

Dance and Science: The Role of Intermediatic Poetic Movement as a Pathway for Scientific Divulgence in the Contemporary Arts Realm*

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Abstract

This work reflects on the creative intermediatic choreographic composition process developed during the making of a multimedia dance performance for scientific divulgation purposes. Aesthetic and epistemological themes are analyzed in the light of François Dagognet's hyper phenomenology, thus making evident the primordial role of the symbol-image as one of the fundamentals of contemporary science. Contemporary art is analyzed as an interactive and plurisensorial art, emphatically multimediatic and performative. The present work applies the Helenita Sá Earp Dance Fundamentals in the choreographic aestheticization of sub-molecular, molecular and cellular conformational and structural changes that are found in the copper homeostasis model used in "Transitions" multimedia dance performance. Just as François Dagognet values the union of image and scientific information in his epistemology, this article points to an intermediatic movement poetics as a pathway for scientific divulgation in the contemporary arts realm.

Keywords: Science, Art, Intermedialities, Contemporary Dance, Helenita Sá Earp Dance Fundamentals, Scientific Divulgence

1. Science, Art and Intermediality

In directing his thoughts to contemporary art and science, François Dagognet's primary intention is to show that there is an intimate intertwining of epistemology and aesthetics. An attentive reading of his *oeuvre* brings us face-to-face with the binomials of reason and imagination, science and art – as central themes of his thought. In his reflections on contemporary science Dagognet exalts the morphological method, through which it is possible to research the surfaces of shapes. This hyperphenomenologist knowledge engages with surfaces, with layers, with cuts, in an effort to thereby penetrate into the data, into what can be seen, with a view to interpreting it (Michaud, 1984).

This whole framework of knowledge generated by morphological and morphogenetic investigation in different areas of scientific research is expressed in a pictorial language supported by technical images that registers, describes, transcribes and treats data. “Thus, the expression as conquest, the importance of drawing and representation, in short, a defense of writing, the glory, both aesthetic and scientific, of Figuration” (Dagognet, 1975: 7).

Accordingly, there is an appreciation in the epistemology of Dagognet of the verb-graphic transcription, of calligraphy, of drawing, of the sketch, the scheme, the synoptic framework, the equation, the map, which are considered a form of “painting” or rational storyboard. This approach intensifies Dagognet’s thought to the extent that it reflects the idea that in contemporaneity there is an abandonment of linear views in favor of multi-interdisciplinary research that leads to discoveries arising from the interaction between different areas of knowledge. Emphasizing the morphologizing method and pictorial symbolism of science provides a basis for the idea that the visual representation and the intellectual symbol unite through the image-symbol as the primary foundation of today's scientific activity, revealing the key role that the image plays in science (Bulcão, 2010).

In several of his works, Dagognet reflects on contemporary art. The artist, like the scientist, is the one who discovers a new way of approaching reality, experiences an unusual contact, tastes an unknown ingredient to free and to offer an unknown substrate.¹ In this way Dagognet lays the groundwork for the artist's work, starting from the materials present in his works, the manufacturing techniques and the creation protocols that he employs.

Dagognet highlights the idea that contemporary art is one of a plurisensorial interaction, emphatically bodily and performative; in that it has as its primary purpose to provide new access to the materials and expand their use and means of enjoyment. He emphasizes that it makes no sense to elaborate a purified epistemology detached from the technical image support and also the importance of technical protocols in contemporary art, as experimental setups. “Thus, most contemporary works of art represent a kind of installation, or at least an almost experimental attempt, designed to reveal to us a real unknown, full of surprises; whereas in his laboratory the scholar tries to extract from materiality what it hides, in his studio the artist is dedicated to tests that transform the basic idea and can lay it open” (Dagognet, 2003: 13).

The relationship between science and contemporary art is quite evident when he says: “We dare thus to mix 'art and science', approach all these workers of 'multiaxial' or 'projectable' art, these writers of iconography” (Dagognet, 1975: 12), whose interfaces with the dance we will reflect upon.

