

MODERN TIME: PHOTOGRAPHY AND TEMPORALITY

by

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A dissertation submitted to the Graduate Faculty in Art History
in partial fulfillment of the requirements for the degree of
Doctor of Philosophy, the City University of New York

2010

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This manuscript has been read and accepted for the
Graduate Faculty in Art History in satisfaction of the
dissertation requirements for the degree of Doctor of Philosophy.

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Abstract

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This dissertation explores the fluid relationship of photography to time. Many theorists have noted that photography has a distinctive manner of representing temporality. Roland Barthes, for example, wrote that the photograph has a peculiar capacity to represent the past in the present, and thus to imply the passing of time in general.¹ As a consequence, Barthes argued, all photographs speak of the inevitability of our own death in the future. Moreover, he linked photography's peculiar temporality to its capacity for a certain kind of realism: "false on the level of perception, true on the level of time."² Barthes's analysis poses a challenge to all commentators on photography – what exactly is photography's relationship to time, and by extension, to reality?

This dissertation addresses that two-part question by analyzing in detail a sample of understudied vernacular photographic practices. Rather than provide a comprehensive, and necessarily incomplete, study of every possible way in which photography can relate to time, this study instead focuses on a number of in-depth

¹ Roland Barthes, *Camera Lucida* (New York: Hill and Wang, 1981).

² *Ibid*, 115.

analyses of specific photographic practices. These practices represent time in at least three distinct ways: as narrative time, device-altered time, and composite time.

My study examines the motivations for photography's insistent struggle to reorganize time's passage, to freeze or slow it for a moment, or to give form to time's fluctuating conditions. I suggest that this struggle is both symptomatic of modernity as a general phenomenon and a manifestation of the photographic medium's conditional relationship to reality, a relationship which arguably has been complicated by the use of digital technology. This dissertation examines photography's unique capacity to represent the passage of time with a degree of elasticity, simultaneity, and abstraction. The medium's ability to represent many levels of temporal experience and indexical slippage, I argue, illustrates photography's potential to relate to and reflect the complexities of modern consciousness. This dissertation also exemplifies the need for a new kind of history – one that addresses the multiple identities of “the photographic” rather than simply “the photograph.” This work is a contribution to that project.

Acknowledgements

This dissertation would not have been possible without the assistance, encouragement and inspiration of others.

For challenging and guiding my thinking – and always helping me to push it further – I wish to extend my thanks to my dissertation advisor and mentor Geoffrey Batchen. Many of the doors he has opened in photography discourse have allowed my generation of scholars much more possibility. And I thank him for that, too. I also thank my readers, especially Katherine Manthorne, for offering valuable insights that helped me make this project better.

Some other individuals who have generously shared their thoughts and research with me along the way include: Andrew Davidhazy, Jerry O’Neill, Tania Ruiz Gutierrez, Don Morehouse, Mac McBride, William L. Stefanov and his colleagues in the Image Science and Analysis department of the National Aeronautics and Space Administration, and my own Graduate Center colleagues, Damon Stanek and Kirsten Jensen. Many thanks go to Cathy Schenck of the Keeneland Library for her assistance with my research on the racing Photo Finish.

On a personal note, I am grateful to my parents, Bill and Jane Belden for their help in making the completion of this project possible. And finally, I thank my husband John Adams for his unconditional emotional and intellectual support, his patience, his relentless belief in me, and for his encouragement through the *durée*.

This dissertation is dedicated to Lily. Her experiences with space and time will surpass mine.

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Chapter One: Picturing ‘Modern Time’

Who shall hold [time], and fix it, that it be settled awhile,
and awhile catch the glory of that everfixed Eternity, and compare it
with the times which are never fixed, and see that it cannot be compared.
– St. Augustine of Hippo³

The most transitory of things, a shadow, the proverbial emblem
of all that is fleeting and momentary, may be fettered by the spells
of our ‘natural magic,’ and may be fixed forever in the position
which it seemed only destined for a single instant to occupy.
– William Henry Fox Talbot⁴

Many scholars tend to discuss photography’s expression of time as if it is singular and coherent. It is neither. Photography, as the product, embodiment and faithful servant of a complex and variegated modernity, is equally variously temporally stratified. This dissertation seeks to prove this proposition by analyzing in detail a range of understudied yet ubiquitous photographic practices which represent distinct and different experiences of time: fin-de-siècle family portraiture, racing Photo Finishes, and the National Aeronautics and Space Administration’s digital composite whole-Earth images. These objects have been

³ In this section of text, St. Augustine argues that only God is beyond time and is capable of understanding its complex operations. St. Augustine of Hippo, *Confessions* (397-398 C.E.), in Albert C. Outler, trans./ed., *Augustine: Confessions* (Dallas: Southern Methodist University Press, 1955), Book XI, Chapter XI, Section XIII.

⁴ Talbot makes reference to the “natural magic” of his early photographic experiments, which he also called “the art of fixing a shadow”: William Henry Fox Talbot, “Some Account of the Art of Photographic Drawing, Or, the Process by Which Natural Objects May Be Made to Delineate Themselves without the Aid of the Artist's Pencil” (1839), in *Photography: Essays and Images*, ed. Beaumont Newhall (New York: The Museum of Modern Art, 1980), 25.

purposefully selected as case studies for their capacity to widen the scope of our existing histories, and to result in a more nuanced, fittingly complex articulation of photographic time. Moreover, these images enable the further interrogation of the distinct character of temporal anxieties prevalent in the 1890s, 1930s, and in the digital age, and offer a partial survey of this period. This dissertation will argue for a new kind of history, one that addresses multiple photography-induced temporalities and expressions of time. It therefore contributes to an expanded identity for “the photographic,” rather than simply providing another account of a monolithic entity too simply called “the photograph.”

I. The Multiplicitous Temporal Experience

Although we use the word frequently, “time” is a difficult entity to define.

St. Augustine of Hippo mused about the challenge of this task in his book

Confessions:

For what is time? Who can readily and briefly explain this? Who can even in thought comprehend it, so as to utter a word about it? But what in discourse do we mention more familiarly and knowingly, than time? And, we understand, when we speak of it; we understand also, when we hear it spoken of by another. What then is time? If no one asks me, I know: if I wish to explain it to one who asketh, I know not.⁵

As St. Augustine suggests, time is deeply familiar, yet confounding in its complexity and in the diversity of its experience. It is real, and its effects can be felt. Time’s passage alters the human body and calibrates human biological

⁵ St. Augustine, *Confessions*, Book XI, Chapter XIV, Section XVII.

rhythms, such as the heartbeat, circadian sleep rhythms, life-span awareness, and the child-bearing “biological clock.”⁶ Yet these temporal cadences each have distinct and differing intervals, and are highly variable in duration from person to person. Thus, while the evidence of time’s passage is palpable, time itself is an intangible, abstract entity that is individually and subjectively experienced.

Biologically destined to be temporal creatures, humans have consistently sought to understand time through orienting themselves with respect to broader schematic ordering systems.⁷ The charting of the seasonal time in agrarian cultures ensures the successful cultivation of a food source, for instance, while also indicating the accommodation of sophisticated, abstract conceptions of time’s operations as simultaneously cyclical and linear. British social anthropologist Jack Goody additionally suggests that four temporal operations appear in even the earliest temporal mapping systems, albeit with different emphases: sequence, duration, cyclical schema, and a linear progression of patterns of causality.⁸ Underlying these efforts to come to terms with, and perhaps even master, time’s fluctuating conditions is the recognition of time’s contradictory, complex and multifarious nature.

