The image of walking

The aesthetics and politics of cinematic pedestrianism

Özgen-Tuncer, A.

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Chapter 1

The Emergence of Cinematic Pedestrianism and the Question of Movement

In this chapter, through an analysis of the scientific studies of human locomotion that led to the invention of cinematographic movement, I examine pre-cinematic images of pedestrianism from the perspective of mechanical motion and Bergson's philosophy of movement. Throughout this chapter, I do not use the notion of pre-cinema teleologically as a primitive, implicitly inferior phase of diverse scientific achievements culminating in the invention of cinema, the ultimate machine par excellence. Instead, I try to establish an analysis that is sensitive to the multifarious forms of representing and reproducing movement, some of which were integrated into the cinematic apparatus while others were gradually abandoned.

As I explained in the Introduction, the flow of pedestrian into a background of still images in *Paris Qui Dort* in some ways recalls early photographic experiments with recording and reproducing human locomotion, specifically those of Eadweard Muybridge and Étienne-Jules Marey. Taking as a point of departure the pedestrian's contingent and ungraspable ephemerality vis-à-vis the regulative ray controlling movement and time in Clair's film, I will compare Muybridge's and Marey's approaches to the photographic (and later cinematographic) representation of human locomotion. Through an analysis of the images, devices, techniques, and literature produced by Muybridge and Marey, I will argue the following: While Muybridge built his analysis of movement on a notion of abstract spatiotemporality outside the body, Marey's principle aim in studying movement was to discover the spatiotemporality within the body and find the perfect scientific means to capture this for analysis. A comparison between the abstract spatiotemporality of Muybridge and the corporeal spatiotemporality of Marey can therefore shed light on the paradox of cinematic movement, encapsulated in Henri Bergson's critique of cinema. Accordingly, I will analyse Muybridge's instantaneous photography and Marey's chronophotography from the perspective of 'privileged instants' and 'any-instants-whatever' – the film-philosophical concepts introduced by Gilles Deleuze in his discussion of Bergson's philosophy of movement. This investigation aims to reveal how pedestrianism is associated with a certain aesthetics of movement that continued to characterise the cinematic image of walking in later years.

Human Locomotion at the Intersection of Science, Philosophy, and the Arts

The nineteenth century was concerned with the phenomenon of movement in many ways. The rise of the factory as part of the Industrial Revolution intensified interest in the workings and the production of a healthy body since it was now a moving part of industrial processes and needed to be efficiently integrated into automation.[1] This interest in efficient and productive movement aimed to eliminate unproductive movement from the body (and thus from the entire system of production) since this was considered a waste of energy and time. This enthusiasm concurred with an increased concern in physical robustness that emerged in the wake of the Napoleonic wars. Education policies, health programmes, and scientific research were produced to rear strong generations and eradicate unwelcome disorders. This approach also

[1] See Anson Rabinbach, *The Human Motor* (Berkeley: University of California Press, 1992).

endorsed the link between a healthy body and a strong mind, which can be traced back to the Rousseauian ideal that the proper use of reason depends on the development of the sense organs and their use in the activity of a healthy body. Rousseau himself was an ardent peripatetic and took regular walks to encourage his philosophical thinking by emerging himself sensuously in diverse settings, practising the ancient ideal of stimulating thinking via walking.[2] The impeccable movement of healthy bodies was considered the key to scientific and ultimately socio-economic progress. The disciplines of anatomy, physiognomy, and eugenics prospered in this context.[3] From this very brief account, it is possible to suggest that the nineteenth-century notion of movement incorporated the mechanical movement of machines, the physical movement of bodies, the movement of mind (reason), and the movement (progress) of history.

This multi-dimensional conception was reflected in widespread scientific investigations of both human and animal locomotion. Situating Muybridge and Marey within this framework can shed more light on how they interacted within the era's cultural and scientific landscape.

One of the earliest known and widely referenced studies of human gait is Giovanni Alfonso Borelli's *De Motu Animalium* (published in 1682), which is considered to be the foundation of biomechanics. Sharing the same title with Aristotle's book on animal movement, Borelli's opus provided a source for the later study of human and animal movement in the nineteenth century. It was evoked many times in Marey's work over the years, as in the works of other scientists studying human locomotion. According to the orthopaedic scholar Arthur Steindler, Borelli's

[2] See, for example, Jean-Jacques Rousseau, *Reveries of the Solitary Walker*, trans. Russell Goulbourne (Oxford: Oxford University Press, 2011).
[3] See for example J. K. Lavater's *Physiognomische Fragmente zur Beförderung der Menschenkenntnis und Menschenliebe* (1775-1778); P. J. Barthez, *Nouvelle Mécanique des mouvements de l'homme et des animaux* (Carcassonne: 1798).

mechanical approach to human locomotion and his fundamental concept of 'muscle action' anticipated the ideas of the nineteenth century.[4] Steindler notes that, even though several scientific accomplishments were achieved in the eighteenth century, it was primarily nineteenth-century scientists who truly continued Borelli's investigations.[5] One study that deserves mentioning is Albrecht von Haller's *Elementa Physiologiae Corporis Humani* (published in 1757), which laid out the principle of the 'electrical irritability of muscles.' In *Nouvelle Méchanique des mouvements de l'homme et des animaux* (published in 1798), the physician and encyclopaedist Paul-Joseph Barthez similarly focused on the co-workings of body parts involved in the execution of movement. He analysed the interactions and correspondences of the body's solid matter (such as muscles, bones, nerves, and fibres) with fluid matter (such as blood and other liquids). As a vitalist, critical of a purely mechanical approach to analysing locomotion, Barthez argued that something remained inexplicable in these workings: what he coined the "vital principle," or "the principle of life" (*le Principe Vital*). As "the first cause of progressive movements of humans and animals ("la premiere cause des mouvements progressifs de l'homme et des animaux"), the vital principle is inherent in each part of the body that moves and is communicated to the other moving parts. The co-ordinated operations of all the complex processes involved in walking were described further by Wilhelm and Eduard Weber, known also as the Weber brothers, in their *Die Mechanik der Gehwerkzeuge* (published in 1836). What distinguishes them from their predecessors is their use of quantitative methods to measure temporal and spatial parameters during

[4] Arthur Steindler, "A Historical Review of the Studies and Investigations Made in Relation to Human Gait", *The Journal of Bone and Joint Surgery* 35:3 (July 1953), p. 540.
[5] Ibid.

human locomotion.[6] Using chronometers and telescopes, they sought to measure the co-workings of all parts involved in executing the gait. They also measured external factors that influence walking and running, such as wind and inclines.[7] In the last chapter of their book, they included a series of pictures representing a skeleton in each of the regular individual phases of walking,[8] proposing on the final page to test the accuracy of their diagrams using stroboscopic slides.[9] These methods, i.e. measuring the temporal and spatial parameters using devices, taking into account external factors that influence the execution of the gait and creating pictorial representations that can be tested through the optical reproduction of movement, in many ways influenced the methods that Marey used in his studies of human locomotion.[10]

In the "Natural History of Organised Bodies," published in the *Revue des Cours Scientifiques de la France et de l'Etranger* in 1867, Marey argued for instruments and apparatuses to aid the limited human senses in the study of physiology:

> We have seen that in physics, our senses teach us very little, and that it is necessary at every step, to have recourse to apparatus for analysing more delicate phenomena […] We must resort to instrumental aid for the demonstration of changes too delicate for the naked vision.[11]

[6] Thomas Andriacchi and Eugene J. Alexander, "Studies of Human Locomotion: Past, Present, and Future", *Journal of Biomechanics* 33 (2000), p. 1218.
[7] John Kirkup, "Mechanics of the Human Walking Apparatus," *Medical History* 37:4 (Oct. 1993), p. 458.
[8] Pasi Väliaho, *Mapping the Moving Image: Gesture, Thought and Cinema Circa 1900* (Amsterdam: Amsterdam University Press, 2010), p. 48.
[9] Emil du Bois-Reymond, "Science and Fine Art I," *The Popular Science Monthly* (May 1892), p. 17.
[10] For an in-depth study of the history of scientific locomotion research in the eighteenth and nineteenth centuries, see Andreas Mayer, *Wissenschaft vom Gehen* (Frankfurt am Main: S. Fischer, 2013). In this book, Mayer traces some of the major scientific investigations of the human gait from an interdisciplinary vantage, placing them at the intersection of physiology, neurology, anthropology and psychiatry.
[11] Étienne-Jules Marey, "Natural History of Organised Bodies," trans. C. A. Alexander, in *Annual Report of the Board of the Smithsonian Institution for the year 1867*, p. 288. <www.bium.univ-paris5.fr/histmed/medica/cote?marey200> Last accessed October 1, 2017.

Around the 1870s, visual recording became integrated into scientific studies of human locomotion to compensate for the limits of human perception. Photography was recognised as a gateway to some hidden reality, one unrecognized by human vision. By freezing time and movement, it enabled scientists to scrutinize the recorded object within a specific space-time. Arthur Steindler emphasises that Marey was the first to use photography for analysing body movements during locomotion and registering the movements of selected points of the body.[12] In addition to his instruments and apparatuses, Marey and his team devised various photographic methods to record and measure movement, as explained below. Around the same time, Eadweard Muybridge, who was originally a photographer, was commissioned to photograph a horse in motion to reveal the actual stages of movement invisible to the human eye.

