when in resolution of its problematic relation with determinate domains of individuation. For this reason, it has been contended that the problematic difference of choreographic individuation necessarily corresponds to singular iterations of a given object's generic idea. From which three conclusions followed: 1) the choreographic object is an idea that, because it pertains to a nexus of movements, is potentially problematic and therefore capable of expressing itself in different ways; 2) the choreographic object can only express itself in different ways by transferring its problematic potentials across domains by means of transduction; 3) the choreographic object is irreducible both to abstraction and to expression and, as such, most aptly seen as a process in itself.

Chapter Four – If the choreographic object can elicit technical transductions,

then it is propositional. Such equation has been here argued by drawing from Gilles Deleuze's theory of ideas, which also allowed for defining the object's diagrammatic character with three distinct phases: it is formless, subjective and expressive. The formless diagram of choreography corresponds to the unconscious of process. It regards the very continuum through which what cannot be known relates itself to potentials that, even if argued to be actual, are nonetheless undetermined. Inasmuch as choreographic transduction individuates instances of knowledge, the formless diagram of a problematic idea is the continuity that assures the many resolutions' connection. As such, it assures as well the connection between subjective and expressive diagrams. The choreotechnical act necessarily co-relates these two diagrams: it determines them as the subjective and objective poles of one epistemological relation. Whereas the subjective diagram corresponds to the idea's conceptual determination, the expressive diagram objectifies it in extension. This led this study to consider the means by which diagrams can be expressed and to explore how both the abstract diagram of potentials and the subjective diagram of concepts participate in such process. This allowed for making the case that, because choreographic transduction necessarily intertwines, in a dynamic and affective manner, the diagram's three phases (which, as argued in Chapter 2, are necessarily contemporary to one another), there is always in this process an implicated potential to express unpredictable and therefore novel facts. In short, only because there is an unconscious and undetermined potential in process, can this express novelty. The choreographic object's propositional character is therefore related with the potentials that it always implicates, regardless of its phase. Nevertheless, it is only by being determined that the object can in fact become propositional. For the choreographic proposition elicits the feeling of a contrast that necessarily corresponds to the object's differential topology. Since such feeling is charged with potentials, it can serve the resolution of their differences into novel determinations.

This study proceeded by discussing Emio Greco and Pieter Scholten's "*Double Skin/DoubleMind*" choreographic object, not only to look upon its propositional character, but also to exemplify how such dynamic diagrammatism partakes choreographic transduction. Out of this, it was realized that, insofar as the digital domain is coded, it is the object's conceptual diagram that assures its nexus' preservation across expressions. This has to do with the fact that the knowledge transduced from dancing to writing is necessarily conceptual. Of course dance can be said to implicate many other kinds of knowledge, such as all those pertaining to kinetic automatisms. But it is the very conceptualization of the dancing body that allows choreography to be

expressed by means other than dance (as argued by Forsythe, in Chapter 3). Additionally, it has to do with the fact that the digital domain is itself conceptually structured. As such, it requires that what is not discrete and quantifiable becomes so. If there is a logic in expressing this one choreographic object by digital means, it is precisely that of dealing with the problems implicated in such transduction. Such problems necessarily regard the difference between what is continuous in experience and what is discontinuous in expression. Here, choreography's characteristic problem of the difference between dancing and writing has been specified with a difference between the qualities of the dancing body and the quantities of digital media. Such problem was resolved both with the conceptual structuration of media objects (i.e. videos, scores and texts) and with the digital programming of algorithms meant to represent the dancing body's movement qualities. This latter case was discussed only in the following Chapter. What matters here to retain is that the different matters of content used to represent in the digital domain this one choreographic object, had to be subjected to the dictates of a conceptual structure, without which the object's nexus could not be expressed in such a definite manner. As with the case of Forsythe's "*Improvisation Technologies*", such conceptual structure acts as a function of expression and assures that the different matters of content are related to one another according to the choreographic nexus that it represents.