⁶ Joost A. M. Merloo, *Along the Fourth Dimension: Man's Sense of Time and History* (New York: John Day Company, 1970), 62.

⁷ Ibid.

⁸ Jack Goody, “Time: Social Organization” (1968), in D. L. Sills, ed., *International Encyclopedia of Social Sciences*, Vol. 16 (New York: Macmillan, 1968), 31.

In addition, humans strove to give the nebulous, abstract entity of time a numerically quantifiable form by creating calendars, clocks and geological and evolutionary time scales.⁹ However, while these systems of managing time's passage give structure to the human temporal experience, these various schemata often conflict with the durations of the natural and astrological phenomena they measure.¹⁰ For example, the solar year is longer than the Gregorian calendar year – the standard in Western cultures – by one-fourth of a day, a conundrum which was solved by adding a “leap year” day, February 29, every four years. As Umberto Eco points out, the “leap year” day is seemingly arbitrarily omitted every one-hundred years, but it is restored once every four-hundred years at turn of century.¹¹ Despite these efforts to realign the calendar, it still “loses” 25.96768

⁹ To add further complication, different historical disciplines have varied conceptions of time which diverge from the time of the human life span, and thus become abstractions in comparison to biological time. Stephen J. Gould writes that in geological time, “7,000 years is the blink of an eye”: Stephen Jay Gould, *Conversations About the End of Time*, trans. Ian Maclean and Roger Pearson (New York: Fromm International, 2000), 18. Similarly, Charles Darwin's 1859 book *On the Origin of the Species* introduced an extended conception of human “evolutionary time”: Charles R. Darwin, *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life* (London: John Murray, Albemarle Street, 1859). Elizabeth Grosz argues that Darwin's theories – in addition to those of his contemporary Friedrich Nietzsche and by later theorists such as Henri Bergson and Gilles Deleuze – contributed to the “modern” conception of time as arbitrary, open-ended, and as a chaotic “force which builds, transforms, contains, binds all relations – whether natural, cultural or personal.” Elizabeth Grosz, *Becomings: Explorations in Time, Memory, and Futures* (Ithaca and London: Cornell University Press, 1999), 3-5.

¹⁰ For a comprehensive history of time's measurement, see: Daniel J. Boorstin, *The Discoverers* (New York: Random House, 1983), 5-46.; Paul Bennett, *The History of Time* (Kent: Ticktock Publishing Ltd., 1999). These units of measuring time have been divided and subdivided, from century to decade, year to month, week to day, hour to second, microsecond, to picoseconds (one one-millionth of a second). The practice of creating ever smaller units of labeled (and therefore, *defined*) time has reduced these units to near-intangible abstractions, such as the picoseconds.

¹¹ In the year 2000, the “leap year” was omitted for the second instance since the Gregorian calendar was adopted in 1582. For more about the arbitrary nature of time's measures, see: Stephen Jay Gould, Umberto Eco, Jean-Claude Carriere and Jean Delumeau, *Conversations About*

seconds per true solar year, and has become misaligned from astronomical patterns by two hours, fifty-nine minutes, and twelve seconds since its introduction in 1582.¹² This “lost” time, Eco argues, reveals the flawed nature of calendar time’s charting of natural phenomena such as astronomical and biological time.¹³

The divergence of quantified time from its various bodily experiences was further accentuated by the institutionalization of standardized “clock time” by British railroad companies in 1847. It spread to New Zealand, Australia, the mainland of Europe and the United States of America by the end of the century – and was soon followed by the imposition of world time zones.¹⁴ Although the

the End of Time, trans. Ian Maclean and Roger Pearson (New York: Fromm International, 2000), 3.

¹² Jan Schall, *Tempus Fugit: Time Flies* (Kansas City: Nelson-Atkins Museum of Art, 2000), ii.

¹³ Umberto Eco explains the shortfall of our measuring systems: “The problem, you see, is that nature doesn’t produce regular astronomical patterns of the sort that would allow us to create simple numerical cycles.” Eco is quoted in: Gould, et al., *Conversations About the End of Time*, 4.

¹⁴ The phrase “annihilation of space and time” was commonly used to refer to the effect of rail travel and the telegraph. On September 15, 1830, the day that the first passenger train line opened – with her aboard – actress Fanny Kemble marveled at the unprecedented speed with which the train covered the landscape. She commented that her mother was “frightened to death” to ride the train, considering it “a situation which appeared to her to threaten with instant annihilation herself and all her traveling companions.” Fanny Kemble is quoted in” Rebecca Solnit, *River of Shadows: Eadweard Muybridge and the Technological Wild West* (Middlesex, England: Viking Penguin, 2003), 9. This phrase also appeared in reference to the passenger train in magazines such as the *Quarterly Review* as early as 1839: Dorthe Gert Simonsen, “Accelerating Modernity: Time-Space Compression in the Wake of the Aeroplane,” *The Journal of Transport History*, Vol. 26, No. 2 (2005): 101-102. That year, Ulysses S. Grant also recalled with amazement a trip he had made by rail that same year: “We traveled at least eighteen miles per hour when at full speed, and made the whole distance averaging as much as twelve miles an hour. This seemed like annihilating space.” Grant is quoted in: Solnit, *River of Shadows*, 9.; *The Baltimore Patriot* is quoted in: Merritt Ierley, *Wondrous Contrivances: Technology at the Threshold* (New York: Clarkson Potter Publishers, 2002), 5. Similar comments appeared in the *Baltimore Patriot* on the day after Samuel F. B. Morse’s 1844 demonstration of the “Electro Magnetic Telegraph” at the United States Capitol. An article declared Morse’s invention a “truly astonishing contrivance” that offered “the annihilation of space.” *Ibid*, 5. Ralph Waldo Emerson similarly wrote of the railroad’s “annihilation” of

human body has a built-in, twenty-five-hour-long “clock” – or “circadian rhythm” – which controls our patterns of waking and sleeping, the clock is based on a twenty-four-hour day.¹⁵ In other words, biologically, the human body is asynchronous with the rest-and-work cycle proposed by the synthetic system of “clock time” by *one hour each day*. The cadence of life prior to the institution of a uniform regimented “clock time” was synchronized to astronomical cycles of daylight and darkness. As technology historian Merritt Ierley suggests:

Before the era of the railroads, the ‘correct’ time was almost anything approximating the hour of the day. In small towns and villages, and especially in the country, one’s daily events were scheduled by the sun. ...Most activities – working, farming, doing household chores – were not dependent on starting and stopping at a certain time. And an activity that was so dictated – say, going to church – could be time-coordinated for all involved by the ringing of a bell.¹⁶

Yet even in a pre-“clock time” age, the human body’s innate “biological time” differed by approximately one hour from the duration of an astronomical day, or the time it takes for the Earth to make a complete rotation.¹⁷ And to add further complication, the length of a day also varies according to one’s location on the Earth and to variations in speed of the planet’s rotation.

distance, but worried that such a thing might bring the death of regional cultures. Solnit, *River of Shadows*, 10-11.

¹⁵ Bennett, *The History of Time*, 4.

¹⁶ Ierley, *Wondrous Contrivances*, 29.

¹⁷ According to the United States Naval Observatory, the unit of measure of the length of the Julian day is 86,400 SI (Système International) seconds, or 24 hours. It is an approximation, for the purposes of regularizing the system. The book this body publishes is considered the definitive handbook for aligning and adjusting clock time with regard to astronomical time: The United States Nautical Almanac Office and Her Majesty’s Nautical Almanac Office, *The Astronomical Almanac* (Washington, London and Greenwich: United States Naval Observatory and the United Kingdom Hydrographic Office, 2008).