The intersection of scientific studies with the photographic representability of movement blurred the boundaries between art and science, giving birth to a rich correspondence. The influence of the scientific analysis of human locomotion on aesthetics can be observed in several essays that appeared around that period. Marey dedicated a chapter of his book *Movement* to the benefits of chronophotography for artists – painters and sculptors alike – providing comparisons with ancient representations of human locomotion from Greek vases and sculptors.[13] In an article that appeared in 1892 in *Popular Science Monthly* called "Science and Fine Art," the author Emil du Bois-Reymond investigated potential correspondences between science and aesthetics. A physician and physiologist who had worked on nerve actions in the body, Bois-Reymond ruminated on a Schillerean sense of beauty observed in the mechanics of bodily movement. In light of a Darwinian concept of beauty as one of the driving forces of evolution and natural selection, Bois-Reymond

[12] Steindler, 541.
[13] Étienne-Jules Marey, *Movement*, trans. Eric Pritchard (New York: D. Appleton, 1895), pp. 169-185.

suggests that science can increase art's insights and can improve its technical means by teaching it useful rules and guarding against errors.[14] Instantaneous photography, according to Bois-Reymond, "catches the expression of the countenance and the attitudes during so short an interval that it makes good what escapes in the average expression, and thus leads to most valuable observations." For Reymond, photography secures instructive data for art.

Penned around the same time,[15] Paul Souriau's *L'Esthétique du Mouvement* is another early attempt to combine science with aesthetics. According to Souriau, the display of scientific images of motion not only have aesthetic value but can also explain how this aesthetic value is produced. For Souriau, understanding the anatomical properties that determine a movement and identifying the mechanical conditions required for the proper execution of that movement may clarify how certain expressions of movement (with force or grace) produce certain affects and the role played by the visual perception of movement.[16] In light of this approach, he considers motion studies as "a specific art" that includes performance, representation and perception, and he endeavours to build a specific aesthetic methodology around it.

Bois-Reymond observes an aesthetic correlation between the pre-photographic, photographic and pre-cinematic representations of (human and animal) locomotion. He writes,

> Dr. William Weber lived to see himself and his brother fully-sustained, after nearly half a century, by instantaneous photography. Mr. Eadweard Muybridge, of San Francisco, applied it in 1872, at the suggestion of Mr. Stanford, to fix the attitudes of horses in the successive positions of different paces. The same phenomena were revealed in the photographs as in the Webers' schematic drawings. Pictures came out the like of which nobody believed had ever really

[14] Bois-Reymond, ibid.
[15] Originally published in France in 1889.
[16] Paul Souriau, *The Aesthetics of Movement*, trans. Manon Souriau (USA: University of Massachusetts Press, 1889), p. xxi.

> been seen. Directed upon street scenes, processions, etc., the camera took many views of men in quite as astonishing positions as those which the brothers Weber had attributed to them on theoretical grounds. It was not different with the wonderful series of pictures of a flying bird and its wing-strokes which M. Marey has obtained with his photographic gun.[17]

However, in addition to highlighting a very welcome congruity between Webers' visionary drawings and the photographic images of locomotion, Bois-Reymond also raises a very significant shortcoming of these images: they do not actually capture movement as it is:

> [W]hen the series of pictures of a periodically moved object taken at sufficiently short intervals, whether it is presented to the eye in the daedaleum or each picture is illuminated for an instant in its passage, is well projected, the original thought of the Weber brothers is realized: the periodical motion, dissected as it were into differential pictures, is integrated again into an impression of the whole, and the accuracy of the apparently false pictures is demonstrated. The latter experiment has been worked out by Mr. Muybridge himself in his zoopraxiscope [...] In both methods we see men and horses walking, running, jumping; but there is still one thing to be remarked that is, that since the length of the passage past the eye of one of the slits of the daedaleum or of the illumination of the directly visible picture is the same for all the pictures, the appearance of the whole impression of the movement is a little different from the view of the same movement itself.[18]

Interestingly, Bois-Reymond's criticism recalls Marey's dissatisfaction with Muybridge's instantaneous photography, which I will explain further below in order to clarify the differences in their approaches to bodily movement and the different aesthetics of walking they produced. My hypothesis, in light of Bois-Reymond's and Marey's criticisms, is that Muybridge produced fragmented instants of movement, and hence conveyed *privileged instants* of movement. Marey, on the other hand, strove to observe movement in its tiniest intervals without any detriment to its continuity. He was in pursuit of discovering, registering, and observing *any-instants-*

[17] Bois-Reymond, p. 17.
[18] Bois-Reymond, p. 18.

whatever of any movement. These film-philosophical concepts formulated by Deleuze in *Cinema 1* are mainly based on Henri Bergson's philosophy of movement in *Creative Evolution* and *Matter and Memory*. Deleuze's "First Commentary on Bergson" tackles three of Bergson's theses: Movement and Instant; Privileged Instants and Any-Instants-Whatever; and Movement and Change. Very briefly, the first thesis differentiates movement from the space covered:

> Space covered is past, movement is present, the act of covering. The space covered is divisible, indeed infinitely divisible, whilst movement is indivisible, or cannot be divided without changing qualitatively each time it is divided.[19]

Hence, it is impossible to "reconstitute movement with positions in space or instants in time: that is, immobile sections."[20] While two instants can be brought together to infinity, movement always occurs "in the interval between the two." Furthermore, "however much you divide or subdivide time, movement will always occur in a concrete duration [*durée*]; thus each movement will have its own qualitative duration."[21] Bergson's critique of the cinematographic apparatus in *Creative Evolution* is located here. The cinematograph sets in motion immobile snapshots; hence it corresponds to what Bergson calls an incorrect formula: "immobile sections + abstract time."[22] The second thesis that Bergson advances differentiates two illusions of reconstituting movement: the ancient and the modern. In the former, movement refers to intelligible elements, Forms or Ideas, which are themselves eternal and immobile. Conceived in this way, movement "will thus be the regulated transition from one form to another, that is, an order of poses or privileged instants, as

[19] Gilles Deleuze, *Cinema 1: The Movement-Image*, trans. Hugh Tomlinson and Barbara Habberjam, (London: Continuum, 2004), p. 1.
[20] Ibid.
[21] Ibid.
[22] Ibid.

in a dance."[23] However, modern scientific revolution replaced the dialectic order of poses with a succession of instants, and related the movement to any-instants-whatever containing the "immanent material elements." For Deleuze, cinema seems to be the latest descendent of this scientific lineage. Although the scientific lineage of cinema is not easily definable, Deleuze argues, its determining conditions can be located in the transfer of equidistant snapshots onto a moving filmstrip that reconstitutes the movement from any-instants-whatever.[24] Further in his discussion, Deleuze refers to Muybridge and Marey. Regarding the images of the horse's gallop, he writes,

> [T]his could only be dissected exactly by Marey's graphic recordings and Muybridge's equidistant snapshots, which relate the organised whole of the canter to any-point-whatever. If the equidistant points are *chosen* well, one inevitably comes across remarkable occasions; that is the moments when the horse has one hoof on the ground, the three, two, one. These may be called privileged instants, but not in the sense of the poses or generalised postures which marked the gallop in the old forms […] If these are privileged instants, it is as remarkable or singular points which belong to movement, and not as moments of actualisation of a transcendent form. The meaning of the notion has completely changed.[25]

Deleuze then argues that cinema eventually thrived on privileged instants, and that these privileged instants are unexceptionally any-instants-whatever in cinema. This then forms the groundwork for his discussion of Bergson's third thesis, which basically concerns what can be called 'qualitative movement': "the movement expresses something more profound, which is the change in duration, or in the Whole."[26]

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[23] Ibid, p. 4.
[24] Ibid, p. 5.
[25] Ibid, p. 6, emphasis mine.
[26] Ibid, p. 8.

I would like to dwell more on the notion of "choosing" as touched on by Deleuze in the quote above to differentiate privileged instants from any-instants-whatever. I will argue that Muybridge's technique in the production of his catalogue of instantaneous photography is based on the formula of "immobile sections + abstract time." In light of Muybridge's method of montage, I will try to illuminate the use of privileged instants. Subsequently, I will explain how Marey's method, aspiring to represent the any-instants-whatever, has certain parallels with Bergson's philosophy of movement. Finally, I will try to show the interrelation and interdependence of these two methods in the evolution of the cinematic aesthetics of pedestrianism.

Muybridge and Abstract Spatiotemporality

Originally a photographer, Eadweard Muybridge was funded by the University of Pennsylvania to conduct experiments on human and animal locomotion. Muybridge had come to prominence when, in the late 1870s, he produced the famous *Sallie Gardner at a Gallop*, which showed his patron Leland Stanford's horse galloping. Muybridge divided space and movement into equal spans to expose the tiniest intervals of motion. In 1879 (exhibited publicly in 1880), Muybridge developed his own projection device, called a "zoopraxiscope," to simulate movement using hand-painted silhouettes of *Sallie Gardner*. Muybridge quickly applied this method to a larger number of animals and humans when, in 1884, he was invited by the University of Pennsylvania to conduct more experiments and provided with a studio with all the necessary technical equipment. By 1885, Muybridge had produced 781 plates (assembled from 19,347 single images),[27] all of which were later collected and

[27] Marta Braun, *Picturing Time: The Work of Étienne-Jules Marey (1830-1904)* (Chicago: University of Chicago Press, 1992), p. 232.

published under the title *Animal Locomotion: An Electro-Photographic Investigation of Consecutive Phases of Animal Movements*. About 64 of the plates involved either male or female human models walking. In Muybridge's catalogue of plates, the first 58 are dedicated to the human act of walking (Image 2). During his time at the University of Pennsylvania, Muybridge was also commissioned to photograph the "walk of diseased people, paralytics etcr. [*sic*] so that by means of the zoopraxiscope they could show peculiarities to the medical student."[28] The catalogue lists 25 plates depicting "abnormal movements," of which 20 illustrate just walking.