2. Intermedialities and the Helenita Sá Earp Dance Fundamentals

The Helenita Sá Earp Dance Fundamentals² have a set of philosophical principles, epistemological and methodological assumptions that are able to establish diversifying agents of body language in the integrated development of motor, interpretive and creative skills. The Dance Parameters Movement, Space, Shape, Dynamics and Time and their variations have an internal consistency in systematic relationships that provide the interaction of the language of dance with other areas of knowledge.

As there is no movement pattern to follow and as the research of motion is unlimited, a person can dance from different types of sounds, words, poetry, drawings, paintings, sketches, maps, facilities, equations, scientific theories, philosophical texts, luminosities, photos, movies; thus from any circumstance that establishes a poetic mobilization, whatever it may be.

The methodology for teaching dancing proposed by Helenita Sá Earp is neither a codified technique nor a closed system, because it derives from exploration of original situations present in the intrinsic attributes of corporeality in its aspects of movement, space, form, dynamics and time. These attributes are present in human corporeality as well as in other universal phenomena. In this sense, they are universal principles that are present in all things. This allows, for example, for relating dance with the topological geometries because form, function, structure, arrangement and configuration are characterized as common aspects of arts and sciences. In this way we can relate body movement and understand it as belonging to the corporeality of all things, which facilitates the use of

¹See *Pour l’art d’aujourd’hui, de l’objet de l’art à l’art de l’objet*. Paris: Editions Dis Voir, 1992. See also *Rematéraliser*. Paris: Librairie Philosophique J. Vrin, 1985, and *Corps réfléchis*. Paris: Odile Jacob, 1990.

²Emeritus Professor (1919–2014). Introduced the teaching of dance in Brazilian universities in 1939.

images and symbols, in close connection with a detailed knowledge of the diversifying of the movement. Thus, the anatomical language (objective and scientific) as well as the metaphorical language (symbolic and artistic) can interact more completely without dichotomies. The anatomical and kinesiological knowledge, fertilized by creativity, beyond disclosing and integrate within, can also be related to the corporeality of the universe in different approaches and themes present in the sciences, in the arts and in philosophies.

All parameters are closely linked and the delimitation and its separate organization is an effective didactic resource for teaching and creating dance through: (1) Knowledge networks in dance generated by such principles and diversifying agents of language of dance in different relations in the integrated development of motor, interpretive and creative skills; (2) Concepts and images of the body in its relations with the Movement, Space, Shape, Time and Dynamics; which conform by an organic interpenetration with processes of improvisation; (3) Creative technique and study of choreography composition generating multiple skills from the same thematic focus; (4) Constellations of knowledge arising from the interaction between dance performance language with other artistic manifestations and modalities in the formation of multiple approaches to scriptwriting and choreographic staging; (5) Development of connections between dance performance language and the knowledge of their physicality arising from scientific content such as anatomy, kinesiology, biochemistry, mathematics, geometry, history, physics, biology, among others; and (6) Focus on a pedagogic innovation that promotes the introduction of various structures and types of classes able to provide contributions toward creation of different dancing teaching practices that coalesce with the challenges of dance in the context of contemporary art.

In this regard, the experimental procedures developed in the choreographic research of "Transitions"³ dance performance depart from the vision that dancing is intrinsic to all manifestations.

3. Dance and Science

In the second half of the twentieth century, information sciences went through an intense phase of change that was monopolized by the art world. In the effervescence of the 60s, new paradigms included molded-in demonstrations such as body art, introducing a re-embodiment of the body in cyberspace.

Art history exemplifies a series of complex relationships between body and space, involving negotiation between the body's vision in real space and its representation in the virtual domain. The contemporary space of the body is no longer linked to the modern notion that grounds the body model in classical ballet. "Our space has a location in vertigo, literally upside down, it is launched into space, is now declared obsolete and superhuman or beyond man in body re-embodiment in cyberspace" (Shaw, 1999: 6).

The evolution of multimedia in the 60's and 70's allowed the emergence of poetic choreography where the viewer participated in the scene on the construction of scenic tissue. Today, the body virtually represented also takes the starring role of choreographic construction, expanded by active conjunction between viewer and work. The body and space are the seeds of these conjunctions and extensions.

