

5. Simmel, "The Metropolis and Mental Life," 14.
6. Simmel, "The Metropolis and Mental Life," 14.
7. Marcuse, *One-Dimensional Man* (1964).
8. For example, see the nineteenth-century Romantic scientist Gothulf Heinrich von Schubert's *Ansichten von der Nachtsseite der Naturwissenschaft* (Views on the Night-Side of Natural Science) (Dresden: Arnold, 1808).
9. This is Maxim Gorky's description upon experiencing the Lumière Cinematographe in July 1896. Richard Taylor and Ian Christie, eds., *The Film Factory: Russian and Soviet Cinema in Documents, 1896–1939* (London: Routledge, 1994), 25–26.
10. Bloch, *The Utopian Function of Art and Literature*, 175.
11. Paul Wegener, from a lecture given on April 24, 1916, at an Easter Monday conference, and printed in Kai Möller, *Paul Wegener* (Hamburg: Rowohlt Verlag, 1954). Quoted in Eisner, *The Haunted Screen*, 33.
12. Benjamin, "Little History of Photography," in *Selected Writings, Volume 2*, 510, 512.
13. Benjamin, "Experience and Poverty," in *Selected Writings, Volume 2*, 734–35.
14. Eisenstein, *Eisenstein on Disney* (1988), 11.
15. Eisenstein, *Eisenstein on Disney* (1988), 24.
16. The phrase *non-indifferent nature* is to be found where Eisenstein found it: in Hegel, in his discussion of chemistry in the *Science of Logic*, where it is crucial to a discussion of motion, transformation, and affinity in natural processes. G. W. F. Hegel, *Science of Logic* (Blackmask Online, 2001), 120–24.
17. Eisenstein, *Non-indifferent Nature*, 27.
18. Eisenstein, *Non-indifferent Nature*, 35–36.
19. See Marx, "The Fetishism of Commodities and the Secret Thereof," in *Capital* (Harmondsworth, UK: Penguin and New Left Review, 1976), 164–65.

2 : : Animating the Instant: The Secret Symmetry between Animation and Photography

TOM GUNNING

The Discontinuous Photography of Continuous Animation

After being marginalized—or outright ignored—animation moved to the center of a new theorization of the moving image brought on by the rise of new media. Pioneers of new media theory such as Lev Manovich promoted animation in opposition to the focus on cinema's links to photography, which was so central to the great film theorists' work that emerged after the silent era: André Bazin, Siegfried Kracauer, Stanley Cavell, and even, in a sense, Walter Benjamin. For Manovich, digital media, with its control over pixels, reveals cinema "as a subgenre of painting," exhibiting a freedom of image creation rather than the supposed indexical enthrallment to reality that photography entails.¹ Valoring animation as the anti-index played an essential role in shifting theoretical focus from a narrow obsession with photography and opened a new exploration of animation as a form, but does placing animation in opposition to photography really provide our best understanding of its nature?

Most film animation actually depends on photography, at least technically, even when photography does not supply animation's imagery. Keeping animation and photography separate seems nearly impossible. The animation theorist Alan Chodolenko claims that "every encounter with film is an encounter with animation—cinema, that is, live action film, included."² This is first of all a technical fact. As David Rodowick has stressed (or any technical description of cinematic animation points out), animating drawings in classical animation involves photographing them onto a filmstrip: "We are mistaken if we use the concept of animation to refer to the hand drawing of sequential images; it refers, rather, to photographing such images frame by frame and producing the illusion of motion by projecting them at a constant rate of movement."³ Rodowick may slightly overstate the case if we consider such devices as

flip-books or zoetropes, but cinematic animation always involves at least a projector and usually a camera. Even animation that employs drawing and painting directly on the filmstrip, often called *cameraless animation* (which has yielded so many extraordinary works by Len Lye, Norman McLaren, Stan Brakhage, Harry Smith, and recently Jodie Mack), commonly involves the making of a projection print through photographic processes. Thus, at the minimum, most animation requires photography as a means of mechanical reproduction. Therefore, animation's relation to the manual (and auratic) aspects of painting (valorized by Manovich) becomes technically mediated. While seemingly only a technical process, this transformation from manual drawing to mechanically produced filmstrip represents a fundamental transformation. By photographing onto the filmstrip, the continuous gestures of the hand employed in drawing or other manual processes are translated into the discontinuous rhythm of the machine.

The technical nature of cinema—producing continuous motion from discontinuous instants (frames)—reveals the common grounding of photography and animation in their control of time, which is what I will call the *manufacture of the instant*. Rather than maintaining the difference between animation and so-called live-action cinema, based in the manual or photographic origins of their images and consequent relation to the indexical, I want to point out not only their common quality as moving images but also their common transformation of time: their creation of the pulse of an instant through the discontinuity of the machine.

