

***CODA, the finale of NoBody dance: the Rite of Spring, a stereoscopic digital dance film based on MoCap and particles technologies***

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***Abstract***

*Research-creation based on MoCap brought the authors to state their innovative concepts of “dance without body” (2006), “particle dancers and “dancers’ kinetic signatures”. The combination of these three paradigms is the seed of their **CODA, the finale of NoBody dance: The Rite of Spring** 10 minutes long digital film. Based on the piano version of Igor Stravinsky’s music, dance itself is the subject of this film who metaphorically evokes perilous events caused and survived by Man and Earth in our modern era. As particles are the origin of the universe and life on Earth, and so the witnesses to the original parity between Man and his environment, this film is entirely made of particles whose use transcends and sublimates its intent.*

*With its non-figurative interpreters, **CODA, the finale of NoBody dance: The Rite of Spring** introduces a dance that is innovative in its aesthetic signature as well as in the technologic tools it comes from, taking Stravinsky’s work into the 21<sup>st</sup> century. Team Époque-Poulin explains the process they elaborate to create this unusual work and show some excerpts of it. Actually in production, extracts of this dance film have been premiered in Montreal on May the 29<sup>th</sup>, 2013, to commemorate the centennial of the creation of the Stravinsky’s /Nijinsky’s/Roërich’s masterpiece.*

**Introduction<sup>1</sup>**

From always, portraying human movement fascinated artists. Long time ago some of them made attempts to reach a bodily-abstraction emphasizing movement perception. Among successful works which could be quoted here, two appear mostly appropriated for introducing this paper because of their focus on movement instead of physical representation of the individual.

The first one is *Nu descendant un escalier* (1911-1918), series of a five paintings by the French visual artist Marcel Duchamp<sup>2</sup>. The second one is *Pas de deux* (1968, National Film Board of Canada production), a dance film by famous animation filmmaker Norman McLaren. In the ending part of this short movie, movements of the dancers Margaret Mercier and Vincent Warren<sup>3</sup> are broken up to trace their intermediate courses, hence, not particularizing the dancers as individuals. In our part, we are in the pursuit of emphasized movements in our-screen dances since 1979<sup>4</sup>.

**Toward the “dance without body” paradigm**

From immemorial time, dance has never been dissociable from the human body which gives it existence and perception: without body there is no dance.

The body as the obligatory medium for dance is so “natural” that even fictitious cartoon characters in films – which almost always have at least one danced sequence – are represented by more or less realistic humankind bipeds. Man and animal are indeed characterized by their morphology and by their way of moving. Film and video were the first technologies which made possible to extend the necessary physical presence of the body to a less realistic image. Nevertheless, the motion capture (MoCap) one allows us to register dance movements as digital data without carrying the body for the first time in the dance history. This is to this art form the equivalent of what were the first audio recordings to voice and music: audio recordings allowed to listen to someone’s voice without one’s body presence; similarly, thanks to MoCap recording, we can look at someone’s movements freed of one’s body-presence.

Nevertheless, if MoCap makes possible to release the dance from the dancer’s body, it undoubtedly does not allow to releasing the dancer himself. On the contrary, while extracting his “human signature” (Vasilescu, 2002), which is quite as specific and representative as his figure, it restores his presence not by his morphology but by his particular way of moving. Moreover, MoCap perfectly capture and preserve the dancer’s kinetic dynamics. All these considerations brought us to submit the paradigms of “dance without body” (2004) and “dancer’s motion signature” (2006). Thanks to these characteristics, making an on-screen *dance without body* stays surely dance, mainly when movement’s images evoke human being.

### **From “dance without body” paradigm to a NoBody dance film project**

A visual exploration produced during the winter of 2003 for the creation of the digital dances of *Tabula rasa: la suite*<sup>5</sup> brought us on the track of using particles for the creation of the dancing images of *NoBody dance*. Seeing living particles animated by their own weight, speed, direction and dynamic parameters spread in and around a digital character itself dancing appeared to us very interesting, and new too.