The representation of the body in contemporary society promotes a growing questioning of the relationship with the technique. New body configurations are imposed by medical and cybernetic technologies. With current technological developments, such interventions have been intensified to sophistication levels that call up internal views from within the body, muscles, organs and fluids.

Chaos theory, complex systems, autopoieses, genetic algorithms, memes, are expressions of the new paradigm in technical and scientific fields that completely affect contemporary dance. The appreciation of the use of image in contemporary biological sciences has caused the creation of aesthetic proposals in choreographic scenic staging today.

Many scientific discoveries in chemistry, cell biology, stem cell therapy and genetic engineering, have become themes in artistic dance agendas, establishing a wide variety of dialogues that connect the artistic to the scientific, involving both academic research teams in universities.

For this to occur in a fruitful way, dancing must be understood as an open artistic language and therefore one that can translate questions of natural philosophy and science, as seen below in some of the creative processes developed by the Federal University of Rio de Janeiro Contemporary Dance Company.

³Dance performance that relied on financial support from the Carlos Chagas Filho Rio de Janeiro Research State Foundation, Program for Dissemination and Popularization of Science (2008 and 2012).

4. Intermediatic Creative Processes in the Making of "Transitions"

"Transitions" is a multimedia dance spectacle that makes a vertiginous descent from the macro world to the micro world, featuring in a poetic and philosophical way the journey of a scientist who leaves the cosmos to reach the interior of a cell.⁴ This work is characterized by the interaction of movement, poetry and mapped projection. "Transitions" had as a guiding *leitmotiv*⁵ the processes of regulation and homeostasis of copper in yeast.⁶

The creation of the show's script came from the notion of building the *environment* (Cohen, 1999). This notion led to the idea that the script was initiated by a process of spatial distribution from the scientific sketch that gathered into itself different extracts and symbols of staging. Thus the process of choreographic creation took as its starting point scenes with projections of tridimensional animations along with the movement of dancers.

It was within these assumptions that we used the above-mentioned scientific sketch as one of the guiding principles for staging the performance "Transitions". The choreographic script was constructed in this research from concepts present in copper regulation and homeostasis, from which emerged the scenes "Proliferations", "Transitions," "Passages" and "Chaperones" as in Figure 1.

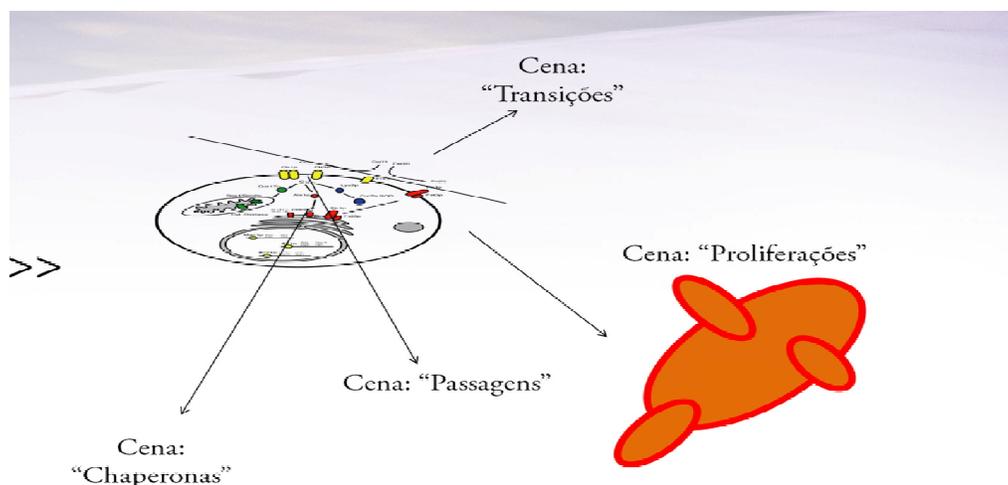


Figure 1. Sketch of the relationship among choreographic scenes. Modified from Valverde *et al.* (see reference in footnote N^o 6).

This graphic model worked recurrently in this dance performance, as a kind of "musical score" which generated reference maps for choreographic composition assembly. We have found that this type of choreographic script from the point of view of the analysis of the graphic-iconic present in the work of François Dagonnet can be considered as a condensation ideo-motor that allows an outbreak of multiple phrases and dance scenes.