Cameraless animation highlights this dialectic relation of the continuous synthesis of movement and the discontinuous parsing of time at the heart of cinematic animation, even in its most “direct” form. In the 1920s the constructivist artist Hans Richter learned that his abstract scroll paintings (which were inspired by the temporal unrolling of the filmstrip—as well as Chinese scroll paintings and musical scores) could not be simply transferred to a filmstrip but had to be subjected to frame-by-frame photography in order to become a projectable film. Filmmakers may ignore or pay close attention to the way the apparatus (at the minimum the filmstrip and the projector, even if a camera is not used in making a print) will process their drawings, paintings, scatchings, or other markings on the actual surface of filmstrips into individual pulses, but they cannot avoid it. The animator Jodie Mack wrote me in response to my question to her about this:

Cameraless animation, free from the constraints of the camera's shutter, can either ignore or embrace the frame-by-frame divisions of the filmstrip imposed by the sprockets. In frame-less animation legato-drawn gestures, sections of pattern, or blades of grass can cover long sections of film producing animation, perhaps unexpectedly, when projected.

Frame-by-frame (staccato?), cameraless animations borrow from the mechanics of cinema to achieve motion through purposeful sequencing of multiple images. A filmmaker could treat one foot of 16mm film as one long canvas or forty tiny individual canvases.⁴

Mack sets up the issue beautifully: the filmstrip viewed as succession of frames yields a staccato rhythm of passing individual instants, which the direct animators can either ignore in their processes, or use to structure their markings on the film. In either case, however, the process of projection (the intermittent frame-by-frame movement and projection through a shutter that are essential to all cinema) will endow the images with a continuity of movement borne of the discontinuity of individual frames (or, at the minimum, the rhythm of the projector shutter). This dialectic of continuous perceptual synthesis of what are technically discontinuous individual frames describes the process of motion in all cinema. Animation arguably makes this *production* of motion more evident.

Animation¹ and Animation²:

Cinematic Motion at Work and Play

This fusion of discontinuous instants, which defines film movement technically, plays a backstage role in our reception of cinema, whose dominant phenomenological effect is the perception of the flow of motion. The perceptual conditions of cinema rest on the fact that we do not, in standard projection, perceive the individual frames. The frame rate of the cinema surpasses a threshold of human perception in order to produce motion and efface our awareness of individual frames. (Some theorists call this the illusion of motion, but I feel that this begs a question. We are not tricked into seeing motion; we perceive it through an encounter between a specially designed machine and the processes of human vision.) But if the still frames become invisible, animated films, from cartoons to experimental work, constantly visualize and act out the process of producing motion. Cartoons from animators like Emil Cohl to Hayao Miyazaki show objects coming to life.⁵ Indeed, the art historian Erwin Panofsky saw this as cartoons' essence: “The very virtue of

the animated cartoon is to animate, that is to say, endow lifeless things with life or living things with a different kind of life. It effects a metamorphosis.⁶ Further, animated films frequently display their own processes by the baring of their devices. From Cohl to Winsor McCay to the Fleischer brothers, animators frequently portray on screen their creation of images and motion, which is a gesture that the historian of animation Don Crafton calls “self-figuration” and claims as emblematic of the animated film (e.g., *Fantasmagorie* [1908], *Little Nemo* [1911], and *Out of the Inkwell* [1918–29]).⁷ In these caprices, animation displays cinema’s otherwise invisible discontinuous frames.

It might be useful to bisect our term *animation* into two related but separable meanings. The first I call animation¹; it refers to the technical production of motion from the rapid succession of discontinuous frames, shared by all cinematic moving images. I define animation² more narrowly, referring to the genre of animation as commonly understood: moving images that have been artificially made to move, rather than movement automatically captured through continuous-motion picture photography. Nonphotographic images are most common in animation², but still photographs can also be animated, as in Norman McLaren’s *Neighbours* (1952) or the collage films of Stan Vanderbeek in the 1950s and 1960s. I would describe animation² as not only displaying but also *playing* with the production of motion of animation¹. I mean by this to invoke the ludic attitude that animation nearly always embraces. But I also reference the more technical meaning of *play* often applied to the muscles of the body or the parts of a machine or device, given in the *Oxford English Dictionary* as “freedom or room for movement; the space in or through which a thing can or does move.”⁸ One could state tautologically that all moving images *move*, but that animation² also *plays* with movement; it directs our attention to the effect of movement and explores its limits, its “room for play,” the freedom of its movement.⁹ Animation² plays with movement with an affect of wonder and draws attention to its own process. Animation² arouses some curiosity about how it is done, though this does not require a thorough technical understanding. Animation² restores to the moving image the sense of wonder at movement that the first projections of moving images occasioned.¹⁰