Given these variables in defining and quantifying time, some commentators have even suggested that time's experience is a social or cultural construct. As such, it has been argued that time is an ordering mechanism, rather than a natural condition.¹⁸ Sociologists and anthropologists, including Émile Durkheim, have argued that additional temporal dimensions – including ritual time, work time, social time, historical time, and geological/evolutionary times – reveal the human experience of time to be infinitely variegated. And even though the Gregorian calendar remains the *de facto* world time-measuring standard, different cultures recognize varying time-measurement systems (such as the fiscal, academic, Mayan, Islamic, Persian, Hindu, Thai, Ethiopian, Chinese, Hebrew and Buddhist calendars).¹⁹

Other commentators have argued that the terms typically used to describe and spatialize one's position in linear time – *past*, *present* and *future* – are themselves unfixed and often inadequate. Eco, for instance, argues that time only

¹⁸ Émile Durkheim is recognized as the original source of the theory that time is a social construct: Émile Durkheim, "Sociology of Knowledge," in *Émile Durkheim: Selected Writings*, Anthony Gibbons, ed. (Cambridge: Cambridge University Press, 1972), 250-268. For an overview of the discussion of time as a social/cultural construct within the discipline of sociology, see: Barbara Adam, *Time in Social Theory* (Philadelphia: Temple University Press, 1990).; Diane O. Hughes and Thomas R. Trautmann, eds. *Time: Histories and Ethnologies* (Ann Arbor: University of Michigan Press, 1995).; Michael A. Katovich, "Durkheim's Macrofoundations of Time: An Assessment and Critique," *The Sociological Quarterly*, Vol. 28, No. 3 (1987): 367-385.

¹⁹ The year 2000 is also the year 1997, according to the year of Christ's actual birth (c. 4 B.C.E.). It also is the year 2753, according to the old Roman calendar; 5760, according to the Jewish calendar; 1420, according to the Muslim calendar; 2544, according to the Buddhist calendar; 5119, according to the great Maya cycle; and 208, according to the calendar of the French Revolution. Schall, *Tempus Fugit*, iv. For more information about the history of the evolution of these various calendars, see: E. G. Richards, *Mapping Time, the Calendar and its History* (Oxford: Oxford University Press, 1998).

exists as *past* tense. He suggests that our awareness of *the present* is actually of events that have *passed* (and therefore already are in *the past*).²⁰ Eco further argues that we have no experience with which we can attest to the existence of *the future*.²¹ And in the 1927 book *Being and Time*, the German philosopher Martin Heidegger suggested an alternative to the conception of time as existing as successive phases of the past, present, and future. He argued that the past impresses itself upon the present, which is shaped by expectations of future events. Thus, interpenetrating tenses of past, present, and future inform each other and create the temporal dimension of human existence.²² This convoluted experience of time, Heidegger argues, comprises our very state of *being*.

Henri Bergson suggested in his essay *Time and Free Will: An Essay on the Immediate Data of Consciousness* that time's nature is rooted in its subjectivity, and lies beyond the capacity of understanding offered by systemized, mathematical management. He postulated that "lived time" is experienced as *la durée* (duration), and it "is psychological in its nature and psychological in its order. ... [and] is non-quantitative, and therefore non-measurable and indivisible."²³

Bergson's theory of temporal contingency gained scientific affirmation in the theories of Relativity offered by Albert Einstein, which proved that the hands of

²⁰ Umberto Eco, "Times," in *The Story of Time* (London: Merrell Holberton, 1999), 10-15.

²¹ Ibid.

²² Martin Heidegger, *Being and Time* (1927), trans. Joan Stambaugh (Albany: State University of New York Press, 1996).

²³ Henri Bergson, *Time and Free Will: An Essay on the Immediate Data of Consciousness*, trans. F. L. Pogson (London: George Allen and Unwin, 1910), 105-106, 115-116, 120-121.

clocks aboard trains moved faster than clocks that were kept on still ground. Einstein's theories posed the possibility that the fourth dimension's spatial and temporal coordinates are fluid, and time's passage therefore is unfixed, mutable and subjective.²⁴ Relative-time theories by physicists such as Einstein worked to steadily dismantle the Newtonian conceptions of an absolute, fixed time.²⁵ As the authority of a standardized time was imposed worldwide in an age of modernity, individuals – particularly inspired by these highly publicized advances in physics – embraced its personal, subjective experience while also noting the inadequacy of various equally abstract ordering systems to control or manage the intangible entity of time.²⁶

II. Time and Photography: State of the Discourse

Expressions of time's experience have been the subject of several recent exhibitions. In the year 2000 alone, a number of institutions addressed the topic of time in art, including the Bruce Museum in Greenwich, Conn., Centre Pompidou, Courtauld Gallery, Fitzwilliam Museum in Cambridge, England, Louvre

²⁴ Albert Einstein, *Relativity: The Special and General Theory*, trans. Robert Lawson (New York: Henry Holt, 1920). To read more about the influence of Relativity upon art in the early twentieth century: Thomas Mook and Delo E. Vargish, *Inside Modernism: Relativity Theory, Cubism, Narrative* (New Haven and London: Yale University Press, 1999).

²⁵ Historian of science Jimena Canales writes that the 1921 volume of reports by France's Académie des Sciences was "filled with new essays about the redefinition of time proposed by Einstein." Specifically, Charles Richet examined the work of Bergson and Einstein in terms of developing his own theories about psychological dimensions of time: Jimena Canales, *A Tenth of a Second: A History* (Chicago: University of Chicago Press, 2009), 179.; Various Authors, *Comptes rendus ses séances de l'Académie des sciences*, Vol. 173, No. 25 (1921).

²⁶ Kern, *The Culture of Time and Space*, xii.

Museum, Nelson-Atkins Museum of Art in Kansas City, Mo., Smithsonian National Museum of American History and the Victoria and Albert Museum.²⁷

The majority of those exhibitions featured artworks and objects made from the nineteenth century to today, suggesting that time captivated artists to an unprecedented degree starting in the decades directly preceding the announcement of the invention of photography in 1839.²⁸

Photography historian Geoffrey Batchen argues that in the decades before the announcement of the medium's invention, a keen awareness of time's passage prevailed, and found expression in Romantic painting and poetry.²⁹ He notes that British landscape painter John Constable – working concurrently in England with William Henry Fox Talbot, one of photography's inventors – strove to arrest the

²⁷ The Smithsonian also installed a permanent exhibition called “Tempus” in 2000. The titles and dates of the above exhibitions, which were tied to the turn of the millennium, are: “The Art of Time,” Bruce Museum, Greenwich, Conn., December 18, 1999 - March 19, 2000; “Le Temps, Vite!” Centre Pompidou, Paris, January 13 - September 17, 2000.; “About Time,” Courtauld Gallery, London, February 24-June 11, 2000; “Tempus,” Fitzwilliam Museum, Cambridge, England, January 11 - April 30, 2000; “L’Empire du Temps: Mythes et Creations,” Louvre Museum, Paris, April 14 - July 10, 2000; “Tempus Fugit: Time Flies,” Nelson-Atkins Museum of Art, Kansas City, Mo., October 15 - December 31, 2000.; “On Time,” The Smithsonian National Museum of American History; “Breathless! Photography and Time,” Victoria and Albert Museum, London, February 10 - September 17, 2000. This exhibition offered a survey history of the medium, with an emphasis on exposure-time mastery.

²⁸ With the exception of the encyclopedic exhibitions at the Louvre Museum and the Nelson-Atkins Museum of Art, each of these exemplary exhibitions concentrated on art made since the nineteenth century. It is worth noting that the majority of the Nelson-Atkins's exhibition catalog features essays and artworks made in the nineteenth and twentieth centuries: Schall, ed. *Tempus Fugit*, 21-206, 228-259, 298-303.

