

Marey's Gun: Apparatuses of Capture and the Operational Image

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We often approach the histories and theories of moving image media in terms of the art and technology of projection. While the understanding of cinema as continuing the tradition of optical shows and magic theaters no doubt discloses an important aspect of the medium, it simultaneously occludes one decisive line of development: the alternative conception of “cinema” as the mechanical recording and automation of movement that can be highlighted in the context of the late-19th-century life sciences, in particular. It was in this context that precinematic devices such as chronophotographic apparatuses – epitomized by the “photographic gun” (*fusil photographique*) that the French physiologist Étienne-Jules Marey made in 1882 – were developed to scrutinize the living in terms of its dynamic expressions. A range of different kinds of machines was designed to capture and reproduce what was seen to be the essence of life: movement.

The following explores this alternative trajectory of cinema to articulate the medium as a specific kind of apparatus of knowing and reproducing the living. Focusing on Marey's photographic gun, the aim is to think of media technologies in terms of technologies of government, and in this particular case, in terms of the biopolitical capture of life into fields of knowledge, intervention and control, the notion of “biopolitical” referring here, following Michel Foucault, to strategies and mechanisms, developed since the 18th century, that come to harness the creative forces of living beings (from physical activity to mental dispositions) into a machinery of profitability.¹ This capture, as we will see, is not a question of spectacles, but rather, of functional, even secretive “operational images,” which over the course of the past 150 years have gradually become an intrinsic feature of our lives.

Photographic Gun

Everywhere he lived, Marey surrounded himself with animals and machines: recording instruments, photographic apparatuses, cages, and aquariums filled with fish, pigeons, lizards, and so on. “Everywhere, in every corner, life,” as the photographer Nadar noted about his visit to Marey's office and living quarters in

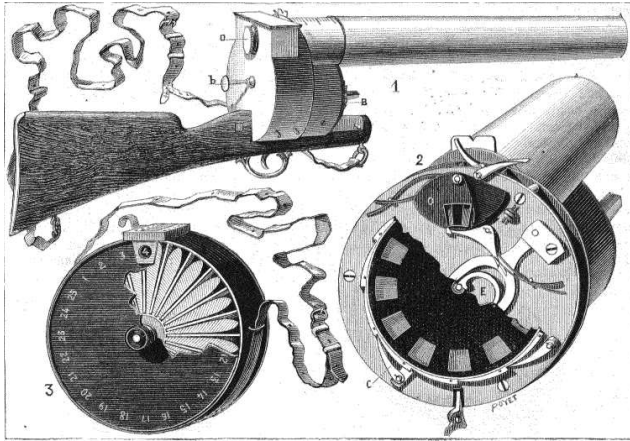


Fig. 1: Marey's photographic gun, *La Nature*, April 22, 1882.

Paris in 1864.² Or, life coupled with technological mediators, one should add, to acknowledge the extent to which, for Marey, life as an object of study could not be epistemologically separated from various kinds of scientific apparatuses, which the physiologist envisioned as “indispensable intermediaries between mind and matter” necessary to overcome “the insufficiency of our senses.”³

Among the myriad of fauna, birds were of particular interest for Marey throughout his career. The physiologist, who also very much acted as an engineer, anticipating modernity's key technological developments, from the cinema to the airplane, was keen to unravel the secrets of aerial locomotion. The aim was to imitate and reproduce the flight of winged creatures so that us humans, too, would be able to “travel through air” in the very near future.⁴ In this regard, the patterns of movement that birds' wings perform in interaction with air, which evade the slow thresholds of human perception, presented an epistemic puzzle that needed to be solved by technical means. In the 1860s, Marey had already started to develop and perfect his recording instruments based on the “graphic method,” that is, the measurement of physiological processes such as the heartbeat, breathing, muscle activity, etc. by using graphs to depict change over time.⁵ To get accurate data about the movement of wings, Marey would wire an individual bird with his recording machines: electrical tracings signaled the speed of the wing movements and myographic tracings indicated the contraction and relaxation of the pectoral muscles. Marey also constructed mechanical bird models to test and synthesize the information so gathered by the instruments.⁶