By foregrounding the process of producing motion, animation² bares the device of the motion-picture camera and projector and returns the vanished discontinuous frames to consciousness. This might be disputed, since our experience of animation¹ most often sweeps us up in a

world of movement, rather than making us speculate on its technology. I argue that the wonder triggered by animation² comes from its pivot from stillness to motion, not simply conceived of as a technical process but experienced as a fundamental manipulation of time, which I call the *production of the instant*. Animation reveals the single frame, the brief increment of time, through the *possibility* of motion, animation’s ability to transform from static image to moving moment, from inanimate picture to animated image. Our core experience of animation² corresponds to the old fantasy of drawings brought to life. We wonder at the motion more than we posit the animation stand, camera, or filmstrip. However, erasing the camera from our understanding of the process not only distorts our technical understanding but also eclipses a full exploration of the wonder we experience at this genesis of motion. Probing animation in relation to the processes of photography actually allows us to more fully grasp the adventure in time and movement that all cinema invites us, as viewers, to join: the technological manipulation of time through the discovery of the instant as the seed of motion.

How does animation² delight us and draw our curiosity to the processes of animation¹, which underlies all cinematic moving images? As Panofsky claimed, wonder at the effect of animation increases with the animation of something otherwise perceived as inanimate (drawings, paintings, geometrical figures, objects, puppets). The process of animation¹ carries an implicit fascination, an element of wonder, which animation² unfolds before us. Therefore, the very playfulness of animation² propels a theoretical project, following both Plato’s and Aristotle’s observations that all theory (*theoria*) begins in *thauma*, the Greek term for “wonder.”¹¹ If theory begins as an affect of astonishment, it develops through curiosity, and the wonder triggered by animation² leads us to consider the nature of time in cinema through the technological production of the instant, the minimal increment of temporality.¹²

I want to use animation²’s devices of defamiliarization to rediscover the processes of cinema, not as a primitive stage of technical development now surpassed in the digital age but as an essential move in the modern technological transformation of time. In this context, rather than opposed to each other, animation and photography both create a novel image and experience of time and movement through technology. Both discover a way to experience the most elusive of the concepts associated with time: the instant. Animation reveals the dynamic nature of the instant through motion, while photography reveals its potential through stillness—but considered together these technological pro-

cesses also reveal that stillness and movement depend on and transform into each other in the production of the instant.

Photography and the Production of the Instant

We experience animation¹ as a visible quality of movement given to images by cinematic devices. This chapter seeks to probe the technical processes that makes this production of movement possible: the succession of individual frames and the parsing of time into instants, frame-by-frame animation, and the creation of an apparatus that presents these manipulations to human vision. Although the experience of movement as the goal of animation¹ can never be forgotten, I want to probe as well its relation to immobility—*not*, as is often done, to expose animation and cinematic movement as an illusion based in our fallible sense of vision (the old myth of the persistence of vision), but rather to remind us of the wonder of the *transformation* that underlies animation: the production of motion through the instant, the metamorphosis of continuity from discontinuous frames.¹³ While the rapid movement of discrete frames through an animation device achieves apparent motion, instantaneous still photography reveals how the seed of motion can be contained in an apparently static instant.

Photography has a long history and cannot be reduced to the recording of an image through optical and chemical means. Photography extends the process of making an image into a representation of time. I will offer a brief sketch of photography's complex and evolving engagement with time, especially the length and control of exposure time and its relation to the instant of movement. An oscillation between stillness and movement (the discovery of one in the heart of the other) shapes this story. As the historian of photography Joel Snyder has observed, rather than producing an image of the world, photographers initially tackled a more technical task, embedded in previous technology: preserving the image produced by a camera obscura.¹⁴ This first era of fixing an image precedes the later period, the production of the instant. The still camera of Nicéphore Niépce, Henry Fox Talbot, and Louis-Jacques-Mandé Daguerre derived from and fundamentally transformed the camera obscura. The ability of a small aperture to project a real image into a dark container (camera obscura) had been observed since antiquity, when it was used primarily for astronomical observations, and perfected since the Renaissance as a way to generate a highly detailed image. But as is

too often forgotten, the camera obscura projected a *moving* image, conveying all the complexity of motion, from staged pantomimes to leaves moving in the breeze.

