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‘Grace taking form’: re-animating Piaget’s concept of the sensori-motor through and with slow-motion video.

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This writing explores the virtual life of video, working with filmed data from an innovative ethnographic research project (The Sensory Nursery) funded by Manchester Metropolitan University in order to foster a long-term research collaboration with Martenscroft Nursery School and Children’s Centre. In this project I took the role of researcher-in-residence in a nursery class for two-year olds in Manchester, UK. Prompted by a piece of slow-motion video data, takes a genealogical approach to film as medium, and considers the part that film has played in the temporal construction of western childhood. The methodological deployment of film in shaping the narrative of unilinear progress from immaturity to maturity requires contextualizing in order to place it as part of a wider colonial discourse of othering in which chronological time is deeply implicated. However, I will go on to make the case that film can also be put to use as part of a de-colonizing methodology because of its unique capacity to give attention to the virtual potential of movement and what Hansen calls the “thickness” of the living present (2004). This potential resonates with film literature that foregrounds the corporeal quality of film, and its capacity to replicate “the body’s activity, with its physical movements, its shifting attention, and its conflicting impulses toward order and disorder” (MacDougall, 2006, p. 3). I will argue, however, that while this emphasis on an embodied sensing human body is productive, the automatic and

temporal capacity of film can do more than this. By making the relationality of *all* bodies perceptible (both human and nonhuman), film (and in this case, slow-motion film), offers a philosophical medium that de-centres the human body in relation to the passage of time.

Watching film in slow motion as a feature of this research occurred incidentally. After six months of fieldwork, during a summer holiday, I had more time to view the data that I had collected. Taking clips out to view and edit on i-movie, I found myself replaying film in slow-motion as a method to translate the action into fieldnotes. While my research was deliberately longitudinal in order to give an in-depth timeframe for relationships, the literal slowing-down of video clips brought a surprising and inexpressible vitality to the data. Slow-motion viewing drew my attention to movement itself, bringing the data to life so that it glowed (MacLure, 2013) in new and unexpected ways. Initially it led me to resist interpreting behavior through the logic of consciousness, rather giving credence to a different ‘bodily logic of potentiality’ (Olsson, 2009, p. 48), as opposed to the foundational idea of a Cartesian “mind-space” that haunts child development theory (Murriss, 2016, p. 4). This thinking process led on to thoughts about the possibility that children and adults might be “caught up in events that move at different speeds and are sometimes imperceptible to one another” (MacLure, 2016, p. 180). This notion opens up many more questions both about the durational aspect of events as they unfold, and about film itself and how it is used to “bear witness to life” (Hansen, 2004). In this essay, one slow-motion video of a child’s hands moving in a water tray filled with objects in a nursery classroom has become the provocation for my thinking. The particular institutional context of the nursery is important to bear in mind, as it is a site in which child development is materialized through practice. It is this that necessitates me to embark on some initial excavations into the role of film in the

early twentieth century, when child development theory emerged as a science. This allows me to ask questions about the historical relationship of film as a medium that bears witness to the life of the growing infant and ways that the moving image has historically entangled the twin disciplines of the physiology and the psychology of child development (the study of which, in turn, is entangled in the construction of colonial and evolutionary time).

I will begin by exploring some of the ways that film has figured instrumentally to produce scientific constructions of the developing child. First, I explore Arnold Gesell's cinematic project that couples the infant's motor development with a genetic epistemology of growth. This abstraction of the child's body as an object of scientific study will be considered in relation to colonial discourses of progress and chronological time. Secondly, I will use the prism of Etienne-Jules Marey's early experiments with movement images in order to find ways of thinking diffractively with film. Marey shares with Gesell a "pre-occupation with documenting changing form" and the science of measurement (Thelen & Adolph, 1992, p. 370). However, where Gesell's interest was centred on the body of the child, Marey's interest was in movement itself. Gesell used film as an objective tool to observe, record and measure the growth of the child. Marey, however, adopts the camera because of its experimental potential to demonstrate movement as an expression of time. In the final part of the paper, I will (re)turn to the piece of slowed film data from my project, (re)viewing it by drawing from Erin Manning's reflections on Marey's radical form of empiricism (2008). I will consider the potential of slow-motion video as a method that destabilizes chronological time. In particular I will work with Deleuze and Guattari's concept of the machinic (2004), and Manning's concept 'grace taking form' as an expression of movement (2008). Here, I return to child development and explore Piaget's notion that sensori-motor intelligence is

