

# Dance Becoming Knowledge

## *Designing a Digital “Body”*

JAMES LEACH AND SCOTT DELAHUNTA

ABSTRACT

In this article the authors discuss the possibility of presenting the unique qualities of “the body” in contemporary dance practice through tailored digital choreographic objects. They reflect on some implications of abstraction in cognitive science and on “the body” as a site of exploration and knowledge in the realm of social, moral and relational being.

Choreographers of contemporary dance have for several decades sought to develop new tools or processes for stimulating creativity in the studio. The choreographer whose work we focus on here, Wayne McGregor, conforms to this tradition by evolving methods of innovation, often through collaboration with scientists. McGregor began investigating the possibilities of digital media as tools for dance-making in the 1990s by working with scientists to build an artificially intelligent computer-based “entity” to be present in the studio alongside the dancers. In the culmination of the development of this “entity” in the context of McGregor’s decade-long collaboration with cognitive scientists [1], we were engaged to analyze why the “entity” developed so far was not sustaining the interest of the choreographer. Supported by the AHRC to bring social scientific expertise to the collaborative design project of a remade choreographic “entity” [2], we focused on what he and the dancers understand as “the body.” Drawing on theory and methods from social anthropology, we explored and articulated the use of the body’s relational and elicitory capacities in the development of movement material. Offering this perspective on what is “known” in dance-making during collaboration with McGregor and digital artists, we were able to inform the development of a

distinct “entity” that was used successfully by McGregor and his dancers in the rehearsal studio.

### THINKING WITH THE BODY

In September 2013, a major exhibition was staged at Wellcome Collection in London called *Thinking with the Body: Mind and Movement in the Work of Wayne McGregor*. The title, although not a new phrase or idea in contemporary dance [3] or, indeed, in cognitive or social science [4,5], nevertheless intentionally poses an intriguing question. Much of the exhibition drew on collaborative studies with cognitive scientists that McGregor and his company had initiated in 2003. A core part of these studies focused on the processes that underlie, generate or make possible the complex movement forms in a piece of McGregor’s choreography. The emphasis was on the mental aspects of the process and how these are intertwined with the physical so that the body in motion becomes a problem-solving, knowledge-generating entity in this genre.

While McGregor’s long collaboration with cognitive scientists may be unusual, the concept that dancers might be problem-solving or thinking with their bodies to generate novel movement material is common to many contemporary dance-makers. Recent efforts on the part of choreographers to share these processes with audiences and other disciplines have been well documented [6–9]. However, *Thinking with the Body* was an ambitious and unprecedented example of such an effort. In this article, we refer to this exhibition to frame our reflections on some outcomes of McGregor’s engagement with collaborators in the fields of cognitive science and technology. The invitation from Wellcome and the large public interest generated by the exhibition [10] points toward the wider fascination with bodies and their capacity to “know.” The exhibition explicitly invited visitors to question and explore what in fact “thinking with the body” might be; we explore this same question here, drawing on social anthropological research we engaged in with the company and their science/technology collaborators in the context of the collaborative design project mentioned above.

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## THINKING THROUGH TASKS

McGregor, in keeping with many in the genre of contemporary dance, engages his performers as creative collaborators in the creation of movement material for a new dance piece. Some terms may be helpful for a reader unfamiliar with the genre here. As the choreographer, McGregor aims to give each dance piece its own signature. This comes through developing a distinctive “vocabulary” of movement in each case. In discussing this process, McGregor refers to giving dancers “tasks” from which to develop movement material [11], and cognitive scientists collaborating with the company have adopted this terminology [12].

The pieces that McGregor makes with his dance company, Wayne McGregor | Random Dance (hereafter “Random”), are always made from scratch [13,14]. McGregor will have an idea, a shape, theme or area of reading and investigation in mind. From these, he will derive tasks for the dancers, usually in the form of clear, brief verbal instructions that invite them to use their imaginations to make links between the instructions and movement. On Day One in the rehearsal studio, the group of 10 dancers begins to develop movement “phrases” based on responding to these particular tasks.