Talbot, the British inventor of modern photography, after trying to use a camera obscura as an aid to sketching landscapes lamented: "How charming it would be if it were possible to cause these natural images to imprint themselves durably, and remain fixed upon the paper!"¹⁵ The first era of photography sought to fix this image, exploiting the tendency of certain chemicals to darken on exposure to light and then taking on the even more difficult task of arresting this process before the image produced was swallowed in total obscurity. Photography intended to capture these fairy pictures and transform them into material, graspable objects imprinted with still images separable from their apparatuses. The dancing image of the camera obscura had to learn to pose, and time had to learn to stand still. The photographic camera and its product rendered the camera obscura's moving image a static one. The photographic image was fixed in two senses: a frozen image was obtained from the inherent mutability of the camera obscura; and this image in turn was delivered from a progressive darkening, arresting the very chemical process on which photography was founded. These victories over time depended on embalming the moment, eliminating all movement and change. The historian of photography Michel Frizot has even declared that "the whole history of the medium could be described as a race against time."¹⁶

But after this initial victory of fixing the image, another battle with time loomed: reducing the actual period of exposure during which the photochemically sensitive surface within the camera had to be exposed to light in order to form an image. Rather than the monumental immobility and drama of preservation staged in early photographs, this next temporal threshold introduced the discovery of the instant. The early photographic exposures by Niépce in the 1820s took hours to imprint themselves on his chemically treated surfaces. Even as the exposure time was gradually reduced to minutes, photographers still had to limit their subjects to static objects and architecture. The emblematic image of this slow process of photographic exposure is the famous photograph of the Boulevard du Temple that Daguerre took in 1838, in which the normally busy street filled with pedestrians and carriages appears deserted. None of the moving figures that actually thronged this street could leave an impression on the photographic plate, due to the ten min-

utes of exposure time needed to make the image. The exception is the lone figure of a man standing still and having his boots blacked (and possibly the blurred figure of the bootblack as he performs this task) whose relative immobility allowed him to imprint himself.¹⁷

Overcoming this opposition between photography and a mobile world motivated photographic innovation in the nineteenth century. It also opened a new realm of time to human culture. The threshold for the photographing of motion (i.e., for shooting a moving scene without blurring) was set at one-tenth of a second (an instant of time that would take on mythic status in the nineteenth and the early twentieth centuries as the marker of the technical and scientific measurement of time, as Jimena Canales's recent book has described beautifully).¹⁸ As photographers cleared this threshold in the late 1870s, the nature of photography transformed radically, perhaps even fundamentally. Frizot refers to the years from 1880 to 1910 as "the era of instantaneity."¹⁹ Reducing exposure time so that human expression appeared more spontaneous, moving vehicles no longer produced an unsightly blur, and processes of nature, such as a waterfall or ocean waves, could be represented constituted goals that photography inherited from aesthetic ideals of realism (i.e., similarity to human perception) and compositional harmony. But if achieving a reassuring resemblance to normal perception constituted one of the goals of nineteenth-century photography, it also had an unstable relation to technical progress. A combination of factors soon allowed photographers to further reduce speed of exposure to one-hundredth and even one-thousandth of a second, domains of temporality only a machine could measure, beyond (or beneath) human experience. A new realm of time, the temporality of the instant, was opened by such mechanical precision and brevity. Photography made this temporality available to the human experience: The mechanical shutter, surpassing both manual coordination and visual perception, provided, as Frizot puts it, the master key to this new photographic process of brief exposures.²⁰

The rapidly closing shutter literally produces the instant, slicing into the continual flow of time like a guillotine, and both instantaneous photography and early animation devices employ it, in somewhat different manners (arguably the shutter appears in animation devices, such as the phenakistoscope and zoetrope, before it appears in the camera). Due to the relatively insensitive photographic chemicals used before the 1870s, the human gesture of removing and replacing the lens cap had sufficed to determine exposure time. The new emulsion speeds of the era

of instantaneity demanded the mechanization and precision, as well as brevity, of a mechanical shutter.²¹

The shutter opens on an era of technological precision, rather than simple human vision, as human perception becomes redefined through its encounter with technology. As any visual representation would, a photograph can invoke and engage visual perception, but photography can never be simply identified with the act of human perception. Shorter exposure times may eliminate certain technical artifacts that contradict our image of human visual perception (such as blurred outlines or transparent objects), but other startling deviations from human perception appeared in the new instantaneous photographs—bodies floating above the ground, liquids taking on solid forms. Instead of recalling our normal vision, this instantaneous image exceeds it. It is human vision *plus*, an alien vision in which time is stopped or reduced into an unhabitable brevity in which the flow of motion in its physical familiarity is replaced by static poses of an ungainly sort. As Snyder, speaking of Etienne-Jules Marey's chronophotography, said: "Chronophotographs then, can bring us into a domain we cannot see; yet at the same time, they can also show us what we do see, though we cannot warrant having seen apart from the pictorial evidence produced by precision instruments."²² Instantaneous photography revealed a world no human had ever seen. An experience of time beyond the limits of human perception is broached by an optical apparatus.