akin to a “slow-motion film, in which all the pictures are seen in succession but without fusion” (Piaget, 1950, p. 121). I discuss the potential of slow-motion film to challenge the underlying progressive and linear conception of time that underpins Piaget’s assumption that a representational logic is necessary to displace an earlier and more primitive sensori-motor engagement with the world. I complete the essay with the piece of slowed film, through which I voice my emerging thinking inspired by Erin Manning’s immanent notion of *grace-taking-form*.

Time, film, child, and other.

Working in the mid-twentieth century, Arnold Gesell’s most enduring legacy is without question the elevation of the ‘typical’ child into biological reality and “norms of development” (Thelen & Adolph, 1992, p. 373/4). This legacy had profound consequences for theory and practice, and his Bayley Scales (now in their third iteration) continue to have considerable global influence as a tool for early diagnosis of atypical child development (Albers & Grieve, 2007). Gesell’s biological maturational approach in relation to the developing child understands typical development as predicting future intelligence, and this biological and maturationist inflection is accompanied by a focus on motor development. Accordingly, film becomes a critical method by which to record the child’s growth, because of its capacity to provide Gesell with impartial “seriated optical records” (1928, p. 57). As a former student of the self-proclaimed father of child study and recapitulation theorist Stanley Hall, Gesell adopts and adds scientific value to the colonizing language of child study (Varga, 2011, p. 140) through his use of film. The construction of biological classification to create normalized social identities based on difference as seemingly natural is at the heart

of the mechanics of colonialism (Reyes, 2019). Gesell states that “the cinema registers the behavior events in such coherent, authentic and measurable detail that for purposes of psychological study and clinical research the reaction patterns of infant and child become almost as tangible as tissue” (Gesell in Curtis, 2011, p. 432). It is the forward movement of film that situates it as inherently well-placed to record the progressive movement of the child. In this era of early film, the emergence of cinematic time is entangled with modernity and the rationalization of time, rendering it “uniform, homogenous, irreversible, and divisible into verifiable points” (Doane, 2002, p. 6). It is important to note that “clock time is a central tenet of modernity and capitalism and it’s universal value has a particular relation to colonialism” (Stalpaert, 2017, p. 377). Thus, film becomes a scientific method to slice into time: child made tangible through film could be “held, parsed, and classified in a way that ephemeral behavior cannot” (Stalpaert, 2017, p. 377).

In the case of infant behavior, the intangibility in question was not the invisibility of the event so much as its ephemerality. One could observe the child’s conquest of the spoon, but motion picture technology allowed one to capture – or construct – this event and submit it to truly scientific scrutiny. (Curtis, 2011, p. 418)

With Laura Spelman Rockefeller Memorial funding Gesell created an elaborate panoptic observation dome (Varga, 2011, p. 148, Armstrong, 1983), with one-way screens that “allowed researchers to move about freely without disturbing the child and also provided space for motion picture cameras in a 360° radius around the subject” (Gesell Institute of Child Development). This ambitious observational film project aimed to provide a naturalistic environment in which to record, sequence and code the movements of children. While the practice of using one-way screens became ubiquitous in many flagship child study