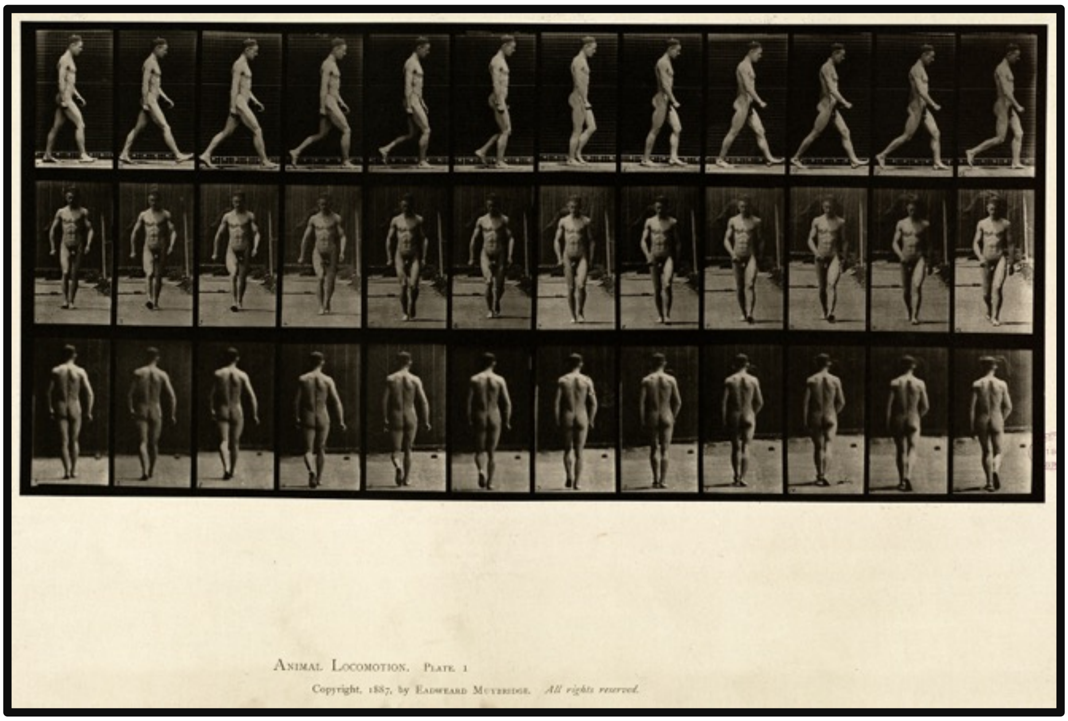

Image 1: *Plate 1* "Male Nude Walking" (E. Muybridge, *Animal Locomotion*, 1887).

In order to represent the phases of this most common everyday habit, Muybridge used a multiple camera system operated by an electromagnetic device to activate the shutters. He had his subjects (university athletes, and male and female

[28] Ibid, p. 233.

models) move along a track in front of a roofless enclosure. The background was covered with black cloth, divided by white vertical and horizontal lines into squares to mark off the space traversed by the moving body.[29]

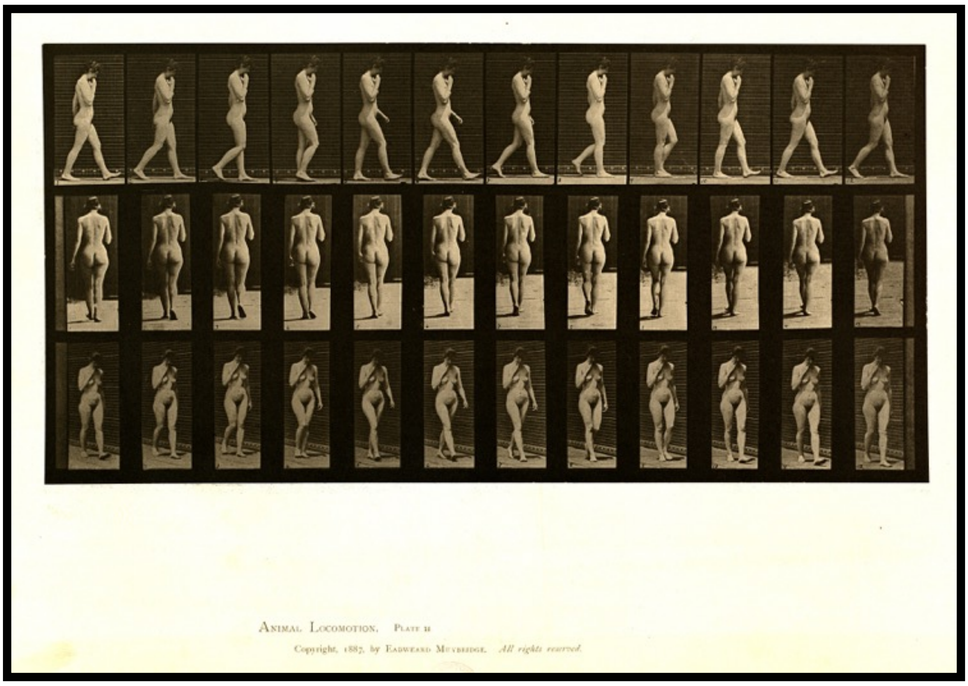

Image 2: *Plate 14* “Female Nude Walking” (Eadweard Muybridge, *Animal Locomotion*, 1887).

In his prospectus, to explain the type of movement conveyed in the plates and the logic of the montage, Muybridge gives the example of walking in reference to *Plate 14* (Image 3). The “quantity of movement” for Muybridge means two steps, or one stride, in the plate where the female model is walking towards right. He photographs twelve successive phases of that movement from each of three points of view, namely lateral, rear and front. Then he arranges these successive phases of movement on a plate as per captured instants. In *Plate 14.* For example, the laterals are placed in the first row, the rear foreshortenings in the second and the front foreshortenings in the

[29] Eadweard Muybridge, “Prospectus and Catalogue of Plates” in *Animal Locomotion* (Philadelphia: University of Pennsylvania Press, 1887), p. 7.

third. The vertical arrangement of images thus corresponds to the *same* bodily posture in the *same* fraction of movement, of time and space. The horizontal sequence, on the other hand, presents fragments of movement with the body showcasing a different posture in each of the frames and a rightwards-linear representation of time and space.

Even though Muybridge's work was highly influential in the field of visual arts,[30] personal letters dating from this period show that there was dissatisfaction among the university committee about the scientific accuracy of Muybridge's work, for which he had been tenured.[31] One major drawback of Muybridge's technique, as partly voiced by his superintendents at the University, was the *lost interval of movement*.[32] It is possible to explain this critique by looking at the three aspects, which Marey considered inextricably bound together in the study of movement: body, space, and time. The image in Image 3 can serve as an example, just as in Muybridge's prospectus. Firstly, even though the phases of walking in *Plate 14* are captured from multiple points of view, it is impossible to see the movement of certain limbs or the stride of the body from one position to the next. In fact, the plate does not show any movement at all. Instead, it presents fragments of one continuous movement arranged according to an internal consistency. The single images that make up the plate only provide an insight into the relationship between different postures the body adopts at successive instants while walking. According to Marta Braun, Muybridge's images therefore require the cooperation of the viewer in filling in the gaps to create the illusion of motion: "any sense of movement must be constructed by the viewer

[30] See for example the change from Théodore Géricault's *The 1821 Derby at Epsom* to Marcel Duchamp's *Nude Descending a Staircase, No. 2.* (1912) and Francis Bacon's Muybridge inspired paintings. Also see Xiang Zhang, "Muybridge, Motion Analysis and Art," *Arts Biomechanics* 1:2 (2012), pp.105-113.
[31] See Braun, *Picturing Time*, p. 233.
[32] Muybridge himself recognized this shortcoming of his technique in his prospectus: "Perfect uniformity of time, speed and distance was not always obtained." See Muybridge, p. 9.

from [the] gestures, frame by frame."[33] Secondly, the single images, when taken together, fail to show the space traversed by the subject while walking. Looking at them as a whole, it is impossible to discern the subject's correct spatial position in the course of movement at consecutive instants. Again, to quote from Braun's general comments on Muybridge's technique:

> Each photograph was made by a different camera (in tandem with the moving subject) against the same background as the one before and after it, but from a different vantage point. As a result, the subject and the camera seem to move in unison and thus effectively cancel out the sense of movement.[34]

The space in this image is an abstract one: a uniform black background that is coded in a geometrical matrix. This mathematical space does not have any discerning characteristic from one image to the next along the same row. Hollis Frampton contends that this "uniform grid of Cartesian coordinates" is also a kind of "universal frame of reference, ostensibly intended as an aid in reconciling the successive images of chronometry," and because of that it "destroys all sense of scale" as well as "annihilating any possible feeling of place."[35] Thirdly, the time that each quantity of movement takes is not rendered by any means in single images or the plate as a whole. Instead, Muybridge's camera imposes an abstract temporality on this representation of movement by the rhythm of exposures and the selected rhythm of movement conveyed in the assemblage of images on the final print. Here, Muybridge's technique can be interpreted as emblematic of the new time regime upheld by the cinema. As Mary Ann Doane explains, "the emerging cinema participated in a more general cultural imperative, the structuring of time and

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[33] Braun, p. 237.
[34] Ibid, p. 237.
[35] Cited in Tom Gunning, "Never Seen This Picture Before: Muybridge in Multiplicity" in *Time Stands Still: Muybridge and the Instantaneous Photography Movement*, ed. Philip Prodger (Oxford: Oxford University Press, 2003), pp. 222-272.

contingency in capitalist modernity."[36] In a way, Muybridge's technique preceded cinema's politics of time. To sum up provisionally, the instantaneous photographs of Muybridge detach space and time from the movement of the body, which in turn appears only as static. Therefore, movement in itself is not analysed but annulled due to being broken down into its privileged instants.

Marta Braun describes the tactics of "insertion, expansion, contraction, and substitution" used by Muybridge to select and arrange the privileged instants. Braun demonstrates that when a phase of movement was missing, due to a camera failure or photographic imperfection, "Muybridge assembled the negatives that remained, gave them internal consistency, and renumbered them to appear consecutively in the print."[37] In her analysis of Muybridge's plates, Braun also reveals other tactics. For example, where the gaps between phases of movement were "most blatant," Muybridge would assemble and number consecutively the left-over pieces. Another way of masking the gaps in a series, or an incomplete series that Braun detects is "to make the lateral and foreshortened views congruent on the page." As Braun explains,

> This was accomplished by replacing a missing image with uncropped images (in other words, using one image to fill the space of two) [see Image 2], printing one image in the series twice [see Image 3], removing the central section of the image and abutting the remaining parts [see Image 4], or even substituting a view of the empty backdrop taken from a viewpoint consistent with the rest of the series [see Image 5].[38]

[36] Mary Ann Doane, *The Emergence of Cinematic Time: Modernity, Contingency, the Archive* (Cambridge, MA: Harvard University Press, 2002), p. 3-4.
[37] Braun, p. 238
[38] ibid.

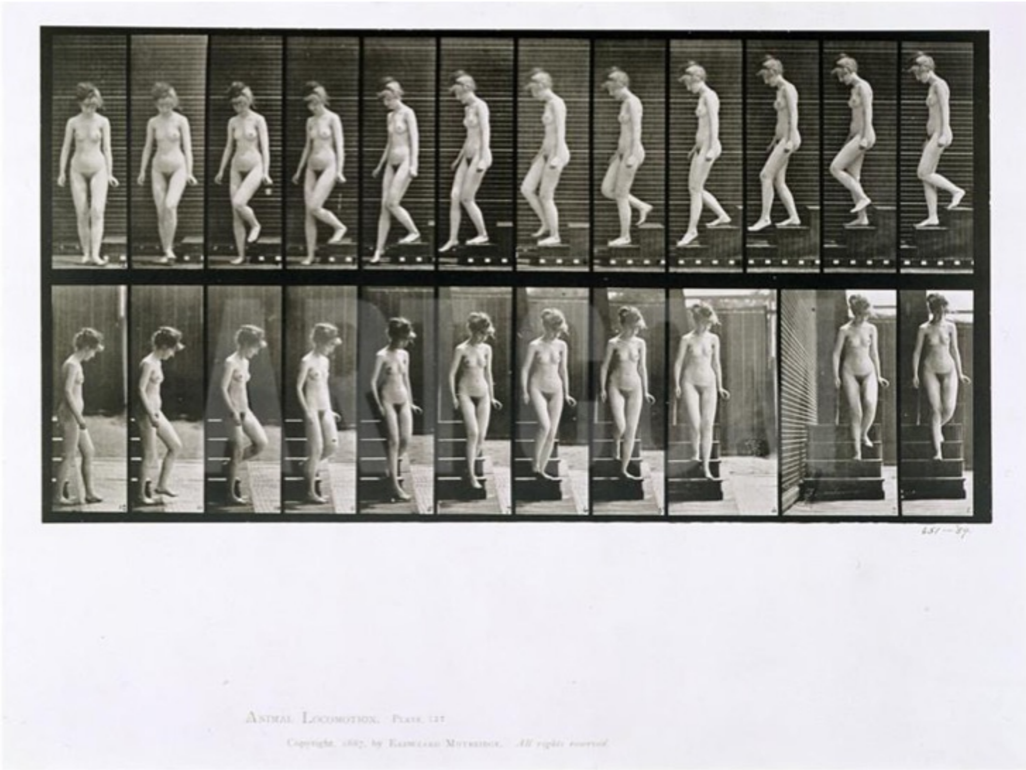

Image 3: *Plate 137* (Eadweard Muybridge, *Animal Locomotion*, 1887).

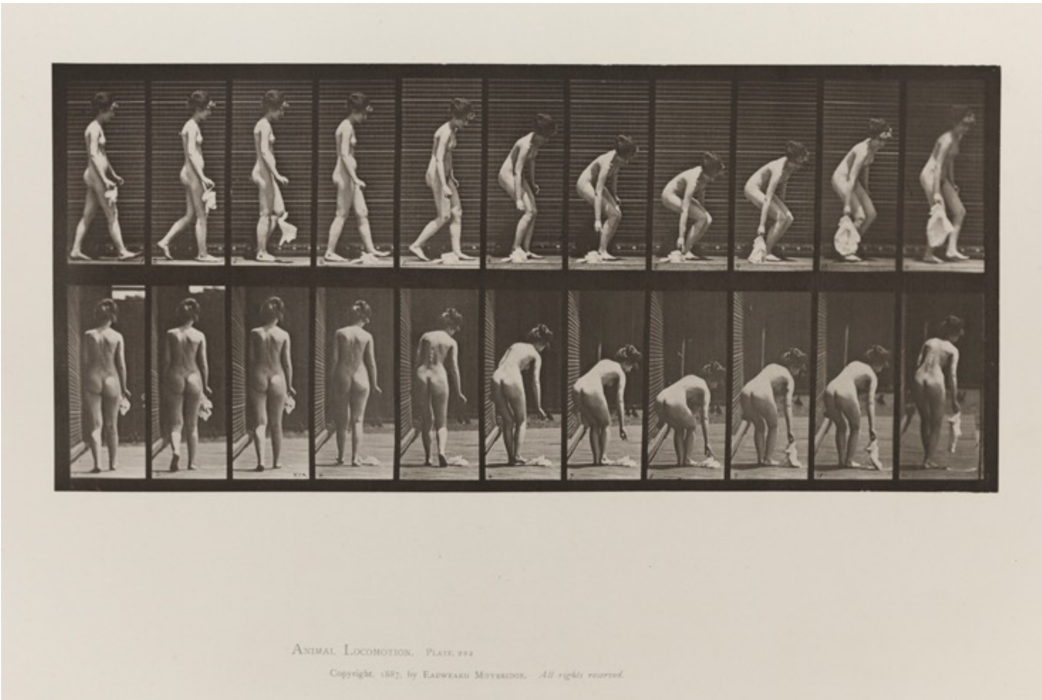

Image 4: *Plate 202* (Eadweard Muybridge, *Animal Locomotion*, 1887).

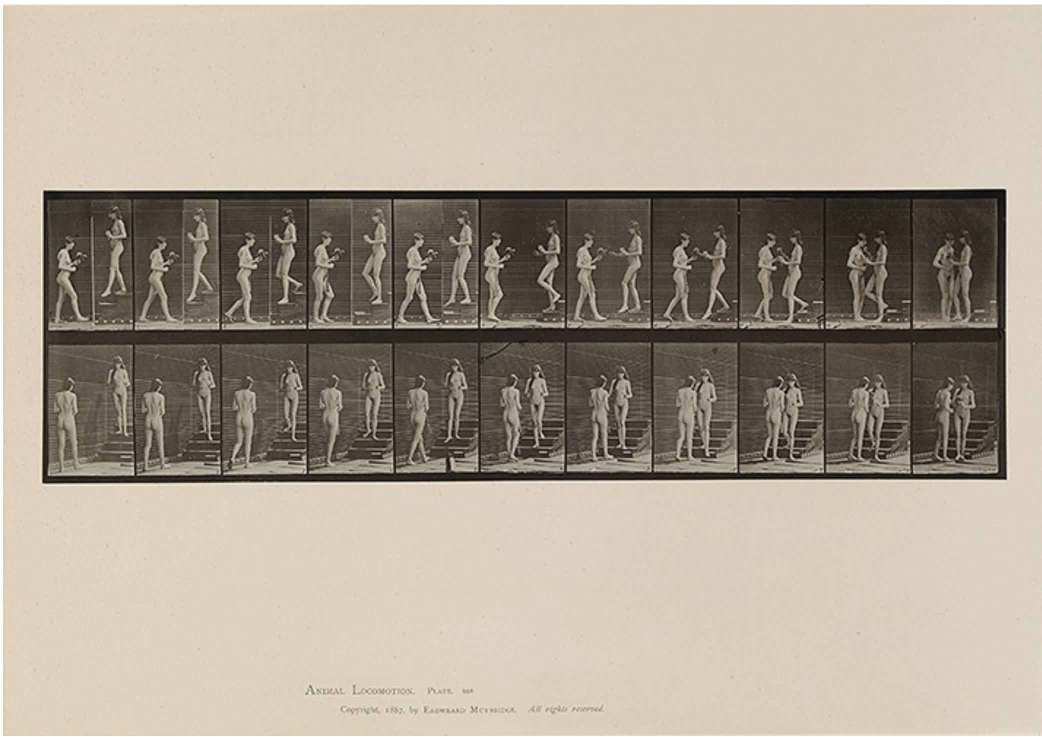

Image 5: *Plate 448* (Eadweard Muybridge, *Animal Locomotion*, 1887).

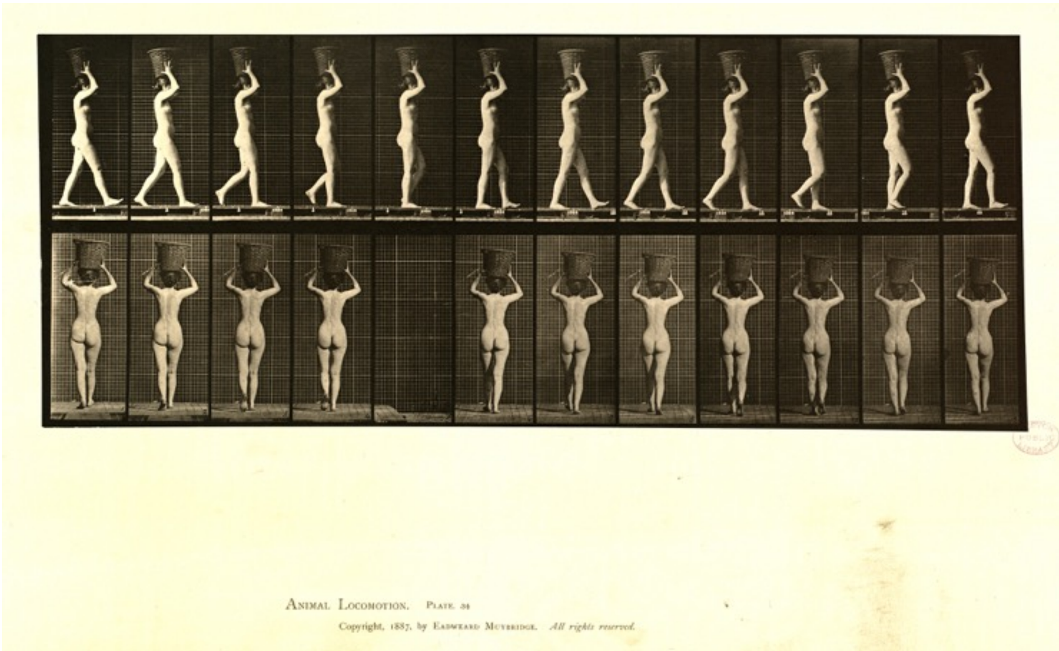

Image 6: *Plate 34* (Eadweard Muybridge, *Animal Locomotion*, 1887).