Defining the scenic setting and the stage format made it possible to chain the scenario, and construct an integrated whole with the image projection. In the scenic setting, the perimeter of the sketch was structured by arranging three surfaces in a sinuous shape. In order to provide more light, the perimeter of each surface was offset from the other two. The perimeter was sectioned into three concave and convex surfaces of tissue, which functioned as "biological membranes" arranged in a spiral. Thus, the scenic environment was shaped as a kind of video installation designed to occur on three misaligned screens that were set like a mandala in the center of an Italian format stage, as shown in Figure 2.

⁴More information about the performance is available at: www.transicoes2011.blogspot.com.br

⁵Renato Cohen in his book *Work in Progress na Cena Contemporânea* cites "The term *leitmotiv* originates from music and literature: a possible translation would be vector – which stands for the various impulses that make up the narrative". São Paulo: Perspectiva 1999: 25.

⁶Modified from Valverde, R. (2007). *Intramolecular long-range communication between regulatory and catalytic phosphorylation domains in Ccc2p, the Cu (I)-ATPase of yeast: Dual role of protein kinase A (PKA)*. Doctoral Thesis, Graduate Program in Biological Sciences (Biophysics), Federal University of Rio de Janeiro..

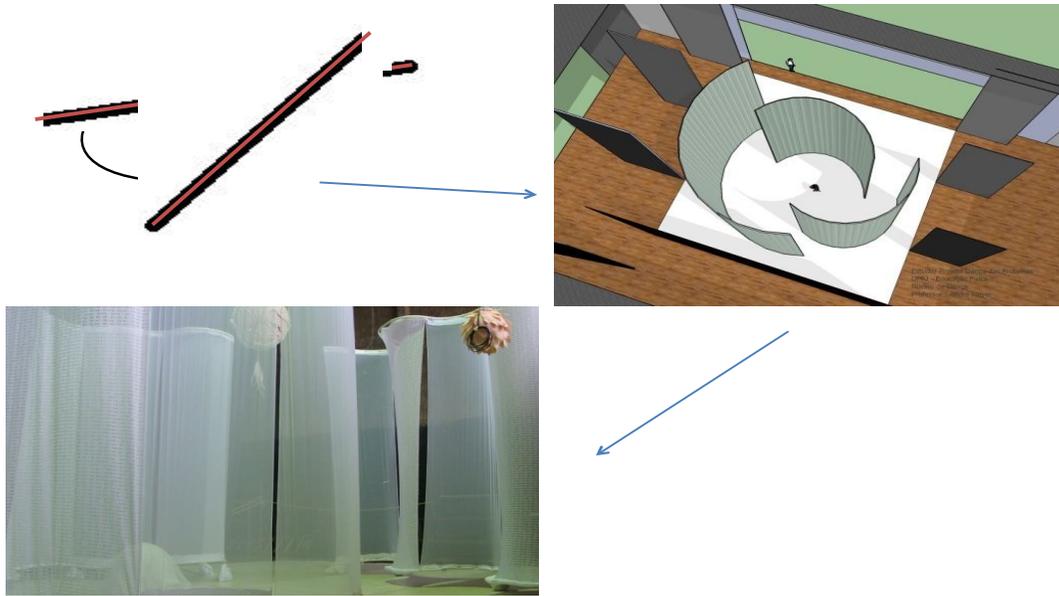


Figure 2. Perimeter misalignment of the yeast design aiming to create the scenography described in text.

Through successive steps, the final model of the scenic setting was reached, like a video installation based on recreating the outline of this yeast cell in a scientific sketch (Figure 3).

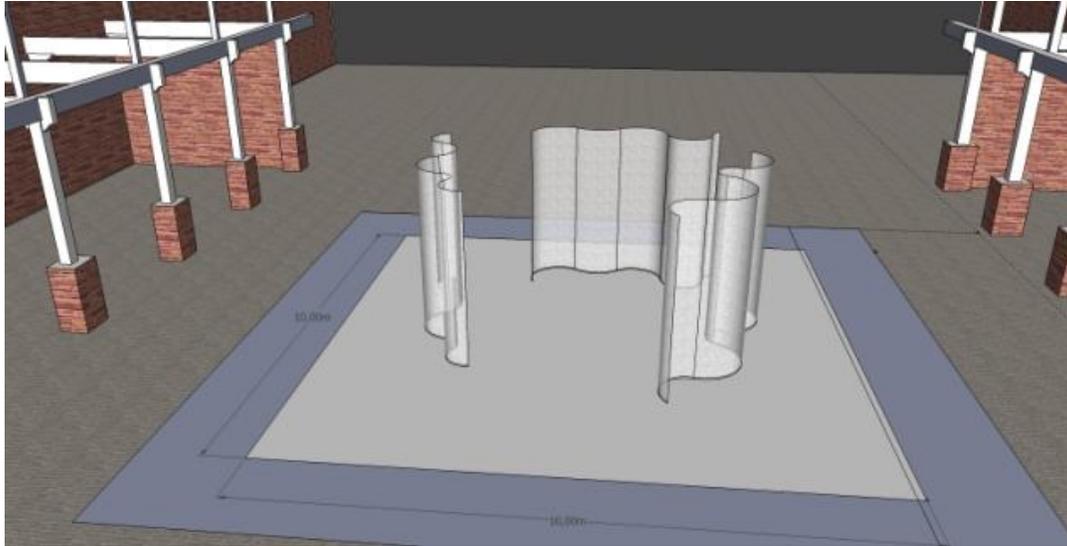


Figure 3. Front view of the virtual model of the final scenario.

This final model of set design was first presented during the II Carlos Chagas Filho Rio de Janeiro Research State Foundation Science, Technology & Innovation Fair, at Cultural Center for Citizen Action in the show's debut (Figures 4 and 5).



Figure 4. Presentation at the II Carlos Chagas Filho Science, Technology & Innovation Fair.

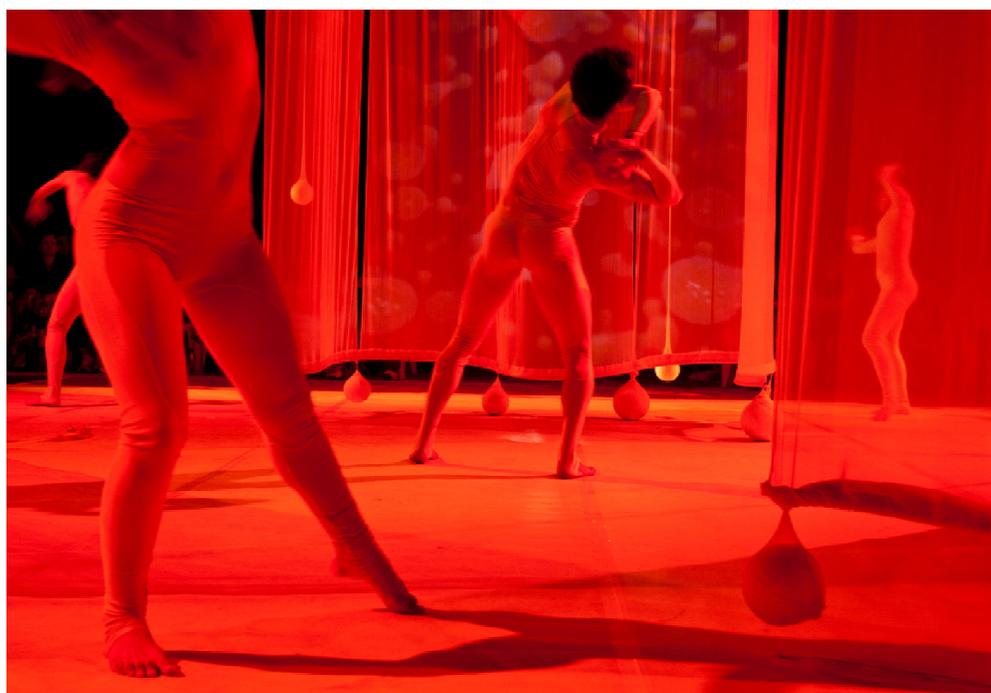


Figure 5. The show's debut at Cultural Center for Citizen Action, Rio de Janeiro, 2011.