²⁹ Geoffrey Batchen, “Desiring Production,” in *Each Wild Idea: Writing, Photography, History* (Cambridge, Mass. And London: M.I.T. Press, 2001), 3-24, 192-196. Much scholarship has been dedicated to the task of explaining why the medium appeared in the early nineteenth century, given that photography's essential components, light-sensitive chemistry and the camera obscura, had been developed earlier. Batchen's essay is a response to this question.

transience of nature in his “six-footer” landscape paintings and cloud studies.³⁰ Constable’s incessant attention to capturing the fleeting qualities of meteorological phenomena reveals a compulsion for stilling the ephemeral, which Batchen suggests is a proto-photographic manifestation of the “desire to photograph” – a yearning to fix time’s fleeting passage and still its fugitive nature.³¹ This urge, and its symptomatic visual expressions, were prompted by a disruption of previous assumptions of time’s stability.³² In effect, Batchen argues that the conception of photography is dependent on, and even embodies, a certain modern time-anxiety that only emerges in the late eighteenth and early nineteenth centuries.

In a ten-page sub-section of his influential 1997 book, *Burning with Desire*, Batchen pursues the idea that “time is important in a number of the discourses from which emerged the desire to photograph.”³³ He goes on to examine texts written by Talbot, William Gilpin, Samuel Taylor Coleridge and Thomas Wedgwood, and compares them to the paintings of Constable, arguing

³⁰ Ibid, 13-14, 22. Other recent scholarship on Constable’s motivations for arresting time includes several essays in this exhibition catalog: Edward Morris, ed., *Constable’s Clouds: Paintings and Cloud Studies by John Constable* (Edinburgh and Liverpool: National Galleries of Scotland and the National Museums and Galleries on Merseyside, 2000).

³¹ Batchen, “Desiring Production,” 16-17, 23. Batchen also argues that one of Constable’s contemporaries, poet Samuel Taylor Coleridge, similarly sought to express the ephemeral in poetic form.

³² Batchen looks to Michel Foucault’s concept of the panopticon to describe the inversion of power relationships between subject and object that underlies the act of photographing/being photographed, and also complicates conceptions of knowledge’s fixity: Ibid, 20-24, 195-196.

³³ Geoffrey Batchen, *Burning with Desire: The Conception of Photography* (Cambridge: M.I.T. Press, 1997), 90.

that these are “as much a study of the temporal exigencies of human observation, and thus of human subjectivity, as a picture of a cloudy sky.”³⁴

By making reference to primary-source documents written by some of the medium’s earliest practitioners, Batchen notes that the task of *expressing time* was a collective motivation for all of them.³⁵ Talbot’s comments, in particular, embody various contradictions peculiar to both modern temporality and photography:

Talbot spoke of the photograph here not in terms of the image that it might produce but as a possible resolution of his frustration with space-time itself. ... Talbot spoke of the new medium as a peculiar articulation of temporal and spatial coordinates. Photography is apparently a process in which ‘position’ is ‘occupied’ for a ‘single instant,’ where ‘fleeting’ time is ‘arrested’ in the ‘space of a single minute.’ It seems that he was able to describe the identity of photography only by harnessing together a whole series of binaries: art and shadows, the natural and magic, the momentary and the forever, the fleeting and the fettered, the fixed and that which is capable of change.³⁶

This analysis is soon extended to include early photographs as well. In an analysis of two of Louis-Jacques-Mandé Daguerre’s sequentially exposed images of the Boulevard du Temple in Paris, Batchen hints at the expanded possibilities of photographic time.³⁷ In this case, Daguerre photographed the view from the

³⁴ Ibid, 99.

³⁵ Batchen, “Desiring Production,” 10-12.

³⁶ Batchen, *Burning with Desire*, 91.

³⁷ Ibid, 133-143.

window of his studio in successive exposures.³⁸ Batchen argues that the act of making several versions of an image of the same object under different lighting conditions indicated Daguerre's interest "not just in capturing a particular view but in representing photography as a peculiar articulation of time itself."³⁹ This series of photographs – one made at eight in the morning, another at midday and a third late in the day – allowed Daguerre to articulate concerns that preoccupied him as a photographer, "the connection between appearance, exposure time, and time of day."⁴⁰ In these photographs, time is expressed as the change in appearance of the same subject at different moments in a given day.

Despite the obvious importance of the relationship of photography and time, an expanded study of temporality in photographs has not been undertaken in our existing scholarship. Photographic time – in and of itself – has yet to be the guiding principle for a substantial history of the medium. The bulk of the existing literature on photographic temporality consists of studies of the pioneers of late-

³⁸ Ibid, 133. A concern for stilling time, Batchen argues, motivated these photographers. Specifically, Daguerre's extended exposure times of four-and-a-half minutes to an hour hindered him from representing objects that were in motion. However, Daguerre declared exposure times of ten to twenty minutes in images such as this one. The photograph was taken from the window of Daguerre's studio in the Diorama Building. Batchen, *Burning with Desire*, 135.

³⁹ Ibid, 133. Prior to focusing on photography, Daguerre was well-known for painting and producing Dioramas, which allowed the artist/photographer to use light effects to produce Romantic landscapes that conveyed the passage of time. For instance, in Daguerre's painting *Morning and Night Scenes, Diorama Painting of Alpine Scene with Chalet* (n.d.), viewers experienced the evolution of night (as the painting was lit by transmitted light) into day (as it was lit by reflected light). The painting illustrated a story in which the inhabitants of the village of Alagna were engulfed by an avalanche and "awakened to sleep – for ever!" For more about Daguerre's work on the Diorama and its connection to his early photographic experiments, see: Helmut and Alison Gernsheim, *J. L. M. Daguerre: The History of the Diorama and the Daguerreotype* (Dover Publications: New York, 1968), Chapters One and Two.

⁴⁰ Batchen, *Burning with Desire*, 135.

nineteenth-century-to-early-twentieth-century motion studies. For instance, Marta Braun's scholarship on Étienne-Jules Marey offers valuable biographical and scientific contexts for these early motion-study projects that also represent the passing of time.⁴¹ Other commentators, including, most recently, Philip Prodger, François Dagognet and Rebecca Solnit, have offered similar studies of Muybridge.⁴² A recent book by an historian of science, Jimena Canales, also takes a closer look at the "tenth-of-a-second-minded" scientific interests that she argues informed the work of this group of photographers.⁴³

While acknowledging this body of scholarship, this dissertation offers a study of a broader selection of photographs from varying periods throughout the medium's history. Rather than duplicate the wealth of existing literature on the unique expressions of time in late-nineteenth-century-to-early-twentieth-century

⁴¹Marta Braun, *Picturing Time: The Work of Étienne-Jules Marey (1830-1904)* (Chicago and London: University of Chicago Press, 1992). Braun studies additional photographers, including Eadweard Muybridge and Harold Edgerton, in these published essays: Marta Braun, "The Expanded Present: Photographing the Moment," in *Beauty of Another Order: Photography in Science*, Ann Thomas, ed. (New Haven: Yale University Press, 1997).; Marta Braun, "Time and Photography," in *Tempus Fugit: Time Flies*, ed. Jan Schall (Kansas City, Mo.: Nelson-Atkins Museum of Art, 2000). Martha Langford's study of family photography albums suggests that the performance of telling stories about those objects is an extension of oral tradition. She implies that the oral narration of a photographic album allows for departures from a linear narrative structure, although Langford does not place this practice in relation to concurrent narrative strategies in modern literature and philosophy: Martha Langford, *Suspended Conversations: The Afterlife of Memory in Photographic Albums* (Montreal, London and Ithaca: McGill-Queen's University Press, 2001). Thus, the temporal evocations of the storytelling performance remain unexamined in Langford's study, as do the various *non-oral* manifestations of narrative.