It was in the purpose of deciphering the mechanics of flight that Marey also developed one of his first chronophotographic apparatuses, the photographic gun, described in an article published in *La Nature* in 1882 (Fig. 1).⁷ The device, as the physiologist acknowledges, drew on the idea of the “astronomical revolver,”

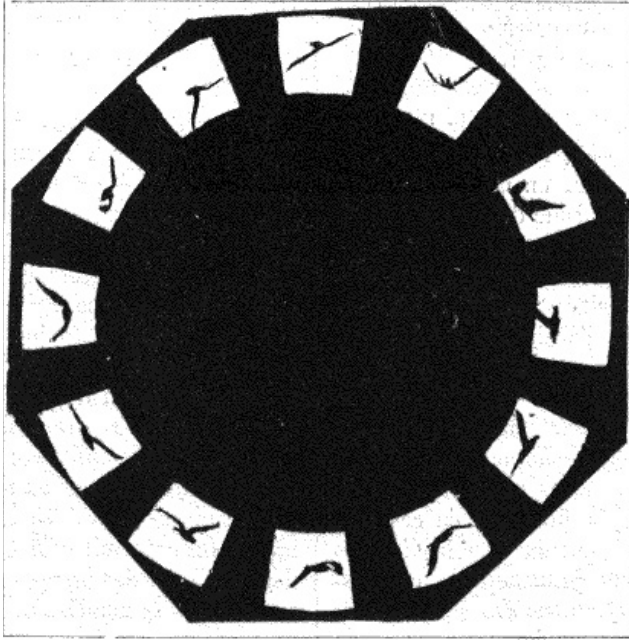


Fig. 2: *Flight of gull, chronophotograph by Marey, La Nature, April 22, 1882.*

which Marey's colleague, the astronomer Jules Janssen had designed in 1874 to record the transit of Venus across the sun: a combination of a photographic camera and a telescope to capture sequential images of the passage of the planet. Janssen had already noted, when musing on the possible uses of his invention, "how interesting it would be to obtain a series of photographs reproducing the various aspects of the wing during that action."⁸ This was exactly the objective behind Marey's image-shooting machine. Further inspiration came from Eadweard Muybridge's studies with instantaneous photography, starting with the study of the trot of Occident, Leland Stanford's horse, in the early 1870s. However, the equipment Muybridge was using was heavy and unsuitably clumsy to capture the rapid movements of birds and insects.

Trying to overcome this shortcoming, Marey designed a device that was about the size of a hunting rifle, portable and free to aim from any angle. The photographic lens was located in the barrel, while the bottom end of the barrel housed a magazine containing a cylindrical glass plate alongside two disks with shutters. Pulling the trigger made a clocked mechanism of the three disks move inside the magazine and record pictures sequentially. The model described in *La Nature* took 12 images per second with the exposure time of $1/720$ th of a second.

One of the first subjects of Marey's experiments with his gun was an anonymous gull flying supposedly somewhere on the coast near Posilipo (Naples),

Italy, where the villa in which Marey spent the winters and developed his apparatus was located (Fig. 2). Here, the study of the large-scale movements of celestial bodies as carried out by Janssen was turned into the capture of the swoops and dives of winged creatures capable of mastering the aerial ocean. The pictures Marey was able to make were nonetheless (as he affirms) somewhat lacking in detailed information, and the interval was not short enough to come up with a desired reconstruction and analysis of the mechanics of motion by means of animation devices such as the phenakistiscope. But the potential advantages of the instrument seemed obvious, especially when it came to extending the reach of knowledge of how different species of birds fly in various environmental conditions, in calm winds or alternatively when pulled by gusts.