Rather than simply embalming time, fixing it through a chemically stable image, the new instantaneous photography processed time mechanically—sliced and diced it, if you will. Instantaneous photography developed alongside new modes of temporal measurement in the sciences, where, as Canales demonstrates, the tenth of a second came to mark the limits of the "human factor" (the individual variability in response time) in scientific observation—a factor that only mechanical operations could remove.²³ A new domain of time, the time of the machine, seemed to open by the end of the nineteenth century. To dip beneath the tenth of the second, therefore, overcame the human, all-too-human, aspect of time and inaugurated the regime of mechanical precision. Such an unfamiliar experience of instantaneity belonged as well to new forces of energy, such as electricity, which seemed to surge across space as if it did not exist. Indeed, Eadweard Muybridge announced his instantaneous images in 1877 as "automatic electric photographs," referring to the electrical triggering of the camera shutters.²⁴ This new temporality was systematic, measured and produced by pre-

cision machinery, and could only be expressed by abstract mathematical measurements (what person could discern the difference between one-hundredth of a second and one-thousandth?).

The Instant: Denial of Motion or Its Origin?

Here we encounter an apparent paradox about photography's mastery of motion and a new phase in the oscillation between stillness and movement within the medium. Motion mastered is, at least in a phenomenological sense, motion destroyed. Frizot even speaks of time being murdered by instantaneous photography.²⁵ Apparently bereft of our traditional sense of time and movement, the photograph no longer represented a familiar world. But is this new world truly motionless and timeless, or does it reveal new dimensions of time and new ways to conceive of motion?

Let me trace this new phase in the oscillation of stillness and motion by focusing on one of the earliest and most famous of these unfamiliar images (in addition to being inscribed in film history, since the 1970s it has nearly been an emblem for animation): Muybridge's photograph of a horse in full gallop. This photograph not only revealed all four of a horse's hooves suspended above the ground at the same instant (a fact already established scientifically by Marey's graphic method) but also portrayed the position of those legs in a totally unfamiliar and previously unseen configuration. As is well known, this photograph was initially received with skepticism, if not outright rejection, especially by those whose observation of horses had been most intense: equestrian painters. The positions of the horses' legs in Muybridge's images were considered absurd, ungainly, and impossible. Indeed, Muybridge employed his device, the zoopraxiscope (a retrofitting of a projecting phenakistoscope), to animate his photographs of animal locomotion, in order to prove that these odd positions could be synthesized into a continuous visible movement. At this moment painting and photography dramatically confronted each other with radically different conceptions of the image of movement. One could claim that modern animation emerged from this conflict. Here the limitations of Manovich's alignment of animation with painting as opposed to photography come sharply into focus. Rather than following the alleged freedom of traditional painters, animation drew its inspiration—and its technical process—from the *photographic* visualization of the instant. Animation⁶, however fanciful,

roots itself in analytical instants especially as defined by instantaneous photography.

Even before submitting itself to the lesson of the instant as taught by photography, animation had pursued the parsing of time into brief increments through submitting human vision to the effect of a rapid shutter. In the 1830s scientists such as Michael Faraday and Peter Roget had systematically investigated the temporality of human visual perception using revolving shutter-like devices. In Roget's case these studies directly led to the first device of animation, the phenakistoscope, which used a revolving-shutter effect combined with a series of drawn images that portrayed stages of motion to create a moving image. As Manovich points out, the first devices of image animation predated photography. Although early animation devices are practically simultaneous with the early experiments in photography, the achieving of the instant in photography occurred some decades later. But my story here is not about claiming the precedence of one medium over the other; instead, I stress that both participate in and explore an era of instantaneity.

It may seem perverse to refer to these devices, designed to produce a moving image, as relating to the instant, since my discussion of instantaneous photography has emphasized suspending or freezing motion. Early animation devices such as the phenakistoscope and the zoetrope used the shutter to punctuate the circular succession of images that revolved within their devices, allowing the human eye to seize them as separate images and thus synthesize them into a flow of motion. Certainly the effects of the instantaneous photograph and the early animation devices are different, even opposed. The camera uses the shutter to freeze the motion of the world in order to fix the image of an instant; animation devices, in contrast, spin still images into a continuous flow as the shutter transforms this continuity into a discontinuous presentation of images to the eye, in order to create a single evolving motion rather than a blur. But both processes use their devices to manipulate the temporal aspect of vision and create new temporal regimes of imagery through the manufacture of the instant.