The show has scenes with poetry⁷ as an aesthetic feature to the inclusion of scientific information in the context of poetic staging. These poems sought to talk about the cell and biochemical phenomena using poetic language. The poems were meant to clarify something about the process of copper regulation and homeostasis. This regulation process is characterized as a paradox. Heavy metals such as copper, iron, manganese, cobalt and zinc are essential to living beings. However, most of these metals are toxic to the cell when present in higher concentrations.

⁷Poetry throughout this section was developed by poet Daniela Szwertzarf.

Scientific information was transcribed poetically as follows:

Back I haul the copper paradox. Let us formulate it like this: essential and lethal element, it makes you live, but it can kill you. The copper. Element sounds sickly, sweet and bitter, dual and single as the thoughts of hell arise ...Let us formulate it like this: at very low concentrations, copper is essential to all beings. However, as it reaches high concentrations, copper becomes toxic. To overcome this paradox, we have come up with evolution, a regulatory process.

Within the homeostasis of copper, the regulatory process in question, the moment that copper can penetrate into the intracellular medium is crucial. So one can translate poetically this exact moment as follows:

Now, attention. Membrane doors open like angel wings beneath the ocean. Membrane doors open. Heavy traffic, a micro-simmer. Already inside, copper. It's already our secret. We are on the verge. A detour and copper can escape from danger...

The danger from which copper can escape is the danger of excess copper in the intracellular environment, which was described poetically as follows:

... Before danger, however, the copper chaperone refers to another protein, called Copper-ATPase which forwards the copper to the Golgi apparatus, where it will then be stored, ready to be excreted. That is how, then, that proteins guide copper and protect the cell, as if they were angels. As if each of them craved the other, all vassals of the muscle heart...

The mapped projections (Figures 6–8) were constructed from a series of compositions made from videographic images of outer space and electron microscopy⁸, which take place at different moments of the choreographic staging.



Figure 6. Diogenes Lima at the scene "Prologue in the Sky".

⁸Provided by Herta Meyer Cellular Ultrastructure Laboratory of Carlos Chagas Filho Biophysics Institute, Federal University of Rio de Janeiro.



Figure 7. Motion research based on cell proliferation in the scene "Proliferations".



Figure 8. Scanning electron microscopy image projection along with choreographic movement in the scene "Chaperones".

Thus, the process of creating "Transitions" combined science, art and technology to provide a dip into the tiny world of yeast to unveil the pulsing richness of a biochemical universe that escapes our eyes.

5. Results and Final Considerations

Besides the II Carlos Chagas Filho Science, Technology & Innovation Fair, the "Transitions" choreography was presented at the end of the annual meeting of the Federation of Societies for Experimental Biology in 2011, in the city of Rio de Janeiro. It was also presented the same year in the Nova Friburgo Municipal Theatre (Rio de Janeiro State), at the opening of the XXV Symposium of Groupe International de Recherche sur L'infinitesimal during the "VIII Brazilian Congress of Homeopathic Pharmacy, in the city of Foz do Iguaçu (Paraná State). These presentations suggest that "Transitions" had a good acceptance rate as a part of the cultural programming, for scientific as well as for artistic events.

The Helenita Sá Earp Dance Fundamentals allows for the formation of networks or constellations, arising from the language of dance interaction with other artistic and scientific events in multiple approaches to choreographic production. Exactly by emphasizing principles and frameworks that provide support for creating multiple availability of the bodies in motion and their possible applications in a creative dancing technique, since the unlimited research of the movement possibilities always involves the intuition and cognitive, affective and motor aspects of corporeality.

These possibilities for unlimited connections allow the creation of different teaching methodologies and creation in dance that tends to generate fluidity between different artistic languages and between different areas of knowledge.

In conclusion, we point out that the Helenita Sá Earp Dance Fundamentals allows us to formulate the scriptwriting and choreographic composing process based on forms and biological organization patterns in an efficient and detailed fashion. Just as François Dagonnet values the union of image and scientific information in his epistemology, this article points to intermediatic movement poetics as one means of achieving scientific divulgation in the contemporary arts realm.

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