Chapter Five – In order to tackle the relationship between quantities and qualities, this Chapter analyzed a series of cases that, in contrast to the ones previously discussed, convey choreographic functions of expression by means of digital algorithms. Instead of expressing just one case of solution, such algorithms are programmed to compute datasets (i.e. matters of content) and iterate the resolution of the choreographic problems defining them. Each series of iterations corresponds therefore to the expression of a choreographic nexus that can only be said to be so if digital algorithms are granted to implicate potentials. Such notion of a digital potential is tantamount to the problem of the relation between quantities and qualities. For if, till this point in the study, potentials had been only thought in terms of continuous multiplicities, the notion of a digital potential requires that the discrete quantities of digital data are related, at the very level of computation, with undetermined potentials. A thorough tentative for resolving this problem was made in Chapter 6.

Chapter 5 resulted in a distinction between the dancing body and its written representations, in terms of gesture. Since most of these algorithms were programmed to structure videographic data and compute representations of the dancing body, such

representations were said to correspond to determinate definitions of gesture used to define the algorithms themselves. The parametric structure of such algorithms represents therefore the very structure of the concept of gesture used to programmed them. From which it follows that the distinction between the dancing body and its written representations—here designated as gestural body—is also a distinction between qualities and quantities, i.e. a difference between the continuity of qualitative potentials and the discontinuity of quantitative possibilities. Here again, such distinction corresponds to the fact that, for choreo-knowledge to be transmitted, it needs to be not only determined, but also conceptually structured. Only the conceptualization of choreo-knowledge allows for its expression in the form of gestures and, as such, in linguistic forms. It is precisely because dance's conceptual structures are resumable across domains that choreographic objects can be said to be algorithmic. They are algorithmic with regard to the diagram of their own ideas. As shown, in the cases in question, the digital representations of gesture have been expressed by parametric descriptors that serve the computation of many cases of solution for one same choreographic problem. Such gestural bodies are therefore fundamentally different from dancing bodies because they express choreography's determination in the form of discrete quantities of digital data. As already argued and confirmed here, it is this very difference that allows for choreographic transduction to individuate novel instances of knowledge and, in this case, for gesture's conceptual structure to be digitally expressed. The fact that such determination is here used to compute, iteratively, the content-expression encounter constitutive of writing, attests both such algorithms' dynamic character and the fact that their expressions correspond to the many possibilities of the encounter's set. The limits of possibility of gesture's parametric structure are the limits of what can come to be known by digital means in regard to choreographic ideas. Notwithstanding, designating such algorithms as metaphors entails the notion that their possibility space is open to undetermined potentials. These potentials belong to the choreographic environments where such algorithms are embedded. But they also correspond to the hypothesis that, beyond possibility, computation can create novel and unpredictable expressions. Once more, this is the problem of a digital potential, which in this Chapter was just indicated to belong to algorithmic computation.

Chapter Six – From this standpoint, this study's final chapter set itself off to pursue the notion of a digital potential and, with this, to open the scope of the varieties of thought present in choreographic creation. What here seems to be most clear is that, despite the digital having been defined as being exclusively possibilistic, computation

cannot synthesize all digital data into countable quantities. Which is to say that, even when considering the digital domain in terms of discrete quantities of data, it must be granted that computation cannot structure all such data and that, therefore, it remains under the influence of a certain degree of indetermination. As such, in computation itself, there must exist incomputabilities.