Cinematic Apparatus

Of course, in the final analysis, the photographic gun could be aimed not only at animals with wings, but at any living being, covering in principle the whole realm of *zoe* in its crosshairs. Furthermore, the gun initiated the construction of several more elaborate chronophotographic apparatuses, which Marey worked on during the 1880s and 1890s, charting movement on either a single or several plates and covering a wide range of phenomena from the physiology of flight to the gestural economy of manual labor and even to the invisible motion of air currents.⁹

In this sense, there is one word that perhaps best describes the functioning of Marey's chronophotographic method: capture. Or, more precisely, the capture of life in its (potentially) moving image. The apparatuses sought to record traces of the living on the silver-gelatin or other type of emulsion in the purpose of the analysis and simulation of motion as well as measuring the forces that determine movement¹⁰ – a kind of “motion capture.” Life was in Marey's eyes equated with movement. “Motion,” the physiologist wrote, “is the most apparent of the characteristics of life; it manifests itself in all the functions; it is even the essence of several of them.”¹¹ Hence, instead of killing the objects it was targeted at, the photographic gun was to affirm animate life in all its positivity, dynamics, and complexity, which is something arguably different from the phenomenology of traditional photography: not ghosts of the living (as Roland Barthes would have it),¹² but the living itself.

In this respect, the chronophotographic machines that Marey designed and built were much more than mere instruments. It is not only by verbal association that the idea of capturing life resonates with Gilles Deleuze and Félix Guattari's notion of the *apparatus of capture* [*appareil de capture*]. This, bluntly put, points out the different and changing mechanisms by which the activity of living beings becomes abstracted, homogenized, and channeled for capital accumulation.¹³ “Capture” is, for Deleuze and Guattari, a process of bringing together bodies,

things, and persons into specific arrangements or assemblages in order to profit from their productivity. In its many forms, the accumulation of capital implies, in one way or another, the apprehension, according to a certain model of intelligibility, efficiency, and functionality, of living beings into circuits of production and consumption that impose upon them a framework of standardized and stratified ways of being, doing, and making sense.

Marey's gun does indeed come across as an apparatus of capture in this particular sense, geared as it was toward the extraction of forces of the living in the purpose of manipulating and (re)directing them. The gun functioned above all as an epistemic "grid," or better, a *technē* in the sense of practical knowledge and action, that filtered the world in perception through the parameters of quantification, homogenization, and standardization. Rather than being considered aesthetically pleasing, for instance, any kind of movement – running, throwing, flying, walking, jumping, crawling, and so forth, intentional or not – was to be disassembled into and scrutinized in terms of minute spatio-temporal coordinates. Critical here is the way Marey's work resonated with the epistemic dynamics of industrial capitalism and the systematic mechanical control and optimization of life's productive forces exemplified by Taylorism, among other things.¹⁴

What becomes evident in Marey's gun is that, generally speaking, technical devices never simply are what they first seem. In capitalism's indifference to (categorical) difference, and embrace of repetition (under the guise of the constantly new), guns easily become cameras, and vice versa, with the result that inferring the purpose and function of technologies from their apparent uses would simply be a mistake. Any gadget becomes operative and meaningful – acquires agency, if you will – only as part of larger systems of power, knowledge, and action. It is these systems that Michel Foucault called *dispositifs*, often translated into English as *apparatus*. In an interview from 1977, he defined the apparatus quite loosely as a network or "ensemble" that in a given historical moment becomes established between such heterogeneous elements as discourses, institutions, architectural forms, laws, scientific formulas, philosophical and moral propositions, administrative statements as well as technologies.¹⁵ Foucault stressed that "the apparatus itself is the system of relations that can be established between the elements. Secondly, what I am trying to identify [...] is precisely the nature of the connection that can exist between these heterogeneous elements."¹⁶ What, according to Foucault, makes the apparatus distinctive as a network of such heterogeneous and even discordant elements is that it has a "dominant strategic function" in relations of power. An apparatus, Foucault outlined, implements a certain kind of manipulation of forces of life so as to channel them in a desired direction, to block them, or to stabilize and utilize them at a given moment.