⁴² Phillip Prodger, *Time Stands Still: Muybridge and the Instantaneous Photography Movement* (Oxford: Oxford University Press, 2003).; Rebecca Solnit, *River of Shadows: Eadweard Muybridge and the Technological Wild West* (Middlesex, England: Viking Penguin, 2003).; François Dagognet, *Étienne-Jules Marey: A Passion for the Trace* (New York: Zone Books, 1992).

⁴³ Canales, *A Tenth of a Second*. She suggests that it wasn't until the 1850s that instruments could recognize a tenth of a second. This distinct bit of time, Canales suggests, is uniquely "modern."

motion studies, this project takes a look at the temporal complexity of other photographic practices, including the fin-de-siècle family portrait, Photo Finish and N.A.S.A.'s digital-composite montages. By moving beyond the motion study, this dissertation examines the broader time anxieties peculiar to the late-nineteenth-to-early-twentieth centuries, as well as to the digital age.

Given the prevalence of scholarship on late-nineteenth-to-early-twentieth-century motion studies, photography is frequently discussed by scholars as offering a “stilled,” fraction-of-a-second-exposure, “instantaneous-time” image that comprises a constituent building block for cinema.⁴⁴ To date, most scholars have been content to articulate photography’s temporal dimensions – to use Solnit’s words – as the unique, “violent, abrupt, glorious” rupture offered by the instantaneous-time photograph.⁴⁵ As Solnit explains, photography’s expression of a sliver of time is decidedly “modern,” and expresses the “sudden shock” of living in “a transformed world” in which the absolutism of time and space had been “annihilated.”⁴⁶ Considering the centrality of the fraction-of-a-second-exposure photograph to our prevalent conceptions of the medium’s expression of time, Chapter Two of this dissertation is dedicated to exploring this convention in detail through a case study devoted to the stroboscopic photographs of Harold Edgerton.

⁴⁴ This conclusion underlies, for instance, these recent books by cinema scholars: Mary Ann Doane, *The Emergence of Cinematic Time: Modernity, Contingency, the Archive*, (Cambridge: Harvard University Press, 2002).; Damian Sutton, *Photography, Cinema, Memory: The Crystal Image of Time* (Minneapolis: University of Minnesota Press, 2009).

⁴⁵ Solnit, *River of Shadows*, 81.

⁴⁶ *Ibid*, 11, 81.

Seductive though this view of photographic time is, other, more complicated views have also been suggested. Walter Benjamin and Roland Barthes, for example, offer a broad array of temporal metaphors in their texts about photography and these are worth considering in detail.

III. Benjamin: Theorizing Temporal ‘Shock,’ ‘Trauma’ and ‘Aura’

To the Marxist cultural critic Walter Benjamin, time is at once subjectively experienced and objectively expressed – even if problematically and inadequately. His skepticism about the possibility of articulating time with any degree of objective precision first appears in a discussion of photography’s relationship to time in 1922. In it, he refers to “earthly time,” and suggests that it varies from images made by a photographer’s apparatus.⁴⁷ Benjamin’s writings convey his personal struggle with the polar tendencies of subjectivity and objectivity by insisting upon centering temporality and its expression within the modern observer. In his notes for *The Arcades Project* (1927-1940), Benjamin mentions a few of a myriad of ways in which temporality may be experienced by specific modern observers:

⁴⁷ See Walter Benjamin, “Baudelaire” (1922), in *Selected Writings, Vol. 1, 1913-1926*, Marcus Bullock and Michael W. Jennings, eds., Rodney Livingstone, trans. (Cambridge and London: The Belknap Press of Harvard University, 1996), 361-362. This text was published posthumously. He writes that “earthly time” can only be half-represented (as a “negative”) by a photographer. Ibid. However, to people who possess “infinite mental efforts,” such as Charles Baudelaire, time’s essence may be “extracted” *subjectively*: Ibid, 361. For others, this “truth” surpasses human comprehension. Ibid.

Rather than pass the time, one must invite it in. To pass the time (to kill time, expel it): the gambler. Time spills from every pore. – To store time as a battery stores energy: the flâneur. Finally, the third type: he who waits. He takes in the time and renders it up in altered form – that of expectation.⁴⁸

Benjamin argues that these typological characters, who all presumably share human biological sensorial capacities – the “gambler,” “flâneur,” and those who “wait” – experience and exemplify the differential use of time, despite capitalist industrial modernity’s efforts to institutionalize time’s rigid, standardized measurement and mathematical description. The human sensorium’s perceptions of time, Benjamin writes, have suffered great “trauma or shock” at a time during which the speed of life accelerated dramatically as a result of the explosive growth of the passenger railroad, telegraph, telephone, radio and automobile industries – which each forever altered previous conceptions of space and time.⁴⁹ Benjamin here defiantly insists that time exists because of, and is defined by, the observer, not by the capitalist industrial system of modernity. A newfound awareness of time’s intensified effects, Benjamin writes, is innately biological: “In the *spleen*, time becomes palpable: the minutes cover a man like snowflakes.”⁵⁰ Benjamin’s observations about the bodily effects of time’s rapidly

⁴⁸ Walter Benjamin, *The Arcades Project*, trans. Howard Eiland and Kevin McLaughlin (Cambridge: Harvard University Press, 1999), 107.

⁴⁹ *Ibid.*, 106. Walter Benjamin’s resistance to the regulation of time and to its precise measure also may find its genesis in his disdain for the capitalist industries that instituted such systems. But such considerations lie beyond the purview of this dissertation. The role of technology in reshaping the perceptions of the modern observer is discussed here, as it is relevant to the historicizing of photography as a time-altering technology.

changing perceptions and experiences in the modern age remain centered in the individual. To Benjamin, time's experience and the trauma it inflicts are innately personal, variable and subjective. They mark the very definition of the age of modernity.⁵¹

However, cinema scholar Mary Ann Doane proposes that photography and cinema provide a means to control time in an age of modernity, and to manage the "shock" of temporal contingency, which she suggests is "potentially threatening" because "danger resides in their alliance with meaninglessness, even nonsense."⁵² Doane specifically argues that Benjamin's bodily shock and trauma must be "*worked through*," using the camera's unique ability to "condense time" and fulfill "the aspiration for instantaneity."⁵³ That is to say, Doane describes photography as a controlling practice, rather than an expressive one. However, to Benjamin, the photograph offers the possibilities of layered, simultaneous

⁵⁰ Walter Benjamin, "On Some Motifs in Baudelaire," in *Illuminations*, trans. Harry Zohn, ed. Hannah Arendt (New York: Schocken, 1969), 184. Italics are the author's emphasis.

⁵¹ Cinema scholar Mary Ann Doane characterizes Benjamin's viewer-centered consideration of temporal contingency as "a form of resistance to rationalization," a "resistance to system, to structure, to meaning" which offers liberation from the regimentation of standardized time that was instituted as a result of the expansion of the railroad system in the 1830s: Doane, *The Emergence of Cinematic Time*, 13. She adds: "From Georg Simmel to Walter Benjamin, modernity is conceptualized as an increase in the speed and intensity of stimuli. Time emerges as a problem intimately linked to the theorization of modernity as trauma or shock. Time is no longer the benign phenomenon most easily grasped by the notion of flow but a troublesome and anxiety-producing entity that must be thought in relation to management, regulation, storage and representation." Ibid, 33-34.; Benjamin, *The Arcades Project*, 106. Doane characterizes Benjamin as operating philosophically and discursively in the throes of chaos and contingency, which she claims offers a liberating – but ambivalent and ultimately unstable – binary opposition to a temporality that is rationalized, quantifiable, and absolute.