In light of the explanations up to this point, it can be argued that time and space in Muybridge's study of human locomotion was built on an abstract notion of time and space that is external to the movement of the body. Furthermore, the time and the space conveyed in the plates are also external to the movement of the body: Muybridge determined the rhythm of the images assembled on the plate. Therefore, the concept of movement embodied in Muybridge's images is based on privileged instants. Going back to Deleuze's commentary on Bergson, "movement, conceived in this way [is] the regulated transition from one form to another."[39] The way the immobile sections are photographed and arranged according to an external and abstract temporality allows us to suspend our disbelief, and to cooperate in the creation of a false movement.[40] Contrary to what Deleuze seems to assume, the creation of privileged instants does not occur during the production of the images (by choosing well the equidistant points) but, as it were, in postproduction, by rearranging or suppressing images that do not fit in well.

Marey and Corporeal Spatiotemporality

Conducting research on human locomotion at roughly the same time, Muybridge's contemporary Étienne-Jules Marey also considered the lost interval of movement a major weakness in the analysis of motion; particularly the abstraction and stillness found in Muybridge's images were serious limitations. "It is necessary to see the things in action," wrote Marey, not in their mysterious immobility.[41] In fact, Marey's lifetime passion was to chart in a scientifically accurate way the plethora of simultaneous movements that occur during a specific locomotive act, such as walking. Marta Braun writes, "Marey wanted to arrive at a visual description of the common types of human motion – the walk, the run, the jump, and so on – and the forces at work in their execution; specifically, he wanted these descriptions to depict the

[39] Deleuze, p. 4.
[40] Braun, p. 236.
[41] Marey, "Natural History of Organised Bodies," p. 279-280.

relationships in time and space of the various body parts."[42] For Marey, to know what is involved in the walk, necessitated

> a depiction of the movement of the leg as one foot goes up and the other goes down, and of the oscillation of the lower part of the leg as it moves against the upper; of the relation of the up-and-down movement of the leg to the shifts in the body's centre of gravity and of the connection of this movement to the movements of the arms and the head. Finally, he wanted to know the amount of muscular force needed to move the body through space […] Marey wanted to picture all these factors simultaneously, in a single and legible representation.[43]

According to Marey, a complete conception of movement characterises it by its form. That is to say, it takes account of the different phases of movement, not only its commencement and end, its maximum and minimum, but that which determines *all the intermediate states*.[44] This aspiration drove him to develop many graphic and photographic techniques, and ultimately chronophotographic and cinematographic methods.

The reason for this primary difference between the works of Marey and Muybridge may be rooted in their dissimilar approaches to movement. Marey's fascination with movement had deeper scientific and philosophical roots than the optical revelatory principle that inspired Muybridge. He had a more holistic understanding of the universe as a giant machine where everything, from the invisible atom to the celestial body lost in space, was subject to motion.[45] From this mechanist perspective, Marey participated in a general movement in physiology in the latter half of the nineteenth century that aligned the concept of life with movement, process, and

[42] Braun, p. xvii.
[43] Ibid.
[44] Marey, "Natural History of Organised Bodies," p. 289; emphasis mine.
[45] Marey, *Animal Mechanism: A Treatise on Terrestrial and Aerial Locomotion* (New York: D. Appleton, 1874), p. 9.

change.[46] According to François Dagognet, "[Marey's] sole concern was to catch life at its most characteristic: its incessant movement (the moving image)."[47] In this context, Marey's studies were directed towards translating movement into perceivable forms for scientific study.

As briefly described above, the early years of Marey's career were marked by an outstanding focus on scientific studies of human locomotion. Marey was mainly interested in the energy flows and movements within the body, such as blood circulation, nerve impulses, and the rhythms of the pulse and the heart. In 1867, he turned to the study of animal and human locomotion, publishing his findings in 1873 under the title *La Machine animale: Locomotion terrestre et aérienne* (translated into English and published in 1874 as *Animal Mechanism: A Treatise on the Terrestrial and Aerial Locomotion*). In this book, the chapter on the "Act of Walking in Man" specifically deserves attention for showing how movement was inextricably rooted within the body for Marey at this time whereas how, later in his career, he worked towards disengaging it from the body for better scrutiny.

In "Act of Walking in Man", Marey refers to walking as the most important type of human locomotion. The continua of impacts and supports, bends and extensions, contractions and relaxations are the core of this act, which, like a machine, continually propels the body forward in space. Fascinated by the complexity of such a fundamental everyday habit, he wrote, "The action seems very simple at first sight, but its complexity is soon observed when we seek to ascertain what are the movements which occur in producing this motion."[48] In order to scrutinize these movements, Marey devised an "experimental shoe," which was worn by the

[46] Doane, p. 46.
[47] François Dagognet, *Étienne-Jules Marey: A Passion for the Trace*, trans. Robert Galeta and Jeanine Herman (New York: Zone Books, 1992), p. 16.
[48] Marey, *Animal Mechanism*, p. 111.

pedestrian to measure the duration, phases and intensity of footsteps (Images 8 and 9). Marey described the way the experimental shoe worked as follows in *Animal Mechanism:*

> [A hollow chamber contained in the shoe], having upon it a small piece of projecting wood, is compressed at the moment that the foot exerts its pressure on the ground. The air expelled from this cavity escapes by a tube into a drum with a lever attached, which registers the duration and the phases of the pressure of the foot.[49]

From the records thus obtained, Marey produced bar graphs and charts, which he called the "graphic method," depicting the length of time each foot was on the ground and the moment of its transition.

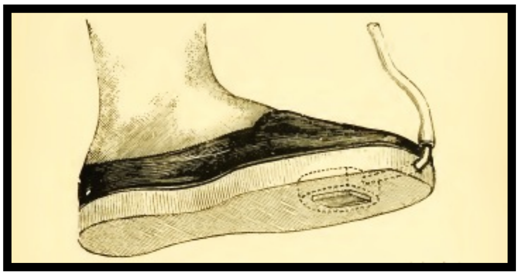

Image 7: Experimental Shoe (Étienne-Jules Marey, *Animal Mechanism*, 1873).

Image 8: Runner wearing experimental shoes (Étienne-Jules Marey, *Animal Mechanism*, 1873).

The fact that the experimental shoe is literally worn by the pedestrian gives it its distinctive value because it is connected to a mobile body by virtue of whose intrinsic rhythm of walking it is put in operation.[50] In a way, the experimental shoe thus works

[49] Ibid., 113.

[50] German physician Hermann Vierordt was working on self-registering shoes to measure and analyse human locomotion around the same time, which was documented in his treatise *Das Gehen des Menschen in Gesunden und Kranken Zuständen*, published in 1887 in Tuebingen.

as a supplement to the body as it translates its innate movements into legible data. It is, for example, sensitive to the amount of the pressure that the body makes on the ground (the impression of a footstep), the duration that the body stays in touch with the ground (the length of a footstep), and the frequency that the body meets and leaves the ground (the rhythm of footsteps) while walking. The aspects of the experimental shoe point to the three major principles that increasingly came to govern Marey's technique in later years: expanded sensorium, indexicality and legibility.[51]

In his aspiration to understand the phenomenon of movement, Marey was equally sensitive to movements inside and outside the body. However, for him, all human senses had certain limitations that restricted access to this information. Hence, he invented a plethora of different instruments primarily to enhance the human sensorium. François Dagognet underlines Marey's passion for constructing "sensors" to measure the tiniest fleeting movements, such as the pulse, the heartbeat, breaths, and the slightest organic dilations and stretches.[52] According to Dagognet, Marey's method was based entirely on sensitive instruments: "He is the inventor of the lightest and most reliable 'sensors' – the sphygmogram, which was the first, the cardiogram, pneumogram, pantogram, thermogram and so on."[53] These instruments that Marey used to monitor and measure movement in the early stages of his career supplemented human sense perception. One such device, the experimental shoe, served as an "add-on" in increasing the pedestrian's sensitivity to the pressure, duration and rhythm of his or her footsteps. Thus, the first principle of Marey's technique was to expand the human sensorium. As Braun aptly summarises, "Marey created and constructed

[51] These three principles are charted out in Doane, pp. 33-69.
[52] Dagognet, p. 175.
[53] Ibid., 175.

instruments that would see, touch and hear for him as well as mark down what was sensed."[54]

Secondly, for Marey, it was crucial that the body whose movement was being measured be the direct source for tracing.[55] That is, unlike Muybridge, the most crucial aspects of movement – temporality and spatiality – are not abstracted from the human body in motion. The experimental shoe was designed to chart the pedestrian's *own* temporality through the frequency of footsteps, and during his experiments Marey discovered that spatiality was also deeply rooted in the locomotion of the body. Marey relates in "Act of Walking in Man" how the body's attitude of walking changes on different surfaces; furthermore, the body never advances with a uniform velocity.[56] At certain points on his or her trajectory, for example when walking in a circle, the pedestrian's style of walking changes.[57] Hence, both temporality and spatiality are implied in the human body in motion. In other words, these abstract notions in Muybridge's images become corporeal units that are deeply rooted within the body for Marey.

Image 9: A graphic rendering of the tracings of the impact and rise of the two feet in ordinary walk (Étienne-Jules Marey, *Animal Mechanism*, 1873).

[54] Braun, p. 22.
[55] Doane, p. 42.
[56] Marey, *Animal Mechanism*, p. 123.
[57] Ibid., p. 123-127.

Yet Marey grew dissatisfied with his graphic method, primarily because the recording of movement was always mediated. Marey's major concern was intervention. In the "Natural History of Organized Bodies" he wrote: "The physiologist should endeavour to inflict on the animal which he is examining as little mutilation as possible, if he would obtain an exact idea of the normal conditions."[58] What was important throughout was to eliminate the human intermediary, which was a screen that further complicated, distorted, and prevented access to reality.[59] Marey therefore envisioned an unmediated representation, which brings us to the second principle that governed his work: indexicality. Marey was increasingly intrigued by how to improve methods of capturing and translating phenomena in a web of inscriptions where it became first visible and then readable (that is, intelligible).[60] This quest drove Marey to photography, which was ideal in this respect for his purposes "since its means of connecting object and representation – that is, light waves – were literally intangible and greatly reduced the potentially corruptive effects of mediation."[61] In his 1895 treatise, *Movement*, Marey wrote,

> Photography could produce the trajectory of a body moving in space; but the idea of successive changes in position was not sufficient to define the movement. The power to do so presupposes a knowledge of the relationship existing at any moment between the distance traversed and the time occupied.[62]

He found the photographic method useful since it could register both temporality and spatiality *directly* from the body in movement. Photography not only displays a continuous trace of the movement but also gives a stronger impression of bodily positions taking a longer period of time. Hence, using photography, Marey could

[58] Marey, "Natural History of Organised Bodies", p. 290.
[59] Dagognet, p. 43.
[60] Ibid., 43.
[61] Doane, p. 48.
[62] Étienne-Jules Marey, *Movement*, trans. Eric Pritchard (New York: D. Appleton, 1895), p. 33.

track down not only the tiniest intervals of muscular movement but also time duration of each bodily position. In this context, the notion of trace, which was a key concept throughout Marey's experiments, became more prominent when he took the path of the photographic method in the study of movement. According to Dagognet, for Marey, the trace was "nature's own expression, without screen, echo or interference: it was clear and, above all, universal. All we had to do was translate what nature itself told us about itself."[63] Here it is possible to draw parallels between Marey's idea of attaining reality without any mediation and André Bazin's idea of an ontological photographic realism. Although postdating Marey's experiments, Bazin underlines in "The Ontology of the Photographic Image" the "objective character of photography"[64] and emphasises its "true realism" due to its being unmediated: "For the first time an image of the world is formed automatically, without the creative intervention of man. All the arts are based on the presence of man, only photography derives an advantage from his absence."[65] For Marey, this quality of absence made the photographic medium a privileged mode of scientific representation. In the 1880s, Marey looked for ways to expand the range of the graphic method and developed what he called "fusil photographique*"* – a photographic gun.

Marey designed the photographic gun based on an earlier model by Jules Janssen, only faster. Marey describes it as follows:

> The barrel of this gun is a tube that contains a photographic lens […] A central axis makes twelve revolutions per second and commands all the parts of the instrument. The first of these is a metal disk pierced with a narrow slot. The disk forms the shutter and lets the light penetrate only twelve times a second for the duration of 1/720 each time. Behind this first disk is another

[63] Dagognet, p. 63.
[64] Bazin is here referring to the word lens, which in the French original is *objectif*. See translator's note in Andre Bazin, "The Ontology of the Photographic Image" trans. Hugh Gray, in *What is Cinema? Volume 1* (Berkeley: University of California Press, 1967), p. 13.
[65] Ibid., 13.

> turning freely on the same axis. This disk has twelve openings, and attached to it is the sensitized glass, which can be either round, or octagonal. This second disk must revolve in a regular and intermittent manner so as to stop twelve times per second in front of the ray of light that penetrates the lens.[66]

The photographic gun could register the movement of any moving object without it being tied to any device in the laboratory. It also allowed its operator to roam freely and record any moving object in its natural environment without the slightest intervention for the analysis of motion. It was a quick camera, registering twelve images per second, which made it possible to achieve a synthesis of continuous motion on a phenakistoscope.[67] According to Marta Braun, Marey used this photographic gun to make "sequential photographs of bats and birds in flight" and "of horses and people on the street."[68] By allowing him to register movement when in movement, it shares some aspects with the Lumière cinematograph, which could be carried easily anywhere to record daily life. This will further be examined in the next chapter.

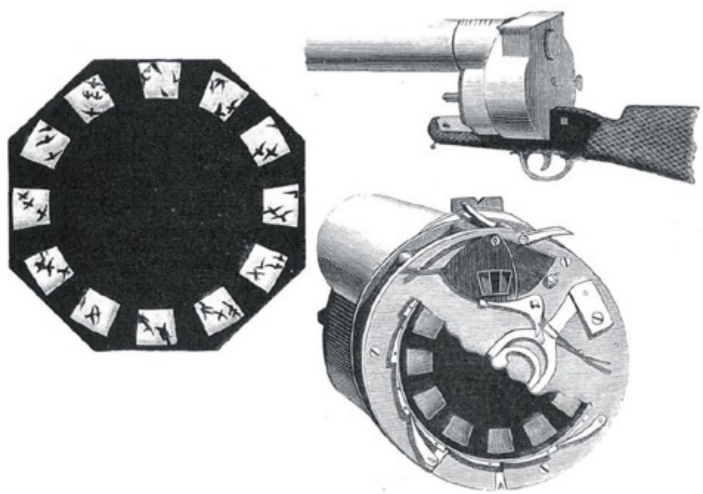

Image 10: Image depicting the mechanism of Marey's photographic gun

[66] Braun, p. 57.
[67] Ibid, p. 61.
[68] Ibid, p. 61.

Marey's dissatisfaction with the photographic gun was primarily due to the absence of the spatial dimension. Although it was more advanced than Muybridge's technique, one shortcoming persisted. It was not possible to see the space traversed and the time that elapsed from one position to the other. His aspiration to represent the movement in all its intermediate states was not satisfied by the photographic gun. When discussing these shortcomings and possible ways to overcome them, Marey clearly dismisses the use of multiple cameras for "photographs taken from different points of view are incapable of comparison."[69] Marey was certain that movement must be registered in its natural continuity from a single perspective. Along with Georges Demenÿ, Marey therefore devised a chronophotographic camera, which could register phases of a single movement via a multiple exposure system on a single fixed plate. Named "photochronography", or "chrono-photography," this method enabled the movement of a moving body in space to be represented.[70]

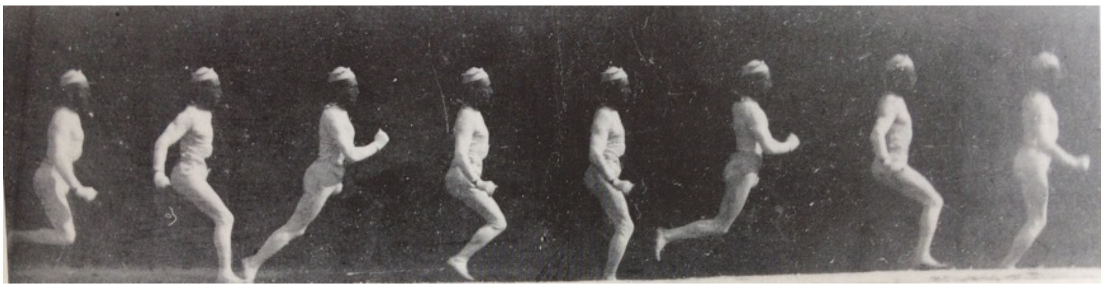

Image 11: Chronophotography of running (Étienne-Jules Marey, 1883).

[69] Marey, *Movement*, p. 114.
[70] Étienne-Jules Marey, "The History of Chronophotography" in *Annual Report of the Board of Regents of the Smithsonian Institution for the year ending June 30, 1901, 1902*, p. 317. Downloaded from Bibliothèque Interuniversitaire de Médecine <http://www.bium.univ-paris5.fr/histmed/medica/cote?marey067> Last accessed October 1, 2017

Image 12: Chronophotography of walk (Étienne-Jules Marey, 1883).

Marey devised chronophotography to "determine with exactitude the characters of a movement." That is, "such a method ought to represent the different positions in space occupied by a moving object, i.e. its trajectory, as well as define the various positions of this body on the trajectory at any particular moment."[71] The method involved a pitch-black background and a stationary photographic camera facing it. A subject wearing contrasting light colours walked before the camera while the shutter remained open and recorded the entire movement from a single perspective.[72] In contrast to Muybridge's separately framed images that annulled movement, the chronophotograph thus displayed all the successive positions of a single subject in the same frame. In line with Marey's principle of heightened sensory perception, the chronophotograph was designed to render visible what escaped the restricted capability of human vision in the most accurate way possible. Furthermore, there was no mediation involved because the pedestrian did not wear any wires, carry any special instruments or was not connected to some device that could alter the normal conditions of his everyday walk.[73] And finally, the principle of indexicality was

[71] Marey, *Movement*, p. 54.

[72] Marey was very cautious about the shutter time. He wrote, "The duration of the exposure must be very brief in order that the object may not move an appreciable distance during a single admission of light." See *Movement*, p. 55.

[73] Marey was explicitly making this point in *Movement*: "In the study of movement, photography has the advantage of not being obliged to borrow any motive power from the object observed." See p. 50.

fulfilled: the body itself was the source of both the spatiality and temporality of the movement.[74] It was possible to see a complete trace of the movement and the amount of space traversed as well as the duration of each quantity of movement. Hence, the viewer could read what occurs within the frame as happening within a certain period of time and over a certain span of space.