Moreover, since we are acquainted with the fact of that the Universe and all living matter are made of particles, it appears to us that their use to represent dance movements would thus evoke a celebration of the World. This relationship of particles with life so seemed to be perfectly suited for the basic concept of our digital choreographic project and immediately brought to our minds the theme of *The Rite of Spring*, famous dance music by Igor Stravinsky. Everything became clear and evident for us: the conceptual and artistic basic components of our *NoBody dance* would be Époque’s work on *The Rite of Spring* (staged in 1988) and 3D animation of elementary particles.

### **From the project to the realization of a prototype...**

In June 2005, having access to the Hexagram-UQAM optical MoCap system<sup>6</sup> and to grants from Social Sciences and Humanities Research Council of Canada, Hexagram and the Dance Department of UQAM (Université du Québec à Montréal), creating a digital “dance without body” for screen became achievable to LARTEch<sup>7</sup> team. Under our direction, this team is constituted by dance students at UQAM’s master and PhD programs and computer specialists in programming, 3D animation and modeling.

Our first step was learning how to operate the MoCap system and its software EVaRT. At the same time, Poulin was learning fluid software’s to test if representing

digital data of a dancing body with particles was feasible. As soon as he got some of these data, he made experiments<sup>8</sup> which were successful and so confirmed the feasibility of our project. Meanwhile, we also had to learn how to clean the data and bring them into the chosen 3D animation and particles software's (Motion Builder, Maya<sup>9</sup>) to create digital actors and characters. Furthermore, we had to test how to generating and working with particles and to create digital bipeds specially done to hold or throw out these particles.

To produce the dancing images of a *dance without body* film requires a long and complex pipeline going from the MoCap steps to the conversion of the digital data under the form of particles, without being able to know and see the visual result until each of the stages are fully completed. Since such a creative process requires having to wait for and deal with technical responses, everybody mainly had to learn how patient one must be in this kind of creative work which implies quite a lot of software's and several dance and computer specialists.

Another unexpected problem occurred with the MoCap suits from Motion Analysis. As quite all optical MoCap systems suits, these are made of stretched material largely covered by female Velcro. The markers have to be attached to the right parts of the body with male Velcro to create marker sets related to the kind of movements having to be captured. Unwillingly, these suits caused huge problems during the MoCap of duos in which there were physical contacts between the dancers because it happened that some markers were going from the suit of a dancer onto the suit of the other one, making the marker sets ineffective. To properly capture these types of dance sequences, we so had to conceive and create a special suit<sup>10</sup> on which markers were solidly fixed.

Having to be technologically focused to reach sensitive and finely tuned movement data was facilitated by our being dancers and choreographers. Nevertheless, due to the optical MoCap in which many occlusions occur when some markers are not seen by the cameras, we finally had to modify parts of the choreography because most of its floor movements were impossible to register properly.

Since dynamic characteristics are very well registered by MoCap and bring the individual kinetic signature of each of the dancers, we also judged that it was even more interesting to ask them to be the more authentic possible in their dance instead of thinking to the beauty or the perfection of their shapes (3D animation software allow to afterward bring adjustment to the appearance but not easily to alive dynamics).

We finally spent quite two years to make a lot of tests to match properly particles to movements and to retain the best combinations. We used these to build the *NoBody dance prototype*, which is an eight minute 45 seconds long HD-BluRay work which is part of the exhibition "*Beyond Images*" an interactive touring exhibition<sup>11</sup> produced by the Sciences and Nature Museum of Sherbrooke that demystifies digital imaging and presents some of its applications.



Figure 1: *NoBody dance: the prototype*. Image and photo: Denis Poulin. Dancer: Charles St-Onge



Figure 2: *NoBody dance: the prototype*. Image and photo: Denis Poulin. Dancer: Caroline Gravel

### ...to CODA, the finale of NoBody dance: the Rite of Spring

*CODA, the finale of NoBody dance: the Rite of Spring* is in production since March 2010 thanks to a grant from Quebec’s *Fonds de recherche Société et Culture (2010-13)*. When finished, it will show the last nine minutes of the eponymous work of Igor Stravinsky, making a first digital and stereoscopic dance version of this mythical 20<sup>th</sup> century music.