⁵² Doane, *The Emergence of Cinematic Time*, 11.

⁵³ Ibid, 14. It is important to note that Doane grants primacy here to the fraction-of-a-second exposure, presumably because it is the building block for the medium of cinema.

temporal considerations, but yields no definitive conclusions to heal the observer's sensory trauma. He instead implies that time was an entity photography could *complicate* but not *master*.

Benjamin elaborates on these ideas in two essays he wrote during the decade before his death, "Little History of Photography" (1931) and "The Work of Art in an Age of Its Technological Reproducibility" (1936-1940).⁵⁴ Both have become seminal readings in photographic discourse and discuss his concept of the "aura." In "Little History of Photography," Benjamin defines "aura" for the first time, calling it a "strange weave of space and time: the unique appearance or semblance of distance, no matter how close it may be."⁵⁵ Notably, Benjamin here suggests that the subject's or object's – and he is not specific about which he means – auratic "unique presence" in *time* is perceived in *spatial* terms. In his later essay, Benjamin elaborates on his earlier definition of aura and writes that a work of art's "uniqueness" is tied to its connection to religious or ritual value.⁵⁶ But in a previous version of this essay, Benjamin argued that an object's aura is

⁵⁴ Walter Benjamin, "Little History of Photography" (1931), in *Selected Writings, Vol. 2, 1927-1934*, Edmund Jephcott and Kingsley Shorter, trans. (Cambridge and London: The Belknap Press of Harvard University, 1999), 507-530.; Walter Benjamin, "The Work of Art in an Age of Its Technological Reproducibility" (1936-1939), in *Selected Writings, Vol. 4, 1938-1940*, Harry Zohn and Edmund Jephcott, trans. (Cambridge and London: The Belknap Press of Harvard University, 2003), 251-283. This is the third and final revision of the essay, which Benjamin constantly reworked and considered a work in progress until his death.

⁵⁵ Benjamin, "Little History of Photography," 518.

⁵⁶ Benjamin, "The Work of Art in an Age of Its Technological Reproducibility" (1936-1939), 251-283.

essentially and necessarily related to that object's unique relationship to a particular, original temporal and spatial context:

In even the most perfect reproduction, *one* thing is lacking: the here and now of the work of art – its unique existence in a particular place. It is this unique existence – and nothing else – that bears the mark of history to which the work has been subject. This history includes changes to the physical structure of the work over time, together with any changes in ownership. ...The here and now of the original underlies the concept of its authenticity...⁵⁷

A prerequisite to an artwork's/object's authenticity, Benjamin argues, is its connection to its original position within both time and space. The photograph's capacity for reproduction, however, allows for the potentially multiple simultaneous presences of the image itself across many spaces and times, and effectively obliterates the singularity of the "aura." For instance, the experience of seeing Leonardo da Vinci's actual painting of *Mona Lisa* (c. 1503-1506) in the Louvre is likely shaped by viewers having seen the artwork reproduced and recontextualized within contemporary culture. When viewed with little knowledge of the Renaissance culture, it becomes difficult to access the painting's original "aura" – its authenticity, its authority as an object, and its mystery.

Photographic reproduction allows the *Mona Lisa* and other reproduced subjects to circulate far removed from the time and space in which they originally were

⁵⁷ Walter Benjamin, "The Work of Art in the Age of Mechanical Reproduction" (Second Version, 1935), in *Selected Writings, Vol. 3, 1935-1938*, Edmund Jephcott, Howard Eiland, et al. eds., Edmund Jephcott and Harry Zohn, trans. (Cambridge and London: The Belknap Press of Harvard University, 2002), 103. Italics are Benjamin's emphasis. This version of the essay, the editors of this volume argue, "represents the form in which Benjamin originally wanted to see the work published." Ibid, 122. It served as the basis for the various translations of the essay which were published during Benjamin's lifetime. However, it is noteworthy that his third version is a significant revision of his earlier essay. Benjamin, the editors suggest, regarded the last version as a "work in progress, rather than a completed essay." Benjamin, "The Work of Art in the Age of Mechanical Reproduction" (Third Version, 1936-1939), 270.

embedded. To Benjamin, time – in the age of mechanical reproduction – is intrinsically *spatial*, subjective and variable: “*Just as the entire mode of existence of human collectives changes over long historical periods, so too does their mode of perception.*”⁵⁸ Moreover, photography enables time’s release from any one, privileged, original “auratic” space/time matrix to the possibility of inhabiting many, simultaneously.

IV. Roland Barthes: Time as Photographic ‘*Punctum*’

In 1977, French semiotician, philosopher and critic Roland Barthes began writing what would be his final book, *La chambre claire: note sur la photographie*.⁵⁹ In it, Barthes presents a feast of temporal metaphors. He refers to a photograph as “a temporal hallucination” whose “testimony bears not on the object but on time.”⁶⁰ Barthes also provocatively declares that photography represents the perplexing conundrum of *time itself*.⁶¹ According to Barthes, as a

⁵⁸ Ibid, 255. Italics are Benjamin’s emphasis. This passage appears in the last revision of the essay.

⁵⁹ Roland Barthes, *La chambre claire: note sur la photographie* (Paris: Cahiers du Cinéma, Gallimard, Seuil, 1980). The text was translated into English in 1980: Roland Barthes, *Camera Lucida: Reflections on Photography*, trans. Richard Howard (New York: Hill and Wang, 1981).

⁶⁰ Ibid, 89, 115.

⁶¹ Ibid, 96. Many scholars have provided analyses of Roland Barthes’s interests in photography: André Aciman, “Deliberating Barthes,” *Social Text*, No. 11 (1984-1985): 110-111.; Graham Allen, *Roland Barthes* (London: Routledge, 2003).; Geoffrey Batchen, ed., *Photography Degree Zero: Reflections on Roland Barthes’s Camera Lucida* (Cambridge, MA: The M.I.T. Press, 2009).; Batchen, *Burning with Desire*, 172-173, 192-194.; Geoffrey Batchen, *Each Wild Idea: Writing, Photography, History* (Cambridge: M.I.T. Press, 2002), 11-24, 76-78, 125-140, 182-183.; Geoffrey Batchen, *Forget Me Not: Photography and Remembrance* (New York: Princeton Architectural Press, 2004), 14-15, 82-84, 94-98.; Jean Delord, *Roland Barthes et la Photographie* (Paris: Créatis, 1981).; Andrew Fisher, “Beyond Barthes: Rethinking the Phenomenology of

stilled image of something “*that-has-been*,” photography certifies the presence of subjects before a camera during the finite exposure at a moment in *the past*.⁶² This essential *pastness* of the photographic subjects is determined by an image’s viewers, who recognize a temporal distance between their own presumably linear time/space nexus – which is predicated on locating oneself within the parameters of past, present and future – and the time/space location of the photograph’s subjects. In Barthes’s terms, viewers actively experience a “superimposition” of the present and past tenses.⁶³

This intersection and comingling of temporalities in the mind of the modern viewer, Barthes suggests, comprises “the very essence, the *noeme* of Photography.”⁶⁴ In this sense, photography represents the complicated nature of

Photography,” *Radical Philosophy* Vol. 148, March/April (2008): 19-29.; Diana Knight, ed., *Critical Essays on Roland Barthes* (New York: Hall, 2000).; Annette Lavers, *Roland Barthes: Structuralism and After* (Cambridge: Harvard University Press, 1982).; Michael Moriarty, *Roland Barthes* (Stanford: Stanford University Press, 1991).; Jean-Michel Rabaté ed., *Writing the Image after Roland Barthes* (Philadelphia: University of Pennsylvania Press, 1997).; Nancy Shawcross, “The Intertexts of La Chambre Claire: Barthes, the Photograph, and the Interstice of Time,” Doctoral Dissertation, Comparative Literature, Rutgers, The State University of New Jersey, 1993.; Nancy Shawcross, *Roland Barthes on Photography* (Gainesville: University of Florida, 1997).