Recently, Giorgio Agamben has developed Foucault's apparatus concept by shaping its definition to apply to "literally anything that has in some way the

capacity to capture, orient, determine, intercept, model, control, or secure the gestures, behaviors, opinions, or discourses of living beings.”¹⁷ Here, the apparatus’s meaning as a technique and logic of power becomes evident. Indeed, Agamben has emphasized the etymological connection that Foucault’s notion of *dispositif* (deriving from Latin *dispositio*) has with the word *oikonomia* especially in the sense of “divine economy,” which the word acquired in Christian theological conceptualizations of the divine rule on the earth. Without going into details of Agamben’s analysis, *dispositif* and *oikonomia* both find their semantic core in the notion of government, that is to say, sets of practices, measures, institutions, and bodies of knowledge employed in organizing and controlling the movements, behaviors, and actions of humans and other living beings. Government is not primarily concerned with the sovereign juridical rule of a territory; nor is it primarily concerned with the discipline of bodies and persons. Rather, it is a mode of power that pertains to conducting the movements of active, productive individuals, and their relationships with each other as well as with their material environment.

Agamben even proposes a general ontological partitioning of beings into two groups: on the one hand, living beings, and on the other, apparatuses into which living beings are captured and which seek to govern and guide individuals. Following this line of thinking, Marey’s photographic gun belongs to the latter ontological category concerning the self-replicating mechanisms of power to which life becomes exposed. The gun presents a “cinematic” mode of government in the sense that it seeks to capture, manage, and regulate the movements and energies of the living. It is a biopolitical apparatus of capture in that it, quite simply, contributes to exposing, optimizing, and controlling the forces of life.

Operational Image

The apparatus concept as conceived above prompts us to think of technical devices in terms of governmentality (the administration and management of the activities of living beings), and as becoming operative and meaningful when embedded within larger social, institutional, epistemic, aesthetic, and political arrangements. From this angle, Marey’s photographic gun appears as a biopolitical technology that renders life amenable to government as well as capital accumulation within a particular visual – and indeed cinematic – economy of movement.

Interestingly, the gun thus compels us to approach the genealogy of cinema from an angle that is quite different from the “apparatus theoretical” conceptualizations of the 1970s and 1980s, of the ideological-psychic mechanisms involved in film spectatorship. Jean-Louis Baudry famously articulated cinema as a *dispositif*, referring to film as a technology that generates a particular kind of viewing position with specific psychic effects, as well as to institutionalized film forms that keep on reproducing this type of spectatorial arrangement.¹⁸ Fashionable as

it might nowadays be to debunk such generalizations as essentialist (or something similar), let us just note how Baudry's cinematic apparatus is fundamentally based on the notion of projection and seeks to conceptualize the particular kind of psychic capture and government that the movie machine as a projector of light and shadow, as an optical spectacle, is able to implement. However, Marey's gun shifts the attention from projection to recording, and from the realm of the phenomenological to what lurks beyond the immediate reach of the senses. Government here concerns, not the contents of our dream-like hallucinations, but the modulation of life processes by bringing them into the field of knowledge and intervention.

Marey's gun should perhaps, then, be seen as an early indicator of what "cinema" – understood broadly as a visual economy of movement – is becoming in today's networks of power. It fashioned a mode of vision that outlines and automates intensities and tendencies of movement, aiming at spatialization and calculation; a vision that traces, scans, reorganizes, and abstracts rather than resembles or represents; a vision that turns our lives into statistical "data."¹⁹ Accordingly, one could regard the photographic gun as a precursor for what Harun Farocki has termed "operational images," that is to say, functional images that increasingly define and determine the sphere of everyday life today, from automated CCTV and missiles to computer simulations and industrial robotics.²⁰ In terms of its circles of production and consumption, this imagery does not conform to what is traditionally, either in terms of education, art, politics or entertainment, expected from the "image." Rather than meant to be something to be gazed upon and serving the purpose of instruction, aesthetic pleasure, enjoyment, or even propaganda, it is defined by its functionality. Farocki characterizes operational images as ones that are part of a process, rather than portraying a process. They contribute to the execution of a technical, industrial, military, or some other kind of operation, for instance, calculating and predicting the average paths of consumers, or pattern recognition in machine vision used in assembly lines or in so-called smart bombs.