To fulfill this work, we had to work with several experienced partners coming from the 3D computer animation world. We will indicate there two of the main difficulties we met in producing this film:

#### *The first difficulty*

The first one was to find – and keep – producers.

Without considering the financial problems they met<sup>12</sup>, the special approach we had to manage to create the corpus of our film represented a major obstacle. Indeed, the usual production process of an animated film goes through the writing of a scenario and the drawing of a story board which clearly defines the content of the film and indicates how it will be done. In the case of CODA, it was impossible to create such a document we didn’t know what kind of images we will work with since particles needed first to be produced from MoCap data to give us an idea of what they will look like. Moreover, CODA is a dance film without any dialogue. So, the main tool we gave us to go through its progress was the recording of the time code of the music and the determination of its different sections as chosen by the choreographer<sup>13</sup>.

Le Sacre du printemps Version piano par M. Tilsit-Thomas					
Time code	Titre	Durée	NB	Chor. ME (1 à 3)	État / MoCap
	1 <sup>re</sup> partie Adoration de la Terre				
0000_0314	Introduction <i>0301: transition vers Augures</i>	03:14 <i>(13 sec)</i>		0	À créer/À faire
0314_0622	Augures printaniers: Danses des adolescentes	03:08	Phrases 13 à 21 (accents) Phrases 22 à 30 Phrases 31 à 36	0 3 0	À créer/à faire /À refaire À créer/À faire
0622_0702	Jeu du rapt	00:40	Phrases 37 à 47	0	À créer/À faire
0702_1104	Rondes printanières <i>0702: 1<sup>re</sup> ritournelle</i> <i>1023: coupure avant retour ritournelle</i> <i>1038: retour ritournelle</i>	04:02	Phrase 48 (ritournelle) Phrases 49 à 52 (chutes) Phrase 53 (grande marche soleil) Phrases 54-55 Phrase 56 (retour ritournelle)	2 0 ou 2 3 3	À revoir/à refaire À revoir/à refaire? OK /À faire
1104_1346	Cités rivales / sage <i>1323: Le sage (transition)</i>	02:42 <i>(23 sec)</i>	Phrases 57 à 70 Phrase 71	3 0	Pac man /à refaire /À créer/à faire
1346_1455	Danse de la Terre	01:09	1448: silence	3	OK
	2 <sup>e</sup> partie : Le sacrifice				

Figure 3: First time code of the music in regard to the choreographic matter (2011-01-11)

This chronometer canvas done, it became possible to draw a table in which positioning dance indications at the accurate moment produced a first visual guide of the action that will occurs during the sequence. This was only useful for the preparation of the MoCap sessions because this kind of document was giving no idea of the real appearance dance will take under the form of particles. So, one can say that a story board for a film like *CODA* was not feasible, a fact that bothered our producers.

Acte-1: Scène-2	0000_0334-Introduction	TC-intermédiaires: 0115_0157_0228_0301_0328
Nbre/danseurs	Debout: 1, puis 3 puis 8; au sol: 50	Energie: calme, lointain. Transition: 5X4-croches-rapides à 0328
Propos	«Avec les nébuleuses et les atomes, avec tout ce qui existe, nous sommes engagés dans cette vaste expérience d'organisation de la matière. Loin d'être étrangers à l'univers, nous nous insérons dans une aventure qui se poursuit sur des distances de milliards d'années-lumière. Hubert Reeves, <i>Hubert Reeves, L'espace prend la forme de mon regard</i> , Collection «Points Sciences»	
Visuel	Le rituel chorégraphique commence. Un spot s'allume sur scène, puis 2 autres, révélant les particules de poussière dans l'air qui se muent peu à peu en mouvements révélant la présence de 8 danseurs-matière-debout. Les side-light s'allument et montrent les contours d'une cinquantaine de danseurs épars couchés à plat ventre sur le plateau.	
Son	La musique commence avec l'apparition de la lumière.	
Camera		
Mise en scène		

Figure 4: Half page 2 of the first table of *NoBody dance: the Rite of Spring* (2011-11-21)

As a guide for the MoCap sessions, we made then another table with more details about each component of the film: subject, choreographic cut-out, visual aspects, kind of particles to be created for dancers and for scenery, number of dancers, cameras movements...

NoBody danse/Le Sacre du printemps		Découpage cinéchorégraphique version piano MTT ©Denis POULIN/Martine ÉPOQUE, version 21 novembre 2012				
Time code	Scène/	Durées/ Phrases	Pulsion créatrice/Action	Environnement/particules	Caméra/Traitement	RéférenceLivret/Contenu danse/N. Danseurs Images motrices
0000_0314	Scène 1 1.1	03:14 Phr. 1-12	<b>Poussières d'étoiles</b> Les marteaux frappent les cordes en attaquant les premières notes du <i>Sacre</i> et leur vibration donne naissance aux particules et à la scène qu'elles construisent, créant ainsi le territoire de la chorégraphie.	Scène et théâtre de particules.  Naissance de la scène : particules frappent la surface d'une scène invisible et rebondissent sur les murs invisibles d'un parallélépipède rectangle	La caméra passe à travers le piano. Pianiste et doigts deviennent en particules Pan haut de la caméra autour de la scène puis plongée pour aller voir la scène de face.	<b>Introduction</b> Les particules forment comme une galaxie dans laquelle passent des danseurs flottant comme des comètes. Puis les particules retombent pour former la scène. ND : multitude.  <i>MoCap : 3</i>
0215	1.2		Parmi les particules se dessinent des silhouettes de bipèdes.	Danseurs verts évoquent un paysage montagneux dénudé.		<b>Immobiles. Respirations profondes (souffle de la Terre).</b> Corps rochers brulant sous le soleil.
0301	1.3	00:13			Zoom out fait entrer un Vert (plan américain) dans l'écran en avant plan qui observe	Position 0. <i>MoCap : 1</i>
0314_0621	Scène 2	03:07	<b>Guerres/éruptions volcaniques</b>			<b>Augures printaniers</b>

Figure 5: Half page 1 of the table detailing descriptions of the components of the film

**The second difficulty**

The second difficulty was THE major one because it directly influenced the format of our film project.

The duration of the music of the *Rite of Spring* being  $\pm$  33 minutes, the film *NoBody dance: the Rite of Spring* would have been at least 35 to 36 minutes including title and credits. The structure we thought for this complete version was made of 10 parts, ending with a coda which will make a summary of its main events. But when we met two of the National Film Board of Canada producers, we were said that this length is not the best one for such an artistic film whose distribution will mainly be dance and film festivals. They strongly suggest us not to exceed  $\pm$  10 minutes to be able to easily register it in such events.

At the same time, we knew that the musical rights for the whole Stravinsky's work would be 20,000.00 US dollars. This amount was a lot expensive for us. So, we decided create *CODA, the finale of NoBody dance: the Rite of Spring* on the nine last minutes of the music. As TwinMuse, the pianists' sisters<sup>14</sup> who will record the music for our film were playing them around 9 minutes and 5 seconds, we bought the rights for that duration<sup>15</sup>.

After having adapted the time codes of the film to the tempi of the TwinMuse version of the music, we entered in the real production stage of the film. When all dance data were animated under the form of avatars, we entered into the realization of the layout of *CODA*. This operation was the *computer-choreographing* part of the production. It required the close collaboration of the choreographer, the technical director and the film director. It consisted in placing the dancers in the cybernetic space, synchronizing their venues and dance sequences one to the others and to the music.

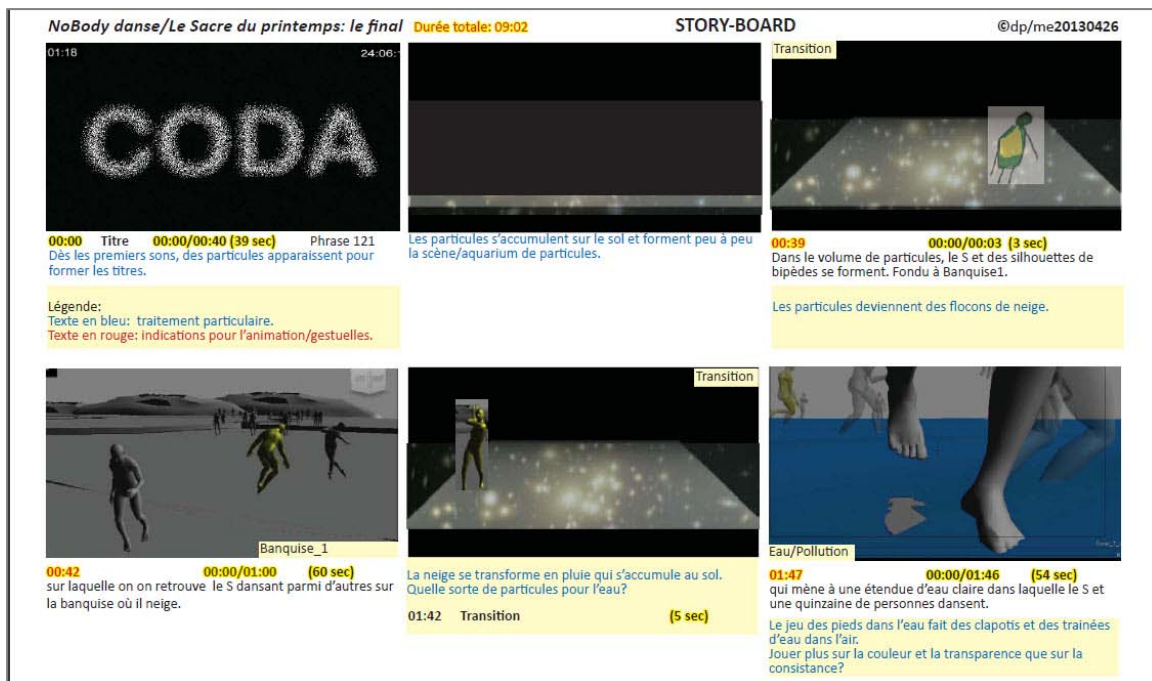


Figure 6: first page of CODA's story board.

This animated tool was (and still is) needed for the creation of the particles. It is only at that time that we were able to make a storyboard depicting the dance movements in their environment under the form of humanoid avatars and realistic surroundings and in close relationship with the time codes. From that point, all technical and artistic decisions and actions implied our whole production team: the particles maker, the animation and data cleaning responsible, the choreographer and the film director. So, to facilitate the everyday follow up between us, we opened a Google drive account through which we exchange all film material: data, ideas, information's, commentaries, notes, and others.

Even if *CODA* was unfinished, three minutes of it were presented as a work in progress by the web site *Espace Musique*<sup>16</sup> of Canadian Broadcasting Corporation/Radio-Canada during the week of May, 24<sup>th</sup> to 30<sup>th</sup>, 2013, to underline the centennial of the premiere of Stravinsky's *Rite of Spring* in Paris on the 29<sup>th</sup> of May, 1913,

In September 2013, we will finally start the postproduction stage of *CODA* to carry out the technical operations that will give it its highest quality and aesthetic power. Those are cameras movements, rendering, stereoscopy and sound in 7.1.

### Discussion and conclusions

The process to produce an animated film like *CODA* is so not usual at all. But moreover, it questions deeply the place and responsibilities of each of the members of the creation team. Such a film does not entirely belong to its author because the way the different specialists are implied in such a creation is deeply.

In fact, such a production mixes up art and science in a so deep way that computer choreographing interrogates the relationship between the work and its creators. This hybridization of art and sciences in the digital media has favoured that creators became more and more involved in research, and that scientists became more and more involved in creation.

As technical specialists get directly involved in the realization of the images of *CODA*, the computer choreographer is not anymore the only author of the work, like it is for choreography on stage. As says Jean-Paul Fourmentraux:

"Today, several factors contribute to the extension of the domain of the creation to other actors that those formally established as artists. [...]. Taken in an interdisciplinary movement which renews the modes of collective creation, actors whom we identified as technicians [...] can be otherwise brought to claim, at least to put on (to assume), an author's position<sup>17</sup>".

The making of *CODA, the finale of NoBody dance: the Rite of Spring* gave and still gives us the chance to fully live and appreciate this atypical process.



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Igor Stravinsky for his marvelous music  
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## Notes

- 1 *Warning:* as it was during our communication in Toronto, the English of our paper is very bad. Sorry...
- 2 "One of the most audacious paintings of the avant-gardes of the early 20th century. Duchamp's '*nus*' are half-cubist, half-futurist, even half-dada icons, in which the multiplication of points of view creates an outstanding sensation of movement. The interpretation of the human body as a moving machine is a purely futurist idea in which the development of chronophotography and the beginnings of cinematography played an important role". *Text by G. Fernández, www.theartwolf.com*
- 3 Dancers in the Montreal company Les Grands Ballets Canadiens
- 4 Our first work was *Beyond curtains*, also produced by the National Film Board of Canada, in which dancers from renowned Groupe Nouvelle Aire Michèle Febvre, Solange Paquette, Paul-André Fortier, were characterized by their way of moving instead of by their faces and bodies.
- 5 A multimedia choreography by Époque, digital dances by Poulin (May, 2003, Salle André-Mathieu, Laval, Québec.
- 6 A twenty infrared cameras system by the Motion Analysis Company.
- 7 Laboratoire de recherche-cr ation en technochor graphie, founded (1999) and directed by Martine  poque & Denis Poulin <www.lartech.uqam.ca>
- 8 At that time, particles animation was always made around or into an object. It is when he was looking at water made of particles poured into a glass in a fluids software tutorial that Denis got the idea of testing if this operation was possible with a moving body.
- 9 Since the last three years, we added Softimage and Unity.
- 10 Conceived and made by Denis Lavoie, director of the Carr  Vert Company.
- 11 Host sites:
  - Sherbrooke Museum of Nature and Science, QC - February 17 2008 to April 20 2008
  - Cit  des T l coms, Pleumeur-Bodou, France - February 2 2009 to December 31 2010
  - McAuliffe-Shepard Discovery Center, Concord, New Hampshire, USA - July 7 to September 5 2011
  - THE MUSEUM, Kitchener, ON - September 15 2011 to January 22 2012

- 12 Canadian federal government made strong cut down on subsidies to many cultural agencies, among whom the National Film Board of Canada.
- 13 This indication was and still is the main tool in the production of *CODA*.
- 14 Hourshid and Mehrshid Afrakhteh, students in the UQAM's doctoral program in *Études et pratiques des arts*.
- 15 The cost was 7,145.00 USD. And finally, the recording time has been 9m 04sec!
- 16 <http://www.espace.mu/espace-musique/animateurs/dompierrefrancois/5517>
- 17 Also on LARTEch's web site [www.lartech.uqam.ca/gallery](http://www.lartech.uqam.ca/gallery)
- 17 Translation. The french original text is : "Aujourd'hui, plusieurs facteurs concourent à l'extension du domaine de la création à d'autres acteurs que ceux conventionnellement désignés comme artistes. [...]. Pris dans un mouvement interdisciplinaire qui renouvelle les modes de création collective, des acteurs que l'on identifiait comme des techniciens [...] peuvent être amenés sinon à revendiquer, du moins à endosser, une position d'auteur".

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