⁶² Barthes complicates this idea by stating that a photograph certifies a subject’s presence, rather than its appearance. Ibid, 87. Barthes – who professes at the start of *Camera Lucida* that he wishes to distinguish photography from cinema – makes several references to the photograph as a still image. He remarks: “[I]t is the image which is heavy, motionless, stubborn (which is why society sustains it), and ‘myself’ which is light, divided, dispersed; like a bottle-imp, ‘myself’ doesn’t hold still, giggling in my jar.” Ibid, 12. Barthes also writes that “[t]he photograph itself is in no way animated...but it animates me.” This “animation,” he argues, is the “attraction” of photography. Ibid, 20. He also states that “the Photograph immobilizes a rapid scene in its decisive instant,” and cites Harold Edgerton’s stroboscopic images as example of this approach to expressing time. However, Barthes quickly dismisses such images as displays of technical “prowess” that must “surprise” viewers by relying not on the power of subject matter, but on technique: Ibid, 33-34.

⁶³ Ibid, 76-77.

the time experience itself. The temporality Barthes explores, Nancy Shawcross argues, is an insistent “*modern*” time – “a physical time” “that engages the attention of twentieth-century science...and [is] the time of human consciousness shaped by and imbedded in this particular worldview.”⁶⁵

Barthes defines the *punctum* of a photograph as an emotion-driven, individually determined detail of a photograph that sometimes “rises from the scene, shoots out of it like an arrow, and pierces” a viewer.⁶⁶ The *punctum*’s act of “piercing” the viewer, and our cognitive processing of this event, occurs within a duration of time, Shawcross suggests: “There is...a gap between the event and our knowing or observing it. The gap is one of distance and time. It is built into the physiology of our bodies.”⁶⁷ Our conceptual framework for tense perception, Shawcross argues “has undergone a radical transformation since the invention of the photograph and its dissemination into our culture”:⁶⁸

⁶⁴ Ibid. Nancy Shawcross suggests that “time and our ideas of it intersect at every point [of our] concepts of being and reality, of the continuity of existence, and of our free will to act as unique individuals. Time is the substantive underpinning, the causal link, in an otherwise fragmented and accidental world of absolute individuation. Time stands firm as the primary signature of consciousness.” Shawcross, *Roland Barthes on Photography*, 87.

⁶⁵ Ibid. Italics are my emphasis.

⁶⁶ Barthes, *Camera Lucida*, 26, 96.

⁶⁷ Shawcross, *Roland Barthes on Photography*, 99.

⁶⁸ Ibid, 101.

[W]e who have lived in the time of the photograph live in a privileged position from all those who lived outside this time. This position can be articulated as follows: we can have a *sympathy* for a time outside our memory which was unknown to those who lived before the invention of the photograph. That fact is the defining characteristic of the age of the photograph.⁶⁹

As a product of the culture of modernity, Barthes uses the photograph, Shawcross notes, “to enter the coordinates of time...not to re-present history...but to confirm presence.”⁷⁰

Moreover, the metaphors of the *punctum* and *studium* have literal application to the conceptualization of time. The *studium* expresses collective, standardized and socialized time experiences. It describes the world of the clock and other device-measured, human efforts to measure, categorize and manage time. On the other hand, the *punctum* allows for an individualized, subjective and variable response to time’s passage. The *studium* and *punctum* are in many ways inseparable. The modern observer’s personal responses to time’s passage are conditioned by time’s systemic regulation. While Barthes is preoccupied in *Camera Lucida* with time’s relentless passage – which brings him ever closer to his own death – all living beings share this fate. Thus, as the *studium* and *punctum* collapse and fold into each other, the modern observer plays a central role in determining a photograph’s temporal dimensions.

While Barthes has suggested that photographs provide a collision of past and present, he also writes that photographs also make reference to the *future*.

⁶⁹ Ibid, 101-102. Italics are the author’s emphasis.

⁷⁰ Ibid, 106.

Barthes examines a photograph taken by Alexander Gardner in 1865 of a young Lewis Payne in his jail cell waiting to be hanged for trying to assassinate Secretary of State W. H. Seward. As he looks at it, Barthes cannot help but ponder “with horror” the event of Payne’s *then-future* death, although it is a “*catastrophe which has already occurred.*”⁷¹ Barthes suggests that the interpretation of photographs necessarily engages this future-anterior sense of temporality. He further states that the specter of death’s inevitability haunts all photographs: “Whether or not the subject is already dead, every photograph is this catastrophe.”⁷² While Barthes comments about the ultimate fate of the subjects of the photographs he beholds, the death he fears most is not really theirs, but his own.⁷³ He states: “I am the reference of every photograph.”⁷⁴ He also remarks that the photograph has a peculiar capacity to represent the past in the present, and thus to imply the passing of time in general.⁷⁵ As a consequence, Barthes argues, all photographs speak of the inevitability of our own death in the future. They convolute and collapse tenses while providing new, yet more complex ways for us to relate to time. Photographs, to Barthes, are grim reminders of time’s relentless passage, and the idea that time’s transpiring will bring Barthes’s inevitable death

⁷¹ Barthes, *Camera Lucida*, 96. Italics are Barthes’s emphasis.

⁷² Ibid, 96.

⁷³ For example, Barthes looks at a photograph of a group of twenty-five wedding guests and comments: “I read the date and I compute: 1910, so they must all be dead, except perhaps the little girls, the baby (old ladies and an old gentleman now).” Ibid, 84.

⁷⁴ Ibid.

⁷⁵ Ibid, 96.

in the future – a point in time that lies *in the past* for readers of *Camera Lucida*.⁷⁶

This makes photography the *punctum* for the inherently temporal nature of our existence: “I now know that there exists another *punctum*. . . This new *punctum*, which is no longer of form but of intensity, is Time, the lacerating emphasis of the *noeme* (“*that-has-been*”), its pure representation.”⁷⁷

However, although many scholars focus on the theme of the catastrophe of death in *Camera Lucida*, Shawcross suggests that a photograph also functions “to confirm life as much if not more than to confirm death.”⁷⁸ Batchen similarly argues that the theme of *life* is just as much of a preoccupation to Barthes:

[*La chambre claire*] was initiated, [Barthes] tells us in an earlier interview, by a ‘fascination with what has died but is represented as wanting to be alive.’ Accordingly, on the same page in *Camera Lucida* where he comments on the ‘catastrophe’ that is inherent to all photographs, he also concedes that there is ‘always a defeat of time in them.’ Looking at a snapshot of two little girls, he exclaims ‘how alive they are!’ It is precisely this suspension of time’s passage, this conjuring of his mother as both alive and dead and therefore neither, that moves him. Only photographs can provide this suspension, a quality that is, Barthes says, the source both of photography’s ecstasy and its madness.⁷⁹

⁷⁶ Roland Barthes died on March 25, 1980, as the result of being struck about a month earlier by a laundry van while walking home from a lunch party hosted by François Mitterrand.