In past work with Random, McGregor has used the image of Leonardo da Vinci’s Vitruvian Man. This image alerts the dancer to the body situated in a space composed of points, lines and planes [15]. In order to make material, the choreographer sets a task based on moving in this imagined space, using simple ideas: Describe a space around the body with the body at its center. Move along axes or in relation to points. Describe lines and shapes with your body. Transpose those into other regions, or use different parts of the body to describe the same movement. For McGregor, instructions stimulate a certain interior landscape of thinking that should bring “intentionality” (McGregor’s term) to the dancers’ performance, rendering visible what the dancer is paying attention to during the execution of the instruction or task. Tasks also support the dancers in their exploration of novel non-habitual movement patterns and are often described from a conceptual or thematic starting point.

These tasks are inspired by or conditioned by certain stimuli such as pictures, readings or music. The consequence of undertaking them is a gradual buildup of sequences of movement: repeatable, transferable movement “phrases” that can be put together to develop a “vocabulary” for the work. Dancers, then, create (some of) the movement that is organized into the dance piece through image-based task-solving, using their bodies as the medium and tool of thought. To make this process interesting and productive, McGregor constantly seeks ways to perturb and disrupt the habitual processes of developing vocabulary.

One way to achieve this is through the introduction of novel or innovative elements in the making process. Scientists undertaking experiments around the studio are one example; another example, pertinent here, is technology. Of course, these are different forms of perturbations, and the way the intervention shapes the emergent movement material is not always obvious or direct. However, a constant in

McGregor’s practice is the introduction of elements designed to disrupt the habitual movement and process of himself and his dancers. (We come back to this insistence on novel exploration later in the article.)

It was this desire for novelty in making material combined with curiosity about artificial intelligence that inspired McGregor to explore the idea of an independent dance entity, a “choreographic agent,” that is, an entity that could respond to and solve the kinds of choreographic tasks that he set for his dancers. It was never intended to replace the dancers but rather to be used for generating a different vocabulary of movement material in the studio.

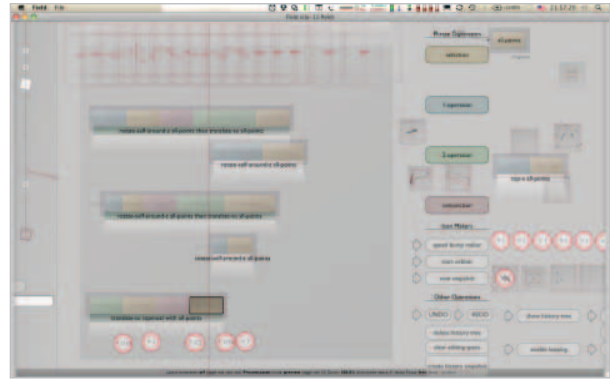
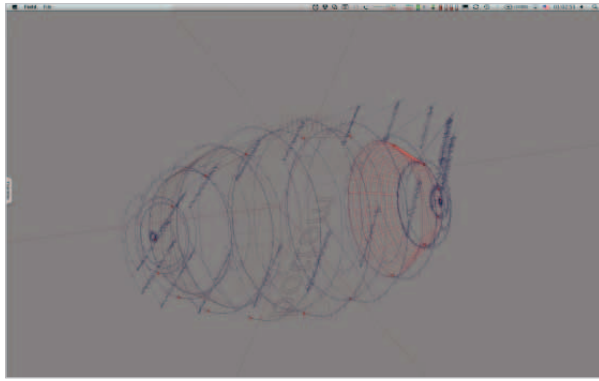
## AN ARTIFICIAL CHOREOGRAPHIC ENTITY

What, though, would an artificially intelligent, choreographic agent do? Early investigations of the field of artificial intelligence brought McGregor and Random into contact with a community of practice largely motivated by nonart engineering goals and computer science research questions that proved difficult ground for the collaborative building of choreographic tools. This inquiry pointed toward the lack of a commonly comprehensible description of what choreographic problem-solving or thinking was. And that was where McGregor’s nascent collaborations with cognitive scientists [16] found one of their long-term goals.