The photographic gun can be considered part of this trajectory of the development of visual technologies of government – especially those of pattern recognition and motion capture, which concern the calculation of patterns of movement for the purposes of surveillance, for instance. Of course, if captured by today's vision machines, the flight of the anonymous gull would not simply remain a series of more or less distinctive traces on the silver-gelatin emulsion. Its trajectory could be predicted by computer vision; the movements of the bird's wings could be simulated by algorithms; a robotic weapons system could both shoot a video of the gull or shoot it down, making no distinction between a camera and a gun. But the general logic that pierces through both Marey's invention and these contemporary technologies is one of taking charge of living beings by means of images that seek to turn gestures and expressions into quantifiable and calcul-

able data – a logic one could describe, in a word, as biopolitical. The photographic gun from 1882 exposed living beings to measurement and control. In doing so, it foreshadowed our contemporary world of biopolitical screens.

27. Noël Carroll reaches the same conclusions (by using different paradigms) when he dismisses what he calls technological essentialism in his *Philosophy of Mass Art* (Oxford: Clarendon Press, 1998).

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1. On the biopolitics-concept, see Michel Foucault, *The History of Sexuality*, vol. 1: *The Will to Knowledge*, trans. Robert Hurley (London: Penguin, 1998), 135-145.
2. Nadar [Félix Tournachon], "Le nouveau président de la Société Française de Photographie," *Paris-Photographe* 4 (1894): 4, quoted in Marta Braun, *Picturing Time: The Work of Etienne-Jules Marey (1830-1904)* (Chicago: University of Chicago Press, 1992), 5.
3. Étienne-Jules Marey, "Natural History of Organized Bodies," trans. C.A. Alexander, *Annual Report of the Board of Regents of the Smithsonian Institution for 1867* (Washington: Government Printing Office, 1868), 278-304.
4. Étienne-Jules Marey, *Animal Mechanism: A Treatise on Terrestrial and Aerial Locomotion*, 2nd ed. (New York: D. Appleton and Co., 1879), 4.
5. Braun, *Picturing Time*, 16.
6. *Ibid.*, 32-35.
7. Étienne-Jules Marey, "Le fusil photographique," *La Nature* (22 April 1882): 326-330.
8. Jules Janssen, "Présentation du revolver photographique et épreuves obtenues avec cet instrument," *BSFP* 22 (April 1876): 104, quoted in Braun, *Picturing Time*, 55.
9. On the latter, see Georges Didi-Huberman and Laurent Mannoni, *Mouvements de l'air: Etienne-Jules Marey, photographe des fluids* (Paris: Gallimard, 2004).
10. Braun, *Picturing Time*, 136.
11. Marey, *Animal Mechanism*, 27.
12. Roland Barthes, *Camera Lucida: Reflections on Photography*, trans. Richard Howard (New York: Hill and Wang, 1981).
13. Gilles Deleuze and Félix Guattari, *Mille plateaux: Capitalisme et schizophrénie 2* (Paris: Les Editions de Minuit, 1980), 545-560.
14. On Marey and Taylorism, see Braun, *Picturing Time*, 320-348.
15. Michel Foucault, "The Confessions of the Flesh," in *Power/Knowledge: Selected Interviews and Other Writings, 1972-77*, ed. Colin Gordon, trans. Colin Gordon et al. (New York: Pantheon Books, 1980), 194-228.
16. Foucault, "Confessions," 194.
17. Giorgio Agamben, "What Is an Apparatus?," in *What Is an Apparatus? and Other Essays*, trans. David Kishik and Stefan Pedatella (Stanford: Stanford University Press, 2009), 1-24, quotation on p. 14.
18. See Jean-Louis Baudry, "Le dispositif: Approches métapsychologiques de l'impression de réalité," *Communications* 23 (1975): 56-72. For a recent reinterpretation of the concept of *dispositif* in the context of the study of film history, see Frank Kessler, "The Cinema of Attractions as Dispositif," in *The Cinema of Attractions Reloaded*, ed. Wanda Strauven (Amsterdam: Amsterdam University Press, 2006), 57-69. Recently, François Albera and Maria Tortajada have developed the notion of "dispositive," inspired by Foucault's apparatus-concept, in relation to the analysis of view-

- ing positions throughout the history of audiovisual media. Dispositive, for them, addresses the “epistemic schemas” that at given historical and technical arrangements determine the coming together of spectators, machinery and representations. See François Albera and Maria Tortajada, eds, *Cinema beyond Film: Media Epistemology in the Modern Era* (Amsterdam: Amsterdam University Press, 2010).
19. I discuss this mode of vision in more detail in *Mapping the Moving Image: Gesture, Thought and Cinema circa 1900* (Amsterdam: Amsterdam University Press, 2010).
 20. See Harun Farocki, “Influences transversales,” trans. Pierre Rusch, *Trafic* 43 (Autumn 2002): 19-24.

Re-editing as Psychotechnique: Montage and Mediality in Early Soviet Cinema

1. See Yuri Tsivian et al., eds, *Testimoni silenziosi: film russi 1908-1919/Silent Witnesses: Russian Films, 1908-1919* (Pordenone: Edizioni Biblioteca dell'Immagine, 1989).
2. An exception is Walter Benjamin, who mentions Vertov in his Moscow diary of 1927; see Walter Benjamin, “Moskauer Tagebuch,” in *Gesammelte Schriften*, vol. 6 (Frankfurt a.M.: Suhrkamp, 1985), 292-409. An admirable overview of Vertov’s activities in this time can be found in Yuri Tsivian, ed., *Lines of Resistance: Dziga Vertov and the Twenties* (Sacile: Giornate del Cinema Muto, 2004).
3. On Vertov’s travels in Western Europe see Thomas Tode, “Un Soviétique escalade la Tour Eiffel: Dziga Vertov à Paris,” *Cinémathèque* 5 (Spring 1994): 68–85, and Thomas Tode, “Ein Russe projiziert in die Planetariumskuppel. Dsiga Wertows Reise nach Deutschland 1929,” in *Die ungewöhnlichen Abenteuer des Dr. Mabuse im Lande der Bolschewiki*, ed. Oksana Bulgakowa (Berlin: Freunde der Deutschen Kinemathek, 1995), 143–158.
4. Indeed, the recent fascination for Vertov – ranging all the way from Lev Manovich to John MacKay, from Jonathan Beller to Alexander Horwath – might have to do with how his modular-materialist concatenations can be mobilized as a prefiguration and illustration of the digital (or the post-Fordist).
5. See Malte Hagener, *Moving Forward, Looking Back: The European Avant-garde and the Invention of Film Culture, 1919-1939* (Amsterdam: Amsterdam: Amsterdam University Press, 2007), 171-175.
6. A good account of the re-editing practice for home distribution, but also for export is Yuri Tsivian, “The Wise and Wicked Game: Re-editing and Soviet Film Culture of the 1920s,” *Film History* 8, no. 3 (1996): 327–343.
7. On this work see Jekatarina Chochlowa, “Die erste Filmarbeit Sergej Eisensteins. Die Ummontage des ‘Dr. Mabuse, der Spieler’ von Fritz Lang,” in *Eisenstein und Deutschland. Texte – Dokumente – Briefe*, ed. Oksana Bulgakowa (Berlin: Akademie der Künste/Henschel, 1998), 115-122.
8. Tsivian, “The Wise and Wicked Game,” 336.
9. For the FEKS-strategies borrowed from popular culture see Oksana Bulgakowa, “Das Phänomen FEKS: ‘Boulevardisierung’ der Avantgarde,” *Montage/AV* 2, no. 1 (1993): 94–115. On FEKS in general see Ian Christie, and John Gillett, *Futurism/Formalism/FEKS: Eccentrism and Soviet Cinema, 1918-1936* (London: British Film Insti-