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MOTION STUDIES

Air is the generosity of fog.

—Erin Mouré, *Little Theatres*

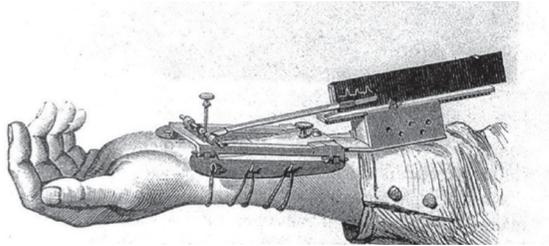
...the way a book can also be a repository of time...

—William Kentridge, *Secondhand Reading*



PART I: THE GRAPHIC METHOD

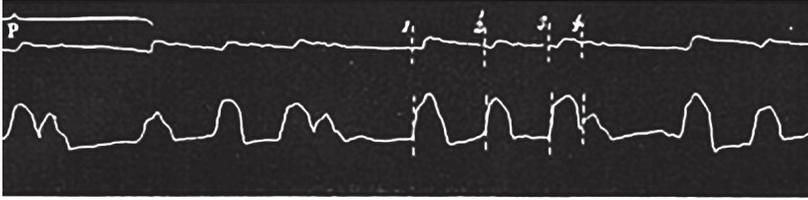
A small action sets off the ones to come. Someone finds a book in a library and is taken with the pictures. “Taken with,” as if an image can take hold of you and move you along. In the corner of each page, at the end of each paragraph, an image slightly different from the last. As the pages turn, stillness becomes animate.



Sphygmograph device, Marey, *La méthode graphique*

The nineteenth-century physiologist Étienne-Jules Marey saw the body as a machine and wanted to understand its mechanics. He created a number of ingenious instruments in order to understand the rules of motion. His first well-known device, invented in 1859, was a graphing tool called a sphygmograph, which measured the rhythms of the blood as it moved through to the heart. An improvement on prototypes recently constructed in Germany, Marey’s version was lighter, portable, and—most significantly—created a readable output. The analyst says come in, sit down.

The sphygmograph worked by pressing one part of a lever against the pulse in the wrist while the other part was connected to a stylus. The stylus traced the pressure of the blood in the artery onto a sheet of carbon. As the blood expanded the artery, the pen moved up; as the artery relaxed, the pen moved down. Reading the heart via the “graphic method” was a matter of translating a text of hills and valleys. I’m kind of nervous when I take tests, says the bird. The analyst says, Please don’t move.



Irregular heartbeat, Marey, *Physiologie Expérimentale*

The device received a prize from the Académie des Sciences and Marey was invited to demonstrate its workings to Napoleon III. At the demonstration, all those present had the pattern of their blood drawn by the device; an irregularity was detected in one of the participants, who died a few days later. Marey's reputation was sealed. Reaction time is a factor in this, so please pay attention and answer as quickly as you can. Sure.



They had struck gold; they'd won the right to be forgotten. The ticket granted them that. All they had to do was sign on the dotted line and then disappear into the sunset, onto the horizon, around the corner, into the mist, over the rainbow, into complete silence.

But for their breath.

The noise of her pulse. Of his.

“The hellish tattoo of the heart” recorded in a line.

They draw a breath and it's made visible,
They have a thought and that's visible as well.

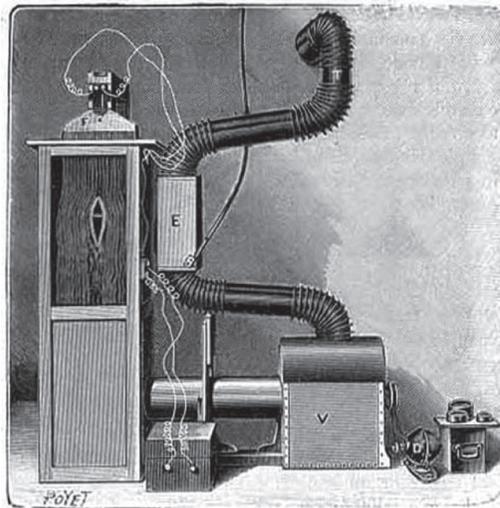
Shallow breath and stealth. Holding breath—

[to ward off the tracker]

[to escape the sensor][the reader]



With the Smithsonian funds, Marey improved upon his last instrument: a smoke machine. An electric fan at the base of the box drew the smoke down in thin streams (“like the strings of a piano”) against a black velvet background. The apparatus allowed Marey to track and record the path of air as it flowed around static objects. Though the objects he used were small (capsule shapes, blades of mica, etc.), they were analogies for the wing shapes of airplanes. A federal investigator has come to observe operations. He offers the bird a stick of gum.