The instant so brief that motion is stilled had been imagined since antiquity, as the speculations of Parmenides and Zeno testify; mathematics and Zeno's concept of the infinite division of time supplied a way to conceive of this paradoxical unit. But the instantaneous photograph and the phenakistoscope are not concepts; as devices they do things, and they do them in relation to human perception. Logic opposes con-

cepts, whereas perception transforms one into the other. Instantaneous photography supplied an image of a time beyond ordinary human reach, now captured through technology. The instantaneous photograph opened the way to experiencing the realm of the tenth of the second, the new microtemporality in which modern technology operates at an ever-accelerating pace beyond immediate human experience, yet arguably made visible to us through new media (through, as Snyder put it, “pictorial evidence produced by precision instruments”) even as it reshapes human life and culture.

The modern instant as visualized in both photography and animation devices differs from the concept found in ancient philosophy. While the conceptual instant of antiquity in the Parmenidean tradition might have excluded motion, the instant of instantaneous photography does so only in a most literal fashion. The instantaneous photograph is an image, not an abstraction, and its relation to motion depends on its imagery. It is as revolutionary in its relation to imagery as it is to time. The traditional static image of painting since the Renaissance strove after a self-contained autonomy, an aesthetic coherence, while the frozen image of instantaneous photography struck observers as ugly, unaesthetic, and uncanny due to its incomplete and restless nature (a claim often made at the time about impressionist painting as well). Although still and frozen, these photographs invoke motion as much as they deny it. Their visualizing of an apparent defiance of gravity, the strain of outstretched limbs and the suspended trajectory of drops of water or tossed balls, displays movement in a more radical manner than had baroque or impressionist painting. These images hardly portray a Parmenidean eternity of total oneness. Rather, they present an often unbearably incomplete moment, filled with potential movement, an instant torn from an un- seen (but imagined) continuity whose contours they evoke almost painfully. The neuroscientist Thierry Pozzo, writing on the effect of Marey’s images, evokes Theodor Lipps’s concept of empathy, in which the viewer seems to experience the physical sensation that he or she witnesses in a performer or image.²⁶ This empathetic sense of kinesthesia renders the frozen positions of the instantaneous image as more of a cramp begging to be relieved than a timeless moment. I believe it is nearly impossible to see an instantaneous photograph of motion without continuing the frozen motion in our imagination. These instant images practically demand animation.¹

Historically speaking, instantaneous photography’s impulse toward motion becomes most visible in chronophotography.²⁷ It is not simply

the positions of Muybridge’s and Marey’s mobile subjects that summon up motion; their placement within a continuous series of images do so as well. Images in series demonstrate the profound relation between practices of instantaneous photography and early animation devices. Phenakistoscope disks or the strips drawn for zoetropes and praxinoscopes also presented a series of still images in stages of motion. Still images serving as sections of motion are designed for these animation devices (which first emerged in the 1830s, an era when photographic exposure remained far from brief). However, these drawn representations of stages of motion remained necessarily speculative reconstructions and record no actual temporal relations. Their primary purpose was not the analysis of motion but the mechanical production of a moving image. The individually drawn image had little significance outside of its role in the mobile device.

Instantaneous photography and chronophotography do not imagine speculative segments but actually record an instant (or a series of instants), rendered visible by abstraction from the flux of time. We see in these images not a conception of the stages of motion but rather an image of the material form that bodies take in a specific instant of time. The chronophotography of the late nineteenth century invokes and invites animation¹ not only because the arrangement of images within a series clearly portrays the trajectory of movement but also because the series both follows and breaks down an action in strict temporal order. While animation² certainly aims at the reconstitution of movement, it fascinates us because we seem to see movement take place before our eyes. Animation² reproduces motion and also displays its origin, its birth, so to speak, the emergence of motion out of stillness, of continuity out of discontinuity.