The implications of such realization are far-reaching. For, if indetermination can be understood as being quantitative and discrete, then the very notion of a qualitative potential becomes compromised. In fact, from such conclusion, it is the very split between virtuality and actuality that must be reconsidered. What resulted from this chapter's incursions both into Chaitin's theory of algorithmic complexity and into Whitehead's theory of extension, was the realization that virtuality can be thought in quantitative terms, rather than only in qualitative ones. In this sense, potentiality corresponds to random quantities of data that exist together with determined ones by means of a rhythmic anarchitecture of extension. Despite the notion of rhythmic anarchitecture having not been here extensively discussed, it sufficed to conceptualize Whitehead's extensive continuum in terms of an immanent and rhythmic relation between undetermined and determined quantities of data. In fact, this seems to be the link missed by this study from the beginning. The relation between quantities and qualities that to this point remained associated with a relation between continuous potentials and discontinuous possibilities, is here, with the notion of the extensive continuum's rhythmic anarchitecture, reformulated both in terms of quantitative qualities and in terms of qualitative quantities. Such terms result from the understanding that virtuality is, in fact, actual. As such, it corresponds to the general potential that random quantities of data implicated in extension have to partake individuation and, in this way, infect the resolution of processual problems with what cannot be anticipated (because it cannot be known). In a sense, the notion that the virtual is continuous and the actual discontinuous is here reformulated with the notion that they are both the one and the other. The general potentials of virtuality are discrete because they belong to the indetermination of actual data. And the relative possibilities of actuality are as well discrete because they correspond to what is in fact determinate. To say that both virtual and actual quantities of data are related to one another by means of an extensive continuum is to say that, in spite of being discrete, they are related to one another by the affective resonance that they have with one another when partaking the same individuations. In this sense, all is extensively discrete but, nonetheless, affectively continuous.

Such notion of affect in the extensive continuum has been here conceptualized in terms of prehension. In fact, it was such notion that allowed for the understanding of digital computation in terms of process. For if the digital domain is pervaded by random and incomputable quantities of data, then it is the affective prehension of data in process (i.e. concrescence) that allows it to be creative. To look upon digital algorithms in this way is to define them as prehensions of data that are both physical and conceptual. They are physical because they correspond to computations of concrete data (i.e. computation is expressive). They are conceptual, not only because the content-expression encounter constitutive of digital writing implicates the ideas programmed, but also and primarily because they are infected by random quantities of data, which are their very condition, but which they cannot synthetically express. Ultimately, and according to Whitehead's notion of eternal objects, the ideas implicated in digital algorithms necessarily correspond to the random quantities of digital data. As such, in digital computation, it is the conceptual prehension of data that allows for algorithms to comprehend ideas and, therefore, explicate the resolution of their problematic potentials. In this way, digital algorithms can, not only convey their programmed ideas, but also convey new ideas (as the very result of digital computation). Together with Luciana Parisi's notion of soft thought, the conceptual capacity of digital computation has been here argued to be a mode of thought in its own right. One that coincides with the rhythm of affect in the extensive continuum's becoming.

From this standpoint, choreography's technogenetic capacities were defined in terms of a heterogeneous multiplicity of parts related to one another by means of extension, which for this very reason allow different modalities of thought (i.e. conceptual prehensions of infinity) to co-occur. Finally, this study came to propose the following: the more connections are created, constrained and intensified, the more the technical system will become problematic and, with its networked potentials, tend to individuate novelty. In this regard, it should be noted that the digital milieu is most apt to prompt technical novelty for the simple reason that its machines, due to their computational capacity, can create magnitudes of connectivity that only have a parallel in the biosphere. As such, because of its increasing reticularity, the noosphere can be expected to become more and more unpredictable.

From this study's central arguments (i.e. that the encounter between dance and technology is choreography itself, that choreography can be creative only on the condition of a constitutive indetermination of potentials, and that the choreographic expression of such potentials is necessarily diagrammatic and algorithmic) a concluding

remark can now be made: Choreography is undergoing a veritable revolution. It is emancipating itself from traditional notions of dance and becoming something more. Most importantly, such mobilization of potentials affirms choreography itself as mode of thought. More than yielding this or that expressive and revolutionary result, choreography's potentials are its strongest force, especially when on the move. They move ideas that only choreography can convey and, in this way, change its modes of existence within the all encompassing transindividuation that we all are currently living. Choreography is becoming, and we are becoming with it: we are becoming choreographic. If there is anything that can follow from this study, it is the thought of choreography in parallel to its developments as a mode of thought. Concretely, this can regard any domain whatsoever. It can follow choreography into the domain of art, it can follow it into the social domain, and it can follow it still into the domain of machines (especially in what regards the increasing complexification their networks). Notwithstanding, all such possibilities share one horizon: to not only accompany choreography's developments, but to also contribute to its expansion.

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