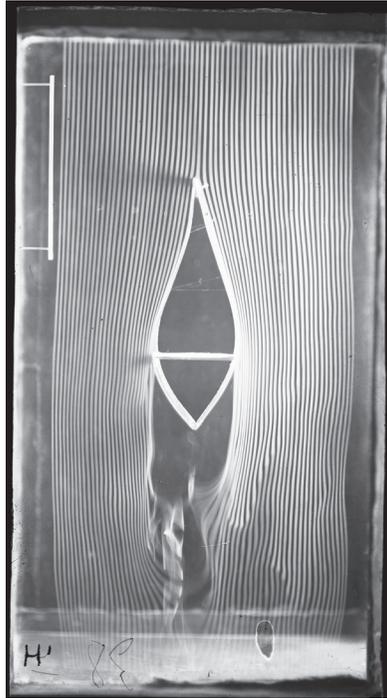
“Les mouvements de l’air étudiés par la chronophotographie,”
Marey, *La Nature*, Sept. 7, 1901

As the smoke trails made contact with the various shapes, they would change course. They wandered, they eddied. Different shapes caused different amounts of drag, made evident by a confusion of smoke, signaling degree of resistance. The shape of the wing defined its conversation with the air. When the confrontation between air and object was lit by the explosion of a magnesium flash, an instant photograph would capture the smoke trails in the acts of deflection and flow. The bird brags to the observer from Justice: Once the Amendment passes, we go national, there’s gonna be nowhere to run.



Movements of air around objects, Marey, Collège de France archive

The photographs were modern extensions of the charts and graphic outputs of Marey's earlier instruments and experiments; the white lines on black backgrounds were a kind of memoir written by the air itself. The photographs are legible, readable as text, ready for analysis. Although Marey called these images chronophotographs, they were stills rather than sequences. However, they captured a continuity flowing around a stasis, and in that way they mapped time. The resulting images were instructions for future aviators about the behavior of air currents. Most of our scrambles are flash events like this one, the bird explains to the observer from Justice. We rarely see anything with premeditation anymore.



Movements of air around objects, Marey, Collège de France archive

The Smithsonian funding for these experiments was cut off after Langley's research resulted in an ill-advised and failed flight. A year later, in 1903 (a year before Marey's death), the Wright brothers finally succeeded where so many had failed. The brothers had studied Marey's *Animal Mechanism* and *Le Vol de Oiseaux* years before. Marey's ideas and instruments had helped them to connect the dots. The bird's boss is on the line and warns that this is no time for a mistake, the nation votes this week. Don't worry, says the bird.



In this procession
they are bits of torn paper

cut-outs in shadow
seen from above
as ribbons of smoke

this helicopter intelligence
these recording birds
of digital revolution

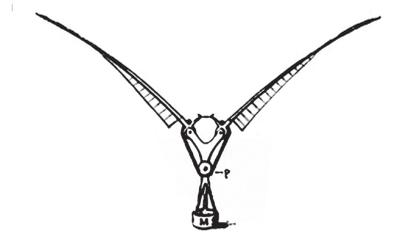
catalog the exhausted paper limbs
the line of bent paper backs
writing the seam

[flip book][to move the reader]
[motion study]



In 1902, two years before his death from liver cancer and too ill to do his own experiments, Marey is reported to have said, “Now I want to watch the others work.” But there are different ways to watch others: an observer can be visible or invisible, a spectator or a spy, a bystander or a voyeur. The caretaker explains to the observer from Justice that through optical tomography of the brain, white light pinpoints can be read; we can see what the writhing detectives see.

Would Marey have been interested in the robotic hummingbird, a nano-sized drone, lightweight and equipped with a video camera? Quiet and maneuverable, it can fly in any direction with its two translucent wings. The soldier, pinned down in the valley, pulls it out of his backpack and lets it flap and fly from his palm, and over the ridge. It can perch on a windowsill or a power line and watch, communicating back what it sees. Early in his career Marey had made a series of mechanical birds—ornihopters—that attempted to replicate the motion of flight. He wrote in *Animal Mechanism*, “We hope that we have proved to the reader that nothing is impossible in the analysis of the movements connected with the flight of the bird: he will no doubt be willing to allow that mechanism can always reproduce a movement, the nature of which has been clearly defined.” It helps if you don’t think of them as human, says the bird to the observer from Justice. They’re pattern recognition filters, nothing more.



Mechanical bird, Marey, *Vol de Oiseaux*