Philosophical Dilemma, Visual Resolution

I will resist wandering too far into the philosophy of time and try to remain focused on the technical production of a temporal image rather than speculating on the nature of time itself, with its notorious aporia. (As Augustine beautifully put it in *Confessions*: “What then is time? I know what it is if no one asks me what it is; but if I want to explain it to someone who has asked me, I find that I do not know.”)²⁸ The ambiguous term I have used throughout this chapter, the *instant*, remains crucial to both philosophical debates and the new image of time that instantaneous photography and animation offer. But I differentiate between

these meanings. Within philosophy, the instant has primarily been conceived of as a unit of time, expressing a view of time as discontinuous and successive.²⁹ For Parmenides and his student Zeno, time is indivisible, and consequently change and motion are impossible, philosophically speaking. Plato posited a distinction between a transcendent timeless realm and a mutable world as a means of overcoming the immobility of Parmenides's system. Robin Durie asserts that the instant arises in Plato's system as a means of explaining change and the passing of time.³⁰ In his dialogue *Parmenides*, Plato writes: "There is no change from rest while resting, nor from motion while moving; but this instant, a strange nature, is something inserted between motion and rest and it is no time at all; but into it and from it what is moved changes to being at rest, and what is at rest to being moved."³¹ Aristotle, in contrast, sees time as fundamentally continuous and claims that conceiving of time as an accumulation of discrete instants is incoherent. In place of instants, Aristotle finds the essence of time in the "now," which expresses the inherent continuity of time in the process of change and movement.³² Time is not inherently made of discrete instants; instead, its continuity is potentially divisible. The concept of *potentiality* determines for Aristotle both the continuous nature of time and allows its passing. Rather than a discrete unit, the now functions both to divide and connect time, like a point in a line. Time is related to motion, stretching into the future, which defines its potentiality.

The philosophy of time recurrently encounters this dilemma. How can we imagine the dividing of time in such a way that its continuity and passing are not denied or rendered impossible? Does dividing up time stop it in its tracks? Inversely, does seeing time as simply continuous betray our sense that time changes radically, that it produces novelty, not just an endless succession of the same? This dilemma seems to recur in the modern era, whether as Henri Bergson's championing of duration versus Gaston Bachelard's valorization of the instant, or Alain Badiou's promotion of the event over Gilles Deleuze's defense of Bergson's duration.³³ I am interested in the issues that these controversies articulate more than adjudicating the contest (which I could never do).

The alternative models of time as a succession of discrete instants or as a pure continuity may seem to parallel the opposition between the frozen image produced by instantaneous photography (or its succession in the chronophotographic series) and the continuously moving image produced by animation devices, including the cinema. But this

comparison seems to me to dissolve the opposition between models of time rather than heighten it. The instantaneous photograph may seem to embody the instant as a discrete unit of time and action, while the moving image expresses the continuity of duration. But a close examination of the technology of these images reveals that each seems to derive its effect from the other. Within its stillness the images of instantaneous photography strain toward the portrayal of motion. On the other hand, animation devices all employ still images that, when the device is operated, yield a perception of movement. In Aristotelian fashion, animation¹ demonstrates the potential of motion in stillness (and vice versa). In Plato's view, the instantaneous photograph possesses a "strange nature" in which "what is moved changes to being at rest, and what is at rest to being moved." Animation (both definitions) does not exist simply in the appearance of motion; animation is in the transformation of stillness into motion. It is this potential that one senses within the tenuous stasis of the instantaneous image; it is this transformation that produces the wonder of animated movement, Panofsky's metamorphosis.

Thus, the understanding of the instant that I propose here does not resemble a discrete unit of time, which somehow paradoxically adds up to motion and the flow of time. The instant embodies the potential to move between the regimes of stillness and motion. I am not sure that this statement is philosophically coherent, yet it describes our experience of both the instantaneous photograph, which may murder time but cannot deny it, and the perceptual experience of animation that resurrects time from its grave of immobility. I do not argue that these images reveal to us the true nature of time, but I would maintain that they produce experiences of the instant that avoid viewing time as inertly static. These images visualize the instant's inherence in motion and time, either by artificially abstracting it from that flow or by mechanically producing that flow. The suspended gestures and actions of the instantaneous photograph complement the moment when the static images passing through an animation device become a moving image. Each process engages with our experience of time and motion in a defamiliarizing manner. Rather than simply conceived of as reproductions of motion, both instantaneous still photography and motion picture cinematography play with our perception of motion in order to produce the instant as a wonder.

Notes

For Jodie Mack, *sprite of motion*.

1. Manovich, *The Language of New Media*, 295.
2. Cholodenko, "The Animation of Cinema," 1. Likewise, Giannalberto Bendazzi, in the standard reference source on animation, states: "A precise separation between animation and other media is not easily identifiable." Bendazzi, *Cartoons*, xvi.
3. Rodowick, *The Virtual Life of Film*, 121. See also the definition of *animated cartoon* from *The American Heritage Dictionary of the English Language* (fourth edition): "A motion picture or television film consisting of a photographed series of drawings, objects, or computer graphics that simulates motion by recording very slight, continuous changes in the images, frame by frame."
4. E-mail from Jodie Mack to Tom Gunning, June 8, 2012.
5. Lynda Nead has brilliantly explored this theme, especially in relation to drawing and painting coming to life in early trick films, in her book *The Haunted Gallery*.
6. Panofsky, "Style and Medium in Motion Pictures," 160.
7. Crafton, *Before Mickey* (1982), 11, 347.
8. *Oxford English Dictionary*, s.v. "play," accessed June 22, 2012, <http://www.oed.com/>.
9. I am referencing here the late Miriam Hansen's brilliant explication in her book *Cinema and Experience* of the German term *Spielraum*, as used by Walter Benjamin (see esp. 192–94).
10. See the description of first projections of Lumière films by O. Winter (reprinted in Harding and Popple, *In the Kingdom of Shadows*, 13) and Maxim Gorky (reprinted in Leyda, *Kino*, 407–8).
11. In *Theaetetus* Plato argues that wonder is the beginning of philosophy (155d), while in the *Metaphysics*, Aristotle says that wonder is the source of theory (982b12–13). My understanding of thauma is indebted to the brilliant discussion by Richard Neer in his work *The Emergence of the Classical Style in Greek Sculpture*, 57–68.
12. Colin Williamson, in his excellent dissertation, "Watching Closely with Turn-of-the-Century Eyes" (2013), in the Department of Cinema and Media Studies at the University of Chicago, discusses the close relation of animation with magic and wonder and also the role that wonder plays in provoking curiosity in Enlightenment projects of education, especially René Descartes's account of wonder in *The Passions of the Soul* (1649).
13. For the best concise account of this theory, see Anderson and Anderson, "The Myth of Persistence of Vision Revisited." For my critique of this theory's application to animation devices, see Gunning, "The Play between Still and Moving Images."
14. Snyder, "Visualization and Visibility," 392.
15. Coe, *The Birth of Photography*, 32.
16. Fritot, *Le temps d'un mouvement*, 7.
17. See Snyder, "Visualization and Visibility," 392, as well as the fascinating blog entry on this photograph by Nicholas Jenkins of Stanford University, "Traces," *Day by Day: A Blog*, August 22, 2007, accessed June 22, 2012, <http://www.stanford.edu/~njenkins/archives/2007/08/traces.html>.
18. Canales, *A Tenth of a Second*.
19. Fritot, *Le temps d'un mouvement*, 9.
20. Fritot, *Etienne-Jules Marey chronophotographie*, 70.
21. See accounts of instantaneous photography in M. Braun, *Picturing Time*; Fritot, *Le temps d'un mouvement*; Prodder, *Time Stands Still*; and Snyder, "Visualization and Visibility," as well as the recent book by Josh Ellenbogen, *Reasoned and Unreasoned Images*. I have also treated these issues before; see Gunning "Never Seen This Picture Before: Muylbridge in Multiplicity"; and Gunning, "New Thresholds of Vision."
22. Snyder, "Visualization and Visibility," 394.
23. Canales, *A Tenth of a Second*, 21–58.
24. Fritot, *Etienne-Jules Marey chronophotographie*, 237.
25. Fritot, *Le temps d'un mouvement*, 13.
26. Pozzo, "La chronophotographie scientifique," 18, 20.
27. Chronophotography produces instantaneous photographs in a temporally regular succession in order to chart a motion through a series of images. Thus, Fritot quotes the official definition of chronophotography from the 1889 International Photographic Congress: "Production of successive photographic images taken at precisely measured intervals of time." *Etienne-Jules Marey chronophotographie*, 233.
28. Augustine, *Confessions*, book 11, chapter 14, 267.
29. See the excellent anthology of essays collected in Durie, *Time and the Instant*.
30. Durie, "The Strange Nature of the Instant," in *Time and the Instant*, 9–11.
31. Plato, *Parmenides*, 156d–e; quoted in Durie, "The Strange Nature of the Instant," in *Time and the Instant*, 11.
32. Aristotle, *Physics*, especially chapter IV, 217–20 (*The Basic Works of Aristotle*, 288–94).
33. See especially these essays in Durie, *Time and the Instant*: Gaston Bachelard, "The Instant," 64–95; Durie, "The Strange Nature of the Instant," 9–11; Keith Ansell Pearson, "Duration and Evolution: Bergson contra Dennett and Bachelard," 144–76; and David Webb, "The Complexity of the Instant: Bachelard, Levi-nas, Lucretius," 190–216.