Initially another mode for enriching his studio practice, and for gaining information from science about dysfunction and perturbation in movement [17], McGregor’s first contact with particular cognitive scientists in 2003 became an opportunity to develop nuanced and detailed descriptions of the choreographic thinking process [18]—of how dancers went about solving the tasks they were given by the choreographer. McGregor and these scientists’ focus was on how images are generated in the mind, how spatial and other forms of imagery operate, and how various forms of movement are followed by, given shape by, these imaging operations. Some of the scientists were particularly interested in looking at notebooks kept by the choreographer and the dancers to understand how physical knowing is distributed in objects and inscriptions [19]. The researchers involved would principally use these two areas of inquiry to inform their work on the “entity” in the years to follow.

## KNOWLEDGE AND ABSTRACTION

McGregor’s aim was always to help himself explore his own process, to understand it better and thus have a better sense of how to innovate on it. The cognitive scientists he worked with brought their own ambitions, vocabularies and assumptions to the project: The scientists who continued to work with Random were interested in choreography as a mode of image manipulation. And the emerging team working on the idea of the “entity,” now involving the digital artists Marc Downie and Nick Rothwell, also wanted to produce something that would “travel” [20]. The “entity” (choreographic agent) was envisaged as a tool that McGregor would use to make work, but that, based on an accurate description of his process, would also be usable by other dance-makers



**Fig. 1.** Top left and right: screens of the Choreographic Language Agent. (© Scott deLahunta. Photos: OpenEndedGroup, Cassiel, and Wayne McGregor | Random Dance.) Bottom left and right: company dancer Jessica Wright working with the CLA in training session June 2011. (Photos: Luke Church)

because of commonalities across the contemporary genre already mentioned.

Armed with the conceptual apparatus of “points, lines, and planes”—drawn from analysis of McGregor’s tasking process, scientific descriptions of image-forming and manipulation in the brain of the dancer, and the sense that the tool was to have agency, that is, make decisions and produce forms that were different from those of the dancers—Downie and Rothwell developed a piece of software called the “Choreographic Language Agent” (CLA) [21]. “Choreographic” refers to the user’s ability to shift points, lines and planes around in a 3D virtual space. “Language” refers to the fact that the CLA can be instructed to make transformations on spatial structures. (In this it mirrors the choreographer’s process of tasking dancers to respond to constraint and stimuli.) And “agency” refers to the program’s capacity to generate movement sequences and images based on an application of rules and preferences built into its functioning (Fig. 1).

The way the CLA prototype worked was relatively simple. The choreographer or dancer would sit in front of two screens: One of the screens was an empty 3D screen where one could draw any shape consisting of lines and points with a mouse; to create a plane, the user would link three points with lines. This shape could be rotated, moved sideways and zoomed in and out. On the other screen were a number of menus allowing one to select aspects of the shape, apply transformations to these aspects and assemble these into sequences that could be played back on the 3D screen. This invited the choreographer or dancer to explore and discover

spatial transformations that they could then use for inspiration for movement development in the studio.

The CLA was in effect a kind of prosthetic dancer’s brain. This outcome was partly a function of adherence to the different elements of the specification outlined above. That is, the CLA fulfilled the aim of generating and manipulating images and of notating and recalling past iterations and movement. Its agency was a function of having some degree of autonomy, tightly coupled with choices the user would make. The CLA presented a version of a technique (tasking) for making material. However, it emerged that it was not the choreographic entity that had been envisaged.

The CLA had in fact been transformed through its iterative design and creation process into something more like an extended digital notebook. Despite achieving a number of its original research goals, during its inauguration in the studio for the creation of *UNDANCE* (2011), the CLA was found to be a disruption to the rapid flow of moving and making, a perturbation gone too far in the context of Random’s creation process. In addition, its outputs did not hold McGregor’s attention. A quality of the choreographic process was not present in the CLA prototype. This stimulated our investigation of other ways to comprehend “choreographic thinking.” deLahunta had taken the lead in developing the CLA in his role of director of Random’s research arm, “R-Research.” Drawing on social anthropology’s methods of ethnographic investigation and comparative analysis (Leach) offered a promising avenue to better understand the parameters by which a successful “entity” would be redesigned.