labs – once again, leaving lasting legacies on the design of early years centres (de Coninck-Smith, 2005) – what is of particular interest here is how the cinematographic method that Gesell developed from this found its way into dominant chronological representations of the child's growth. Although film offered Gesell a medium "mightier than the psychological eye" (Gesell, in Varga, p. 2011, p. 150), it was the very complexity of the naturalism that he sought to document that posed problems in relation to his adherence to a methodology of uniformity and essence. While the elastic capacity of film to be slowed, speeded and freeze-framed allowed the image to be literally held through manual operation of the projector, this in-the-moment viewing of film was not amenable to the *systematic* analysis that Gesell aspired to. Instead, he developed what he called an analytic projector, a machinic device by which frames of film were projected onto paper to render children's bodies as line drawings (Gesell, 1946). Such frame-by-frame cinematographics enabled child bodies to be graphically and serially extracted from the complexity of naturalistic noise (a 'naturalistic context' that Gesell had gone to such lengths to preserve within the laboratory dome of observation). Following Coghill, who used similar techniques by graphically translating the growth of the salamander embryo, Gesell's analysis rests upon a methodology that is based on separation of form and content. His appetite for coding abstracted (or in his terms "dissected", 1935, p. 6) individuated forms led him to take the classification of *forms* of behavior as "caricatures of age-related changes" to the "almost absurd" (Thelen & Adolph, 1992, p. 370). For example, he elucidates 91 stages in the development of an infant's reaction to and interaction with a bell (Curtis, 2011, p. 435).

(Figure 1)

Gesell's bubble-baby-bodies (Figure 1) produce what Goldfield (1993, p. 52) identifies as Gesell's "air theory" legacy, where fine outline drawings are made of infants as if they "were suspended in a vacuum". These suspended universal bodies blindsight us to the biomechanical facts of particular children's bodies, as well as "the physical properties of their environments" (Adolph & Berger 2006, p. 163). The outlined infant body is a mechanism to categorize movement and in so doing motion is erased. These graphic figurations of the growing infant continue to haunt pediatrics, and their depictions of "indices of normal development" (Curtis, 2011, p. 423) are still issued to every new mother in the UK in the form of the Government issue personal Child Health Record or "Red Book". This long-standing deployment of photographic extraction not only teaches parents how to view their babies, particularly in relation to time, but they also insinuate a scientific method of comparison and correlation, where theory and method are "mutually reinforcing" (Curtis, 2011, p. 428/9). Normalcy is constructed through a methodology of slow-motion film, whereby each frame marks out and stands in for a moment in progressive time – each moment as bounded in the inexorable passage of evolutionary time.

Marey: events taking form?

In the following section I will use Etienne-Jules Marey's photography work to think more about film's capacity to picture time in particular ways. Marey was a physiologist working at the end of the nineteenth century just as motion pictures were emerging. Contra to Gesell, and with his contemporary Henri Bergson, Marey was distrustful of motion film's potential to offer us a more reliable optical reality than our vision (De Freitas, 2016, p. 558).

If movement is a series of positions and change a series of states, time is made up of distinct parts immediately adjacent to one another... Succession thus understood, therefore, adds nothing; on the contrary, it takes something away; it marks a deficit; it reveals a weakness in our perception, which is forced by this weakness to divide up the film image by image instead of grasping it in the aggregate (Bergson, 2007, p.7).

Marey's interest is focused on *movement* itself, rather than the body as distinct from movement. In a similar vein to Bergson, he opposes the idea that a succession of images depicting the changed form of a body in motion might operate to capture movement. He argues that this "presupposes a knowledge of *the relationship* existing at any moment between the distance traversed and the time occupied" (2017, p. 33, my italics). Marey attends to the motion of animals as well as humans, and later in his career he goes on to explore the motion of matter such as water, balls, and air.

Figure 2

In his book *Movement*, he goes on to note the complexity of the dynamics of water in motion, stating that "... in some cases the conditions of movement are so complicated that it is difficult to foretell exactly what the oscillations will be" (Marey, 2017, p. 99). It is his particular interest in bodies in transformation relative to space/time/matter, as opposed to the positions of bodies as such, that pushes Marey to almost stop seeing the human figure as central, and so the "body as subject of investigation tends to recede from view" (Auerbach, 2007, p. 11). Marey's overriding compulsion to grasp the elasticity and incipience of the *relation* (Manning, 2012, p. 90) drives him away from successive separate

photographic images towards devising more horizontal overlapping images, in order to suppress the separation produced by the frame (Doane, 2002, p.57). These mappings in turn lead to machinic experiments in photo(graphy), where lighted rods and points are attached to bodies as they are filmed, to produce lines on motion that give a “visual expression to the relation between entities being graphed” rather than “a picture to its object as the photograph does” (Braun, 1992, p. xviii).

Figure 3.

Unlike the Gesell’s series of separate time frames, Marey gives us an “exploration of the thickened present of continuous flux” (Braun, 1992, p. xix), where “body, movement and environment become one” (Manning, 2008, p. 85). In contrast to the idea of a gradual progressive representation of movement, and with his distrust of the human eye, Marey edges towards shifting forms that blend together and dissolve. He offers a sense that “the universe in reality is made up of surges and drops, ruptures and flows...a world of tensions, phases, and fluctuations” (Dagonet, 1992, p. 12).

Figure 4.

Marey seems to be always seeking but never quite finding “the imperceptible, the fleeting, the tumultuous and the flashing” (Dagonet, 1992, p. 12) as he grapples with the problem of the interval; the *between* of instants. In particular, he circles the question of the “indivisibility of the interval” (Manning, 2012, p. 33). Haunted by the *lost time* of the interval that evades his machines of capture (Freitas, 2016, p. 558), Marey is interested in the place between “fusion and fragmentation” (Dagonet, 1992, p. 98). Like Gesell he seeks to reduce the interval, but instead of slicing into time he seeks a unitary image and increasingly his images become blurred, indistinct, and illegible. And like Gesell, he also excludes the

thickness of the ecological context that movement responds to, but this is *not* to delineate the form of bodies in movement, but rather to render motion itself. He overlays his successive series transversally across horizontal, wide frames. Bergson says “movement slips through the interval” (Doane, 2002, p. 175) and what Marey is focused on is the “*apprehension of continuity through discontinuity*” (Doane, 2002, p. 211, my italics). Echoing Manning’s idea where the motion of form in the making is an “incipience rather than displacement” (2012, p. 6), this highlights how movement responds *towards*. This also resonates with early film’s strange quality, where “the subject seems more to be acted upon than to act” (Auerbach, 2007, p. 10).

Slow hands in the water tray: “Making the interval felt” (Manning, 2009, p.111)

“Rather than pass time, one must invite it in” (Walter Benjamin In Doane 2002, p. 7)

In this final section I return to the nursery class, the site of my research, where I try to answer Stengers’ (2004), and Millei and Rautio’s (2017) demands to slow down. While the previous excavation into the advent of early scientific photography has attended to ways that film is implicated in colonial constructions of childhood and time, and where development is entwined with progress (from immature to mature), I nevertheless return to film as a method to speculate otherwise. I experiment with the literal act of slowing data down and frame this as a methodological resistance to fixing data in time, so that data is less about time, and becomes instead, the “stuff of time” (Ingold, 2012, p. 438). This refusal of progressive time in relation to child development is a deliberate decolonizing technique (Reyes, 2019) that forces me to think more deeply about time, speed, and intensity. This

strategy takes up Burman's call for "child as method", where child development is not only implicated in colonialism, but by helping us discern how colonality continues to be produced in current political landscapes and events (Burman, 2016), it can create what Pacini-Ketchabaw and Taylor call a state of "productive unsettlement" (2015, p. 15). In particular I am inspired by Marey's movement experiments as a way to revitalize film (even though Marey himself felt film was not scientific enough, while Gesell used made film an instrument of science). My aim is to disrupt chronological understandings of time that undercut ways of sensori-motor knowing, and render this as immature. I will suggest, with Bates (2019) that by attending more closely to *duration* and *intensity* we might give attention to ways of knowing that are excluded, and explore the colonizing part played by progressive time in the materialization of particular subjectivities over others (Pacini-Ketchabaw, 2012, p. 158). I also am interested in what Lemke describes as a kind of over-layering of time-frames when viewing video, so that when we view a videoed event: "we find ourselves trying to forge connections between worlds where time may be flowing at different rates, where space can have different relative scales, where we can move backward and forward in virtual time" (2007, p. 47).

The dominance of Piaget in the field of child development elevates the sensorimotor stage as a significant (and foundational) way of engaging with the world and understanding: protecting and nurturing this stage of development often lies at the heart of Early Years training and practice. However, because it is characterized by an absence of conceptual unity, it is simultaneously rendered negatively; "sensori-motor intelligence acts like a slow-motion film, in which all the pictures are seen in succession but without fusion, and so without the continuous vision necessary for understanding the whole" (Piaget 1950, p. 251).

This negative framing of young children's ways of knowing is both configured by progressive and chronological constructions of human growth, as well as by a mind/body split where vision becomes coupled with knowledge (Butterworth, 1993, p. 176). Sensori-motor intelligence is rescued by an embodied cognition approach, but as Sheets-Johnstone notes (2011, p. 310/311) this can serve to re-inscribe the Cartesian split and it generally "focuses on how conceptual knowledge is mapped onto the sensorimotor system" (De Freitas: 2016, p. 563). Butterworth draws our attention to touch and to what he calls inter-sensory perception (1993, p. 179), and Sheets-Johnstone to a tactile-kinesthetic body in ways that reanimates bodies (1996).

Manning pushes this expanded approach to conceptual knowing further by drawing our attention to the *relation* that is produced by a body in motion. Movement is always a movement towards, a tending, and "this tending-toward is a sensing-with that does not occur strictly at the level of the sensory-motor. It happens across layers of strata, both actual and virtual" (2009, p. 34/5). It is a transversal sensing in which the relation produced through movement is in constant flux. It is a sensing I become aware of when I watch the rises and falls of intensity expressed by slow-motion hands in the water tray. Time does not unfold evenly: it can slow movement through a perishing, hesitating or lingering, and it can accelerate with an incipience as it moves towards (Manning, 2012, p. 38). Rather than succession "there is no movement that is not nested within another movement within which it is in continuity" (Manning, 2012, p. 39). For Piaget the interval is the gap between the successive instants that the sensorimotor fails to unify. However, following Bergson's attention to time as duration, Manning counters this with the notion of a virtual

“coexistence” (my emphasis, Manning, 2012, p. 24) that *“prolongs past into the actual”* (Ingold, 2014, p. 128).

Finally, I propose that that it is useful to follow Cannella and Viruru (2004) by invoking the figure of *“relation”* as a decolonizing strategy. This is about being in relation to the world, and an answering to the world (Lingis, 1994, p. 226). It demands that we attend fully to the minor registers of events that take place in nursery classrooms (MacRae, 2019). It also demands that we do not too quickly delineate the boundaries between bodies (both human and non-human bodies).

When the skin becomes not a container but a multi-dimensioned topological surface that folds in, through and across spacetimes of experience, what emerges is not a self but the dynamic form of a worlding that refuses categorization. Beyond the human, beyond the sense of touch or vision, beyond the object, what emerges is relation. (Manning, 2009, p. 42)

The slowed hands in the water tray cannot be reduced to a successive series of instants where a human body can be extracted as an abstraction of a moment in time. Instead, by foregrounding the on-going relationships produced through the movements in the water tray, the event is unified by an on-going-ness that anticipates and spills out into the possible future. The intensity of involvement in an event like this is one that has not *“yet succumbed to the promise of linear time, living instead in the active topology of spacetimes of experience”* (Manning, 2009, p. 37): hands are space-timed by matter (Manning, 2009, p. 67). The responsivity engendered through and with the water tray assembly is a matter of relation – but it is an inhuman responsiveness, it is machinic because of the way that it *“sets*

itself going” (Olsson with reference to Deleuze and Guattari, 2009, p. 150). This is a more-than-human response where “duration is defined less by *succession* than by *co-existence*” (Manning, 2012, p. 24, my emphasis). I finish less with a conclusion and more with a new starting point that has come about through the productive unsettlement of child development theory through the slowing down of filmed data. I invite the reader to watch the slow-motion video clip of hands in water accompanied by my emerging responses that have provoked me to think afresh about ways that progressive and chronological time has been, and still is, entangled in developmental constructions of young children and childhood.

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Figure 1

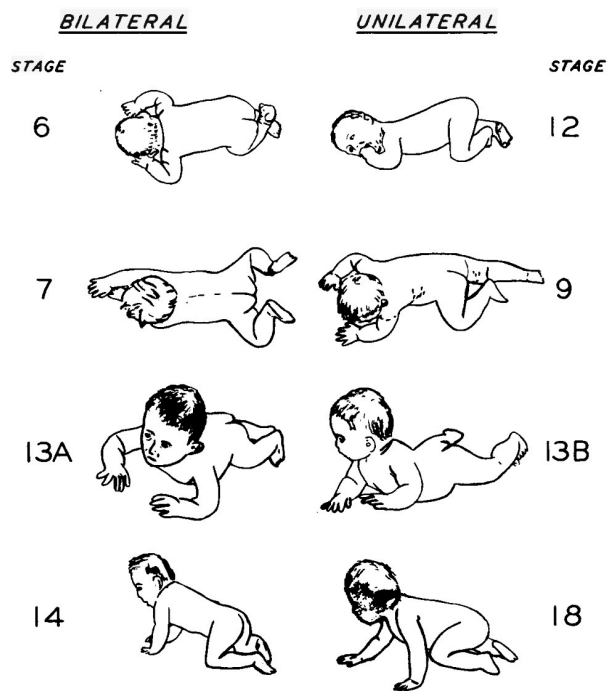


FIGURE 2
PHOTODIAGRAMS TO SHOW BILATERAL-UNILATERAL SHIFTS OF BEHAVIOR

Figure 1. Gesell, A. & Ames, L.B. (1940, p. 259)

Figure 2

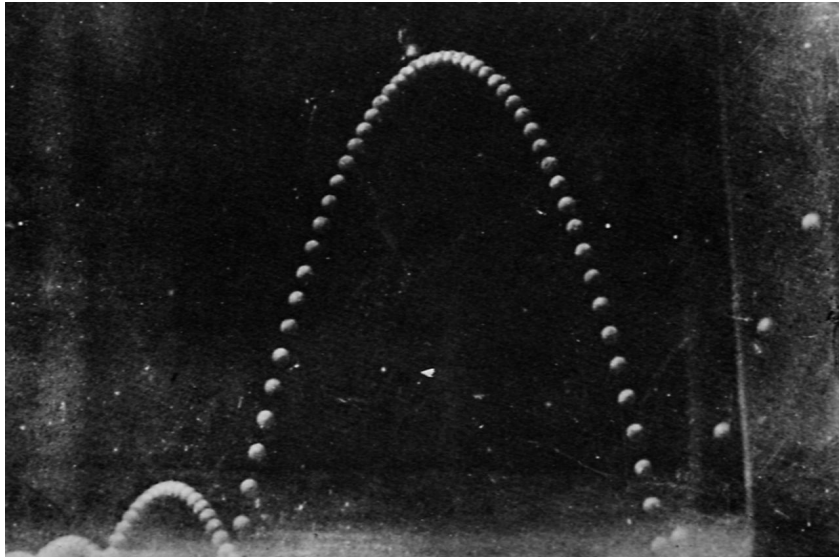


Figure 2. Marey's Richocet of a White Ball (public domain image)

Figure 3

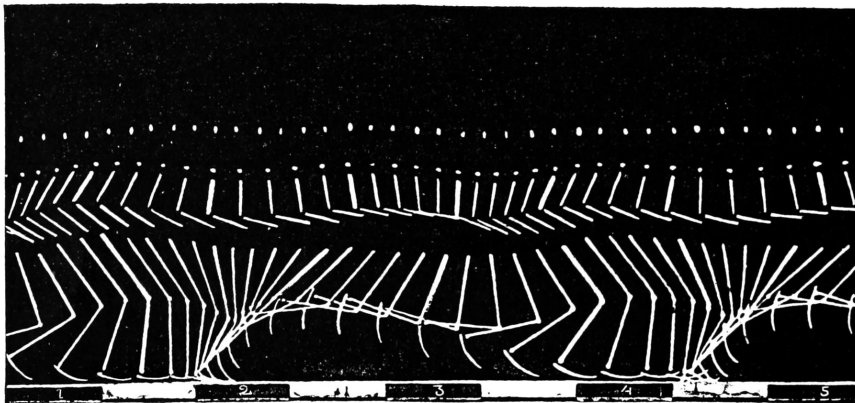


Figure 3. Marey's Graphic Method (public domain image)

Figure 4

Figure 4. Marey's air movement in a collision with objects of different shapes, (public domain image)