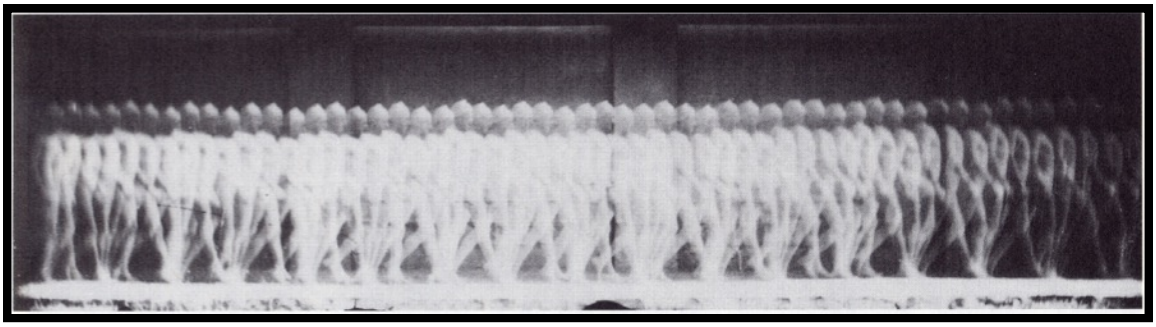

Image 13: Demeny Walking (Étienne-Jules Marey, 1883).

Yet this setup of chronophotography also posed a problem for Marey because the impressions of the movement at certain points were either too blurred or there were too many superimpositions that made the photograph hard to read for a scientist (Image 14). Marey's efforts to overcome this problem shed light on the third aspect of his work: legibility. As a consequence of superimposition, legibility of time and movement were seriously impaired. As Marey noted, "This confusion from the superimposition of images sets a limit to the application of chronophotography on fixed plates, yet in many cases, by means of certain appliances, this difficulty may be

[74] Even though in the later stages of his experiments Marey had to work with multiple shutters and a chronometric dial, there was a preliminary procedure whereby the distance and the intervals of time could be calculated from the body's movements (see page 56 in *Movement*). The shutters were then adjusted according to the data obtained from this procedure. "Such photographic pictures contain the two necessary elements for understanding a movement; namely a notion of space as well as that of time," wrote Marey and explained, "nevertheless (…) it is often difficult to harmonize two such incompatible notions without having recourse to certain expedients" (see *Movement*, p. 57).

overcome."[75] These involved a special suit that Marey and his assistant Georges Demenÿ designed in order to translate the entire body into a graphic of movement. The idea was to blacken and render invisible those parts of the body that were not wanted in the photograph while accentuating the movement of those portions that were to be studied. "Thus a man dressed in black velvet, with bright stripes and spots on his limbs, is reproduced in the photograph as a system of white lines, which indicates the various positions assumed by the limbs," explains Marey (Image 15 and 16).[76] Using this technique, called "geometrical chronophotography," Marey eliminated the undesired overcrowding of superimpositions without foregoing the complexity of the representation of movement. In a way, the geometrical chronophotography was a blend of the photographic medium and the earlier graphic method as regards the latter's tendency to provide abstract translations. By converting the entire body into a graphic drawing that is at once legible and indexical, it can be maintained that Marey managed to detach movement from the moving body in order to analyse it in itself (Image 17).

[75] Marey, *Movement*, 60.
[76] Ibid., 61.

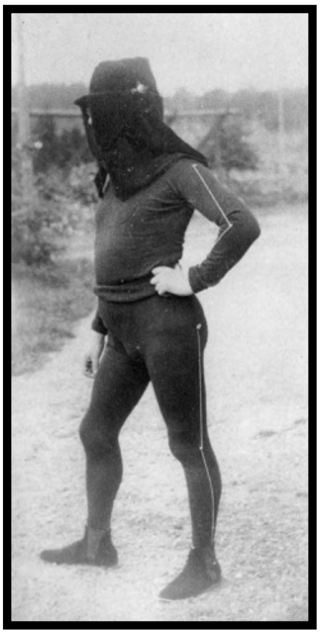

Image 14: Demeny in black velvet suit, 1884.

Image 15: Walk with bent knees, an example of geometrical chronophotography (Étienne-Jules Marey, 1884).

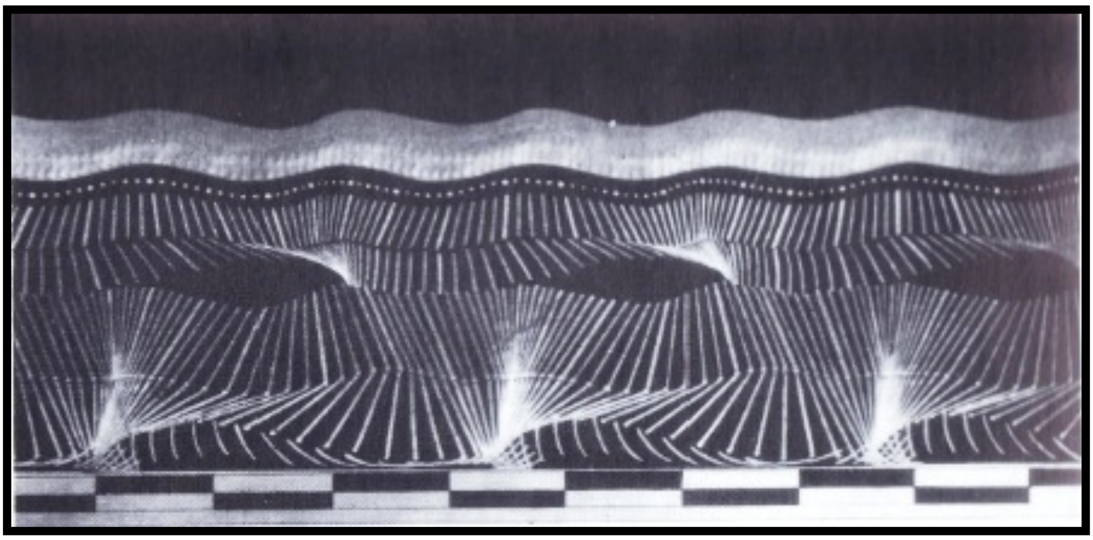

Image 16: Joinville soldier walking, an example of geometrical chronophotography (Étienne-Jules Marey, 1883).

An analysis of Marey's and Demenÿ's chronophotographic works reveals that certain forms of chronophotography allowed the capture of any-instants-whatever of movement for analysis. However, it also posed problems for Marey. He describes the shortcomings of chronophotography in the final chapter of *Movement*, dedicated to the analysis of machines that synthesise movement:

> Although chronophotography represents the successive attitudes of a moving object, it affords a very different picture from that which is actually seen by the eye when looking at the object itself. In each attitude, the object appears to be motionless, and movements, which are successively executed, are associated in a series of images, as if they were all being executed at the same moment. The images therefore appeal rather to the imagination than to the senses.[77]

In many ways, Marey's last chapter in *Movement* is a harbinger of the cinematographic method as it contains a detailed description of "a good apparatus." After careful examination of the stroboscope, the phenakistoscope, the zootrope, Muybridge's zoopraxiscope, Reynaud's praxinoscope, and Demenÿ's photophone, which enabled the analysis and reproduction of movements executed during speech, Marey concludes with a description of a chronophotographic projector designed "to realise the nature of a movement satisfactorily." Fitted with perforated sensitized film, long enough to contain "forty or sixty figures," the chronophotographic projector is illuminated from behind with an electric lamp or sun light.

It is important to emphasise that when Marey invented the photographic method, the chronophotographic method, and eventually the cinematographic method, he did not abandon previous methods. Rather, looking at the huge body of his work, it is possible to see many combinations, intersections, and deviations of various methods. Even chronophotography, which forms perhaps the largest part of his oeuvre, contains many variations and forms such as chronophotography on fixed plates, chronophotography on moving plates, geometrical chronophotography, and

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[77] Marey, *Movement*, p. 304.

microscopic chronophotography.[78] Marey's thirty-year scientific search to measure, record, analyse, and represent movement in all its intermediate states ends with the cinematographic method, which, despite its advantages, proved dissatisfactory for Marey. Even though the movement was registered and reproduced in a lifelike fashion, it slipped away too quickly for the scientist's analytical gaze.[79]

The Question of Pure Movement

With regard to all the aspects considered above, it is possible to chart three main differences between Muybridge's and Marey's technologies of conveying and representing movement. First, Muybridge produced fragmented instants of movement, thereby conveying a set of *privileged instants* to which an abstract, external spatiotemporality was added to achieve the illusion of movement. Marey, on the other hand, strove to observe movement in its tiniest intervals without any detriment to its execution and continuity. He sought to represent *any-instants-whatever* of any movement – that of humans and animals, as well as of matter, such as water and air. Secondly, Muybridge's images have an abstract temporality and spatiality imposed on them by the technician whereas both temporality and spatiality were *corporeal* aspects of a moving body for Marey. Instead of imposing an abstract rhythm and a mathematically coded background, he sought the ideal intervals of time and space to photograph the movement of a body *within* that body. Determining the exposure speed, for instance, was tied not only to the physical factors of light and sensitized plates or film but also to the speed of the movement to be captured. Marey endeavoured to *extract* the movement *from* his object of study (any kind of body in motion). Hence, even though the modern parameters of temporality, such as seconds

[78] See Laurent Mannoni, *Etienne-Jules Marey: La Memoire de L'œil* (Milano: Mazotta, 1999).
[79] Marey, *Movement*, p. 318.

or milliseconds, were a concern, he conceived of movement in relation to the corporeal temporality (rhythm) of the moving object. Thirdly, in contrast to Muybridge's detached spatialisation of time based on successive images, Marey's desire was to render simultaneous movements of different parts of the body on a single photographic plate. If time meant *succession* for Muybridge, it meant *simultaneity* of various movements in a single frame for Marey.

From his work outlined so far, it is possible to argue that Marey's understanding of movement differed from that of Muybridge while sharing significant parallels with the philosopher Henri Bergson's conception of movement. Like Marey's dissatisfaction with Muybridge's method of instantaneous photography, Bergson was critical of the "halt" that gives an illusion of a movement's divisibility. Bergson contends that these halts only mask the perception of real movements:

> These points have no reality except in a line drawn, that is to say motionless; and by the very fact that you represent the movement to yourself successively in these different points, you necessarily arrest it in each of them; your successive positions are, at bottom, only so many imaginary halts.[80]

Real movement, for Bergson, is indivisible because it implies a *passage* or becoming, a change of state or quality. It is the human mind that is always inclined to think of movement in relation to external points in space. Bergson values passage as a more productive way to think about movement as an indivisible phenomenon: "A passage is a movement and a halt is an immobility. The halt interrupts the movement; the passage is one with the movement itself."[81] The passage is not identical to the line extending from point A to point B because such points are but extraneous (and, immobile) points in relation to which we are inclined to think of movement. This way

[80] Henri Bergson, *Matter and Memory*, trans. Nancy Margaret Paul and W. Scott Palmer, (USA: Dover, 2004), p. 248.
[81] Ibid, p. 247.

of conceiving movement substitutes the path for the journey; and just because the journey is subtended by the path, the two do not necessarily coincide:

> As every point of space necessarily appears to me fixed, I find it extremely difficult not to attribute to the moving body itself the immobility of the point with which, for a moment, I make it coincide, it seems to me then, when I reconstitute the total movement, that the moving body has stayed at infinitely short time at every point of its trajectory.[82]

Bergson's critique of the cinematographic apparatus is rooted in this drawback of perception. Common sense perception always reconstructs movement in relation to supposedly immobile points of space and time. Muybridge's instantaneous photography, therefore, can be considered as an embodiment of this idea with all the intervals and gaps to be filled in by perception. Muybridge's extraneous rhythm and mathematical space prevents real movement from being captured if not understood, and only maintain the limits of human perception. This mechanism precludes an understanding of movement as an uninterrupted flow of moving matter and moving mind. In *Creative Evolution*, Bergson writes,

> Instead of attaching ourselves to the inner becoming of things, we place ourselves outside them in order to recompose their becoming artificially. We take snapshots, as it were, of the passing reality, and, as these are characteristic of the reality, we have only to string them on a becoming, abstract, uniform and invisible, situated at the back of the apparatus of knowledge, in order to imitate what there is that is characteristic in this becoming itself. Perception, intellection, language so proceed in general. Whether we would think becoming, or express it, or even perceive it, we hardly do anything else than set going a kind of cinematograph inside us. We may therefore sum up what we have been saying in the conclusion that *the mechanism of our ordinary knowledge is of a cinematographical kind*.[83]

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[82] Ibid, p. 247.
[83] Henri Bergson, *Creative Evolution*, trans. Arthur Mitchell (Boston: University Press America, 1983), p. 306; original emphasis.

Marey's approach, in all its differences from Muybridge's, can be seen as an attempt to circumvent this mechanism and understand movement in its continuity and complexity. For Marey, movement equals life; hence it needs to be understood in its uninterrupted flow, in its all any-instants-whatever. This conception of movement was a guiding principle in Marey's efforts to analyse the act of walking.

It is worthwhile to note, however, that Marey's and Bergson's conceptions of movement differ in certain respects, especially with regard to chronophotography. In her article "Evaluation, mesure, mouvement: la philosophie contre la science et le concepts du cinema (Bergson, Marey)," Maria Tortajada reminds us of the contextual paradigms needed to fully comprehend Bergson's philosophy of movement and his dissatisfaction with cinematography as a model for thought. Tortajada emphasises that the cinematography that Bergson mentions was primarily chronophotography, and that this instrument was primarily concerned with science.[84] According to Tortajada, it is crucial to distinguish the philosophical from the scientific notion of movement that researchers sought to analyse, dissect, and synthesise for scientific scrutiny. In Bergson's philosophy, movement is essentially indivisible ("indécomposable") so the only way to grasp or comprehend movement is through intuition.[85] Tortajada emphasises that Bergson's main point in *Creative Evolution* is not to oppose the photographic image to a moving image but to show that the breakdown of movement, as perfectly seen in the breakdown of shots of a moving image, fails to capture and thus decomposes real movement.[86] From a Bergsonian standpoint, in its endeavour to

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[84] Maria Tortajada, "Evaluation, mesure, mouvement: la philosophie contre la science et le concepts du cinema (Bergson, Marey)", *Revue européene des sciences sociales* XLVI-141 (2008), p. 97; my translation from the exact quote: "Le cinématographe de Bergson appartient à l'espace de la chronophotographie, et celle-ci s'élabore dans le champ de la science."
[85] Also see Gilles Deleuze's "L'Intuition comme méthode" in *Le Bergsonisme* (Paris: Presses Universitaires de France, 1966).
[86] "Ce qui intéresse Bergson, ce n'est pas d'opposer l'image photographique à une image en mouvement (…) mais de montrer que la série d'instantanés fige le mouvement en le décomposant"; Tortajada, p. 99.

dissect and analyse movement, science creates false terms – stops, instants, and intervals are but scientific or theoretical abstractions that cannot grasp movement: The movement will always slip away in the interval ("Le mouvement glissera dans l'intervalle").[87] For Marey, however, movement is a natural phenomenon that awaits to be revealed, measured, interpreted, and formulated by science. This is where the major difference between their approaches to movement lies: while, for Bergson, movement can only be grasped by intuition, for Marey movement can be analysed by science beyond the register of human sensory organs. Unlike Bergson, as a physiologist Marey constantly sought new devices to render movement legible for scientific analysis, as I have described earlier in this chapter. Marey's persistent experiments with photographic, chronophotographic, and cinematographic media aimed to record the movement that escaped limited power of human vision. Marey wanted to represent what the eye cannot see. Thus, phases of movements, which were false scientific abstractions that fail to grasp movement for Bergson, were necessary steps to analyse the natural phenomenon of movement for Marey. However, despite these well-observed differences between their conceptions of movement, I would like to propose that a parallelism can still be noticed, especially in the last stages of Marey's studies of human and animal locomotion. Towards the end of his penultimate treatise on locomotion, *Movement*, Marey acknowledges the limits of each apparatus to capture movement and concludes his book with a dissatisfied tone, pointing only to further research in the field. He even discloses his "doubts" that "more perfect" tools are possible. Marey's constant dissatisfaction with each method he develops, and his final remarks humbly pointing to further investigations to capture movement for scientific analysis, indicate that there is always some aspect of movement that was

[87] Ibid, p. 100.

ungraspable and unattainable by such tools. It is here that I see a possible connection between Bergson's and Marey's conceptions of movement.

Conclusion: Pre-Cinematic Pedestrianism

In an interview in 1914, after being asked about his views on cinema, Bergson elaborates more and in a slightly different way from his conceptualisation in *Creative Evolution*, quoted earlier. He comments on cinema not as an analogy of limited practical understanding but as a synthesis of memory, which contains different times and different movements fused into one. He says,

> Memory, is like cinema, a series of images. Immobile, in its natural state; in movement, it is life itself. And some might conclude, or have concluded, that life is movement. Is not vibration the essence of light and sound? Is not the living eye a cinematograph?[88]

According to Louis-Georges Schwarz, who translated the interview from French for *Cinema Journal*, while *Creative Evolution* compared cinematographic technology to practical understanding, the cinematographic image is compared here to subjective experience.[89] From this perspective, certain aspects of Deleuze's interpretation of Bergson's philosophy of movement in relation to cinematic aesthetics become clearer, especially his concepts of movement-image and time-image.

Going back to *Paris Qui Dort*, which I described in the Introduction, it is now possible to see how the film brings together two conceptions of movement that characterised industrial modernity within which cinema excelled. While the ray represents the standardised time and movement that produced the technology of cinematographic movement, the ephemeral and free-flowing movement of the pedestrian represents the immanent contingency that escapes or eludes such

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[88] Lois-Georges Schwarz, "'Henri Bergson Talks to Us About Cinema' by Michel Georges-Michel from Le Journal, February 20, 1914," *Cinema Journal* 50:3 (Spring 2011), p. 82.
[89] Ibid, p. 80.

standardisation. The pedestrian in *Paris Qui Dort* embodies the corporeal spatiotemporality, the subjective experience of movement vis-à-vis the standardised and rationalised form of movement. In that sense, the movement of the pedestrian in the film is closer to a Mareyesque or Bergsonian notion of movement – unattainable, ungraspable and elusive.

To conclude, the figure of the pedestrian and the act of walking as the primary instrument to attain, analyse and represent pure movement informed the emergence of cinematic aesthetics at the turn of the century. Control over the spaces and rhythms of bodies across industrial spaces, specifically in urban contexts, inescapably gave rise to a set of social figures that resisted or failed to become incorporated into the rationalisation of time and space that restricted the movement of bodies. One such figure was the flâneur or flâneuse who rambled the streets at his or her own pace, as exemplified in *Paris Qui Dort*. In an age marked by industrial advancements and by a mechanistic view of the universe as a giant machine of a myriad parts working in harmony, the figure of the flâneur could be read as the embodiment of contingent, unrestrained movement. In the next chapter, I will try to formulate the figure of the flâneur or the activity of flânerie as a constructive element in the early cinematic aesthetics of urban streets. Just like Albert's flânerie, which connects snapshots of everyday life in Paris in *Paris Qui Dort* to the fashion of Eugène Atget, I will try to show how, in the case of Lumière operators, flânerie worked as a constructive element that connected the catalogue of everyday life scenes. This will enable me to demonstrate the close relationship between the activity of walking in the street and the emergent cinematic aesthetics of walking.