## THE BODY

Dancers and choreographers talk all the time about “the body”—about the body being their tool, about bodily intelligence, about signature movements and bodily habits, about challenging and pushing the body, about investigating the body and its possibilities. This seems obvious, of course, but some very particular outcomes of ethnographic engagement with McGregor and his company led us to investigate the body in this practice in a specific manner.

When we asked McGregor why the CLA had not been used much in the studio and why it had not been fully realized from its prototype form, he was careful to acknowledge the work behind the CLA. But, he said, “it really needs a body.” Elaborating, McGregor suggested that the CLA was not interesting to him or to his dancers in the way that a body is interesting. It emerged that what an “artificially intelligent choreographic agent” needed (for him) was not just the ability to make decisions and generate movement forms; it needed to have something else as well—a quality that bodies have. The user’s interactions with the CLA in its current form—which consisted of sitting at a computer terminal striking keys [22], watching shapes transform, and then using that as stimulus for movement—did not evoke this quality. At this stage, then, we sought to understand what “the body” meant for this particular choreographer and perhaps more generally within the choreographic process of “thinking with the body.”

When we asked what “the body” meant to them, McGregor and several dancers (independently) asserted that bodies are things one has a response to. They insisted that one cannot help, in fact, feeling a response to another body in the same space. There is a quality to bodies that we feel, and in that feeling, a kinesthetic as much as an emotional response is central. Bodies attract, repel and move other bodies. We came to understand that, for these dancers, it is *the relation* between bodies that is compelling and generative. The CLA prototype was all about movement, but it was about movement highly abstracted and removed from the body—as if the brain that processes imagery and solves spatial or emotional problems were outside, directing and feeling through the body, not *being* it.

We then introduced comparative ethnographic material [23] to the conversation to allow McGregor and the dancers at his company to elaborate on what they were saying about “the body.” Through this exercise, we discerned that making movement material with others, or with others in mind, is about the relational aspects of movement. When articulating the qualities of working with others in a studio, or in tasking situations, dancers [24] said that they are aware of a constant negotiation of feeling and presence, of desire, shame, imposition, power, politeness, domination or facilitation. These are qualities *felt and worked with* in making movement material. They are *moral*—if we may deliberately introduce a startling term in this context—aspects or qualities of what is being termed “the body” here, which begins to appear far less of an individual entity restricted to the skin and much more as an extension of feeling, knowing and sensing into the world *with, and of, other bodies*. An anthropologist would identify this as

the world and space of *other persons*—and that means persons in bodies, bodied forth. The moral, aesthetic, social and political aspects of persons are tangible in their relation to others.

It is not that the CLA’s focus on image manipulation was necessarily inaccurate as a rendering of certain mental processes that dancers use in making dance material. But these mental processes are not abstracted from the body in that making. They cannot be, since to be of use to the choreographer they must be within the body as an extended and relational entity.

In McGregor’s dance-making process it is in the contact between unfamiliar and challenging movement, and in the relational space of expectations and convention, of others and their feelings, responses and movements, that what is *interesting* about movement comes into being. The choreographer is articulate about the fact that novelty for its own sake is not the goal. It is clear from observing the dance-making practice that the choreographer and the dancers are not focused on innovating purely to distinguish themselves against peers or ancestors. Movement is a form of thinking, we suggest, because it is an exploration of and emergent understanding within a particular kind of space. Movement, “thinking with the body,” is a way of exploring the world and what it is to be human within it. That exploration thrives on unfamiliar yet highly conscious movement.

To make work in this genre, then, is to commit to exploration and experiment *with the body as the tool and vehicle*. But for that to make sense in the context of technology such as the CLA, we must retain a sense of *what* the body is. Doing so assists in understanding what the body’s potential for knowing refers to. From there we might consider what possible exploration, experiment, engagement and knowing can be made through “thinking with the body.” Our research around the CLA offers a description of the exploration of bodies in this dance-making practice as an exploration of the space of human relationality.

The sense of oneself as part of others in movement, of the necessary unfolding of consciousness in a world of relations to space and social other, relations that also constitute and unfold these things, is clearly highlighted, made available, through the medium of dance and dance-making. Philosophical articulations of understanding dance in this way can be discovered in the work of Manning and Massumi [25], Gil [26], and Noë [27]. For these authors, exploration of thinking in movement is an exploration of the emergence of subjectivity, and its reliance on relations to and with the worlds and others it participates in generating. We have already introduced (proactively) the term *moral*. Manning mentions the political and argues that movement, thought and subjectivity are not *given* as social—they are not social *before* they are made present in movement—but that the social and the political come into being as part of movement [28]. We concur that the social and the political cannot pre-exist movement and relation because they are always made into being in movement and relation. Dance is a modality in which this coming into being is explored in experimental, innovative patterns and events. It is “thinking” precisely

because thinking in movement is an exploration of the unfolding human relation.

The exploration of subjectivity, of consciousness of self and other, and of the political, moral and social dimensions of these experiences is undertaken by making them present through moving with others, or for others, or in relation to an idea of others. The political here is a micropolitics of realizing and experimenting around coexistence, domination, facilitation (and so forth) as *events of specific interaction*. The experiment in making movement material is also the experience, and thus something is “known,” we might say, in dance-making and in the choreographer’s attention to these elements. That attention is focused on finding what is interesting in movement and as such is focused on what we know and can know by our movement.

This argument develops our conceptualization of the outcome of our investigations into the qualities of movement made with others in the context of a critique of the CLA. It offers another way into some of what is interesting about a body for McGregor and his dancers. With their emphasis on disrupting habits, on exploring novel and nonintuitive modes of provoking and developing movement, on making new forms, these movers are utilizing the body as a tool for thinking. As a key part of our project, developing a description of the qualities of this thinking offers us a chance to consider an appropriate mode for the presentation, representation and transmission of such knowledge processes.

### **BECOMING**

Discussions with McGregor about the body resulted in a new understanding of what the entity, the “choreographic agent,” might be. “The body,” we had learned, is something that is compelling to be with. It has presence, and that presence has an effect. McGregor said, “You cannot be in the same space as another body and not feel a response.” That we may or may not actually move is not the point at all; the point is that bodies elicit responses in other bodies. Those responses are both emergent in the particularity of the relationship and conditioned by familiarity, morality, personal history, convention, innovation, daring, etc. The qualities of the body that are “interesting” then are “to do with” its capacity for elicitation and the elicitation of a specifically social-kinesthetic response.

What emerged about the process of creative work in these ethnographic investigations is that choreographers use specific techniques (tasking, image-based manipulations, improvisations) to generate new or unfamiliar exploratory movement. These techniques *generate* movement. What is *interesting* in that movement, the *substance* or material that emerges in the generation, has something to do with the quality of the body’s relationality, its presence eliciting feeling response and movement in others. When McGregor, with his expertise in working with bodies, says that the CLA “needs a body,” this highlights qualities that bodies have in relation to one another.

We specified, as part of our research brief, some new parameters for a “remade” CLA. To remake the entity, and to make it true to an aspect of the knowledge form, we had to

revisit “physical thinking,” not as a version of intellectualization, but as an exploration of the awareness and intelligence of kinesthetic elicitation. The parameters were simple: Whatever the “entity” was to become, it needed to be compelling to be with and it needed to elicit a kinesthetic response. We suggested that it should be human scale, that it should have its own presence without the need for complex setup or manipulation (not too much perturbation of the creative process), and that it would work toward or try to solve movement tasks in its own way, a way that was elicitory of human movement. In this context, a *representation* of a body is not “the body.” We were instead looking for something in the space that those in its presence would want to respond to.

During the months leading up to the making of a new piece (*Atomos*) by Random, the digital artists who had created the CLA prototype built a new entity in response to these parameters; they called the new entity *Becoming*. *Becoming* was built around the manipulation of points, lines and planes on the platform of the CLA software. But it was made to be an aesthetically and kinesthetically compelling presence. It takes stimulus from (in this case) the form outlines and color palette of film clips and, following rules in a constrained environment that includes gravity and friction, it attempts to build toward taking the form of the stimulus. That is, it is constantly striving, against certain constraints, to achieve a form:

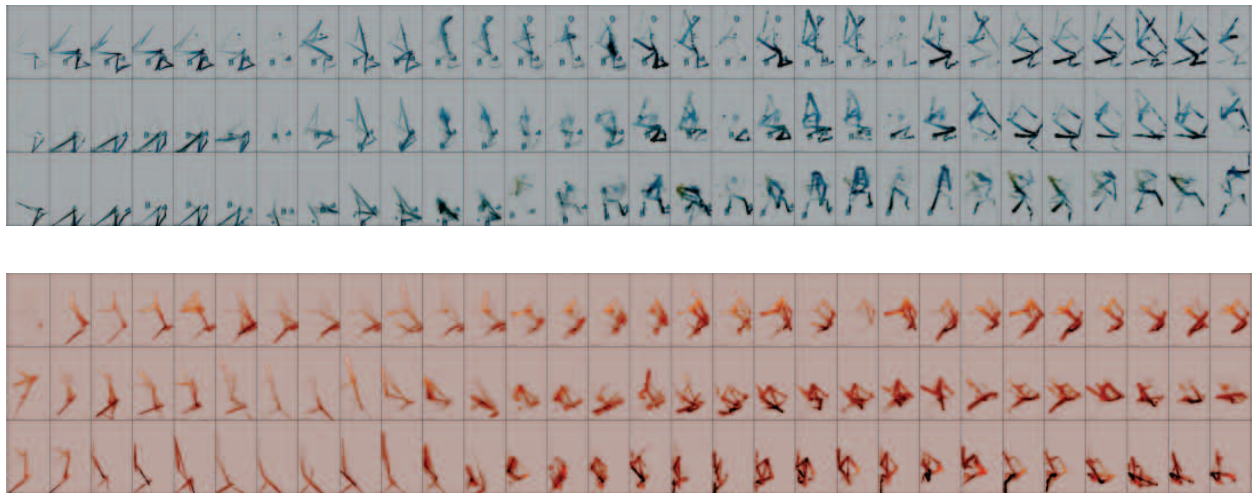
The abstract agent then enacts an heuristic search through the space of all the configurations and muscle activations of its own peculiar body to match the movement of each shot. It works out its approximations through a series of iterations, stopping only when satisfied that it has come as close as it can [29].

It is shown on a large 3D screen, which must be viewed using 3D glasses (Color Plate B and Fig. 2).

The human scale in the studio, the script guiding it to seek solutions and its expressive aesthetic qualities summed up to something much closer to the originally envisaged “entity.” McGregor found it compelling enough to use in the studio as the company made their latest piece—referring to it as an “11th dancer.” *Becoming* was subsequently installed as a part of the aforementioned Wellcome Collection exhibition, *Thinking with the Body*.

One aim of that Wellcome exhibition was to take something of the knowledge form that is McGregor’s contemporary dance practice and make it available, present it outside the context of the studio. *Becoming* was featured as an experiment in capturing something of the elicitory capacity of bodily movement that choreographers work with and presenting that in another medium and form. To be with this strange entity is to feel something of the capacity of bodies to elicit response.

Of course *Becoming* does not capture, represent or give access to the body in its moral and social situatedness. In that it is also interesting. The limitations offer an opportunity to further explore what it is about the body that is compelling and effective in the making of contemporary dance material.



**Fig. 2.** *Becoming* screen shots. (© Scott deLaHunta. Photo: Marc Downie [OpenEndedGroup] and Nick Rothwell [Cassiel].)

Reflecting on the use of “tasking” in the studio in the light of our analysis of the CLA, we can agree that tasking is solving problems using the capacity of the body to think. But the emphasis on thought may be misleading. It is easy to see why such an emphasis is prominent in reaction to the common misperception of dance as physical, intuitive, primitive, etc. [30], but it is a potential misdirection made visible in the CLA. The CLA prototype was developed alongside emerging ideas from within collaborative research with cognitive science as an extended form of “thinking with the body.” It was, however, an abstracted and intellectualized version of this “thinking.” So to remake the entity, and to make it true to the knowledge form, we had to revisit “physical thinking,” not as a version of intellectualization, but as an exploration of the awareness and intelligence of kinesthetic elicitation [31]. The body is physical if we understand *physical* as an extended presence in relation to others and spaces.

How would one gather some qualities of this process of knowing? *Becoming* is a strange form in space that elicits a movement response in the bodies of those in its presence. When the CLA first appeared in McGregor’s studio the dancers “got it” immediately, with one dancer responding as he walked into the room by saying “Ooooh, it’s a body” and moving in response to its movements.

Public visitors at the Wellcome Exhibition were more bemused. It was not clear to them what *Becoming* was (we deliberately placed text and explanation to be viewable only *after* their initial encounter with it). But audience responses indicated that the CLA was capable of eliciting kinesthetic response and that their bemusement was because of the ambiguity of the form they were seeing on the screen [32]. *Becoming* is neither tool nor artwork; it corrupts and distorts conventional categories, utilizing aesthetic elicitation as a form of knowledge transfer. That knowledge is not utile; it is not about something other than the experience of the body as a responsive entity. *Becoming* was an experiment in presenting a form of knowledge that did not collapse that knowledge into a conventional representation.

In this refusal to be something other than the moving form, *Becoming* does not “think with the body,” nor does it represent the body or the techniques of dance making, but it does give an experiential sense of kinesthetic responsiveness.

There is no sense in which “Becoming” mirrors or captures the moral, social or emotional reach of the body. But it does provide a compelling presence in the space and it does elicit movement in the viewer, and, as such, it actually reveals both some of what is and is not “bodily” about it.

## CONCLUSION

We return in conclusion to the question, “What is ‘thinking with the body?’” We have written that contemporary choreographers understand the body to be intelligent. For others not part of this community of practice, such phrases may have little meaning other than as metaphor. It is quite clear how skilled the dancers are in movement. But why call it intelligence? Why call it thinking? One interpretation that resonates particularly with what we have observed in the genre of contemporary dance is that at a level of incredible sophistication, we all operate within the same space as other bodies that are *other people*, all the time. Continual calculations and judgments are being made by bodies in the same space, about obligation, cooperation, domination, discomfort, shame, desire—these are some part of what bodies “are.” We are constantly negotiating and manipulating the spaces we occupy with others—in fact, we do this whether the others are there or not [33]. Bodies are things that are always eliciting and provoking a response. We feel them, we think through and around them, we respond to them. “Response” is all about the experience of a relation to others. The experiment with *Becoming*, and the specific history of its development as an iteratively created choreographic object within the context of the work of a particular dance company, provided a revealing opportunity to probe these themes of body, relations, dance and knowledge.

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## References and Notes

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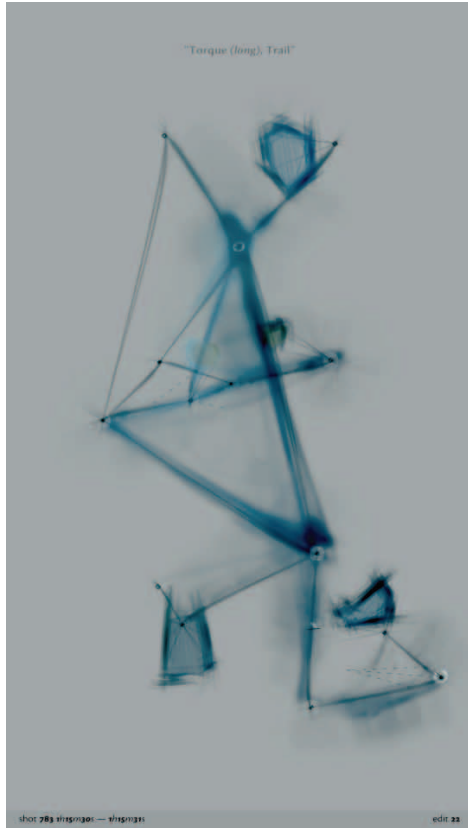
- 1 The authors have been involved with Wayne McGregor’s research since 2003–2004 when deLahunta was the organizer and facilitator of Choreography and Cognition, an interdisciplinary dance-science research project jointly funded by the Arts Council England and Arts and Humanities Research Board as reported on in Leach, James, *Leonardo* Special Section: Arts and Humanities Research Council/Arts Council England, “Arts and Science Research Fellowship Scheme,” co-edited with Bronac Ferran and Tony White, *Leonardo* 39, No. 5 (2006).
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- 10 A total of 19,229 visitors were recorded over a six-week period.
- 11 E. Brannigan, “Positioning Passions: Erin Brannigan Interviews Wayne McGregor about Chunky Move’s Choreolab,” *Realtime* 34 (1999) p. 30. Accessed 14 September 2014 at <[www.realtimemarts.net/article.php?id=5359](http://www.realtimemarts.net/article.php?id=5359)>.
- 12 D. Kirsh et al., “Choreographic Methods for Creating Novel, High Quality Dance,” *5th International Workshop on Design and Semantics of Form and Movement* (2009). Accessed 14 September 2014 at <[adrenaline.ucsd.edu/kirsh/publications.html](http://adrenaline.ucsd.edu/kirsh/publications.html)>.
- 13 The use of instructions, procedures or tasks to create movement material or even entire dances has a history in contemporary dance, dating in particular to the 1960s workshops of the composer Robert Dunn (S. Baner, “Robert Dunn’s Workshop,” in *Democracy’s Body: Judson Dance Theatre 1962–1964* [Ann Arbor, MI: UMI Research Press, 1983] pp. 1–33).
- 14 Wayne McGregor | Random Dance was rebranded as Studio Wayne McGregor in May 2017.
- 15 Reference to invisible points, lines and planes in space is widely used by choreographers, e.g. by William Forsythe and Trisha Brown, who are well-recognized proponents from the genre of contemporary dance, and is also found in the movement analysis concepts of Rudolf Laban (R. Laban, *Choreutics*, Lisa Ullmann, ed. [London: MacDonald and Evans, 1966]).
- 16 S. deLahunta, P. Barnard and W. McGregor, “Augmenting Choreography: Insights and Inspiration from Science,” in J. Butterworth and L. Wildschut, eds., *Contemporary Choreography: A Critical Reader* (London: Routledge, 2009) pp. 431–448.
- 17 R. McCarthy et al., “Bodies Meet Minds: Choreography and Cognition,” *Leonardo* 39, No. 5 (2006) pp. 475–478.
- 18 *Choreography and Cognition* was a research project initiated by arts researcher Scott deLahunta and choreographer Wayne McGregor to engage practitioners from the field of cognitive science in seeking connections between creativity, choreography and the scientific study of movement and the mind. For project documentation, see <[www.choreocog.net](http://www.choreocog.net)>, accessed 14 September 2014.
- 19 L. Church et al., “Sketching by Programming in the Choreographic Language Agent,” in *Proceedings of the Psychology of Programming Interest Group Annual Conference 2012*, 163–174.
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- 28 E. Manning, *Relationescapes: Movement, Art, Philosophy* (Cambridge, MA: MIT Press, 2009) p. 22.
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- 33 “Even one body alone is dancing relationally” is taken from Manning and Massumi [24] p. 44.

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COLOR PLATE B: **DANCE BECOMING KNOWLEDGE**



Designing a digital “body” in contemporary dance practice through tailored digital choreographic objects. Top left and right: *Becoming* screen shots. (© Scott deLahunta. Photo: Marc Downie [OpenEndedGroup] and Nick Rothwell [Cassiel].) Bottom left and right: Company dancers working with *Becoming* in the studio during the creation of *Atomos*. (© Scott deLahunta. Photo: David Bickerstaff.) (See article in this issue by James Leach and Scott deLahunta.)