⁷⁷ Barthes, *Camera Lucida*, 96.

⁷⁸ Shawcross, *Roland Barthes on Photography*, 106. Geoffrey Batchen argues in an analysis of one nineteenth-century vernacular photograph that “the play between the past captured in the photograph makes us conscious of time’s passing, and ultimately of death, but the locket makes us dream of the possibility of everlasting life.” Batchen, *Forget Me Not*, 76.

⁷⁹ Geoffrey Batchen, “Another Little History of Photography,” in *Photography Degree Zero*, 166-277, 272.; Roland Barthes, interviewed by Bernard-Henri Lévy and Jean-Marie Benoist on December 23, 1978, as quoted in Louis-Jean Calvet, *Roland Barthes: A Biography*, trans. Sarah Wykes (Bloomington: Indiana University Press, 1995), 220.

The binary operation of the photograph as a site for both *life* and *death* – and, in Batchen’s argument, the impossible space of a “*neither*” – echoes the unsteady binary poles of other metaphors in Barthes’s text, including *studium/punctum*. This conundrum of *life/death/neither* suggests another dimension of time: that of the suspended duration removed from the certainty and temporal clarity of the lived-time narrative. In other words, Barthes suggests that photographs may also “defeat” time by standing aloof from engaging actively in its narratives.

These temporal complexities are apparent in Barthes’s analysis of a photograph of his mother as a child in Part Two of *Camera Lucida*. Barthes notes that one evening shortly after his mother’s death, he found himself looking through some photographs. As he did so, Barthes recollects that night: “I had no hope of ‘finding’ her, I expected nothing from these ‘photographs of a being before which one recalls less of that being than by merely thinking of him or her.’”⁸⁰ He mentions that efforts to glean something of “the essence” of his mother’s “identity” were “painful.”⁸¹ Barthes here is forced to acknowledge the tragic impossibility of recovering the past, and of bringing his mother’s presence from the past and into his present. Even the temporally complex photographic medium fails for Barthes to reverse time’s essential, forward-bound linear operations, and the author laments that his mother is relegated to the status of a fleeting memory, rather than a physical presence. And for that, the photograph

⁸⁰ Barthes, *Camera Lucida*, 67. Barthes cites: Marcel Proust, *In Search of Lost Time* (Six Volumes), Christopher Prendergast, ed., Lydia Davis et al. trans. (London: Allen Lane, 2002).

⁸¹ Barthes, *Camera Lucida*, 66.

offers Barthes no suitable substitute. It cannot replicate his mother's living presence. However, the photograph does provide a material manifestation of her that exceeds the cold absence imposed by death. By operating somewhere between representing her life and her death, the photograph gives Barthes a material visual presence of his mother that lies outside of the temporal operations of the lived-time experience. Photography, Barthes implies, creates a new set of relationships to time that are complex and variegated.

As Barthes looks at this photograph of his mother, he notes that she inhabits a space/time nexus different from his own: "I could read my nonexistence in the clothes my mother had worn before I can remember her."⁸² He continues to suggest that "clothing is perishable, it makes a second grave for the loved being."⁸³ Clothing then serves as a double-indexing or additional reminder of the subject's essential *pastness* – and the *pastness* of the event of the taking of the photograph. This conclusion further kindles Barthes's anxiety about death, and it also reveals the author's conception of time's operations as categorical (existing as "past," "present" and "future") and irreversible – much like the human life cycle, which progresses in a sequential manner through various stages, from birth to death.⁸⁴

⁸² Ibid, 64. The "Winter Garden" photograph, which depicts his mother at age five with her seven-year-old brother in a glassed-in conservatory in 1898, is never reproduced in the book, and arguably may be the product of Barthes's imagination. Diana Knight was the first to pose the possibility that the Winter Garden photograph might be an invention: Diana Knight, *Barthes and Utopia: Space, Travel, Writing* (Oxford: Clarendon, 1997), 265-266.

⁸³ Barthes, *Camera Lucida*, 64.

To Barthes, temporality is a layered, multifarious entity that finds an appropriately multifaceted visual expression in the medium of photography. In *Camera Lucida*, Barthes discusses the medium's unique capacity to collapse and/or convey multiple tenses simultaneously. As such, this text provides a starting point for any account of photography's relationship to time and modernity.

The work of Benjamin and Barthes points to the complexity of photography's relationship to time. But time itself remains a somewhat singular and abstract entity in their accounts, as is photography. This dissertation aims to add a further layer of complication by looking at a selection of ordinary photographs and evaluating the temporal experience that each of them offers. In doing so, I hope to show that these experiences are multiple, that there are many different photographic articulations of time. Conversely, I will also demonstrate that, in offering a range of temporal experiences, photography can no longer be understood as a singular phenomenon—there are as many photographies as there are times.

V. Reconsidering 'Photographic Time'

The chapters that follow test, interrogate, expand and revise the prevailing ideas about the photograph's relationship to time. This task begins with Chapter

⁸⁴ However, in response to the "Winter Garden" photograph, Barthes discusses his mother's life story, starting from the year before her death and progressing backward to her childhood, reversing the conventional chronological linear narrative. *Ibid*, 71-72.

Two's detailed study of Edgerton's stroboscopic images. His 1,000,000th-of-a-second exposures offer the occasion for a further discussion of our established canonical views of the "instantaneous" nature of photographic time.

Chapter Three continues to complicate our conventional views with an analysis of a common and exemplary late-nineteenth-century family portrait from the American Midwest, the *Leighton Family* (1899). While this image complies with conventional expectations that photographs provide a visual record of a given rectangular field of space in a fraction-of-a-second time exposure, the *Leighton Family* presents the opportunity for an expansion of the temporal possibilities of the "instantaneous," full-field exposure. Vernacular photographic portraiture is often overlooked in our histories, despite its ubiquity and complexity as a visual form and a temporal expression. Extended study of the *Leighton Family* allows for the closer examination and expansion of discourses involving an imaginative, subjective, simultaneous, multiple-tense photographic time proposed by Barthes and Siegfried Kracauer. It also takes a closer look at more recent scholarship on vernacular family photography by Batchen and Martha Langford.⁸⁵

Chapter Three's case study will offer a comparative look at: (1) the *Leighton Family* portrait, (2) an undated poem written about the image by one of its subjects, Nancy Ellen Miller, and (3) an analog montage integrating the

⁸⁵ See Geoffrey Batchen "Snapshots: Art History and the Ethnographic Turn," *Photographies* 1: 2 (London, September 2008), 121-142, and Langford, *Suspended Conversations*.

portrait by Billie Hazel Leighton Flora (c. 1980). A consideration of the photograph, poem and collage allows for the exploration of *narrative time* – a subjective, creative, often non-chronological, mutable context that is imposed upon a work by an observer. Although *narrative time* has been a popular topic of recent study in literary disciplines, this concept has yet to be applied to an expanded study of the temporal possibilities of a photograph.

Chapter Four provides a case study of racing Photo Finish images, which challenge essentialist definitions of “the photograph” as a materialized expression of spatial relationships in a full, rectangular field of space in a fraction-of-a-second duration of exposure time. Instead, a Photo Finish depicts objects moving past a fixed vertical strip of space (the finish line) over time, using a moving strip of film which travels inside of a shutter-free camera at the estimated speed of the racing objects. In a photo finish, the usual expectation – that a photograph will reveal spatial relations at a given instant of time – is reversed. Instead, the resulting photograph depicts only moving objects as they pass a fixed location over elapsed time. A device-altered photograph is produced by a camera with a modified focal plane, shutter, and/or film advance system. In a device-altered photograph, time and space may be represented as asynchronous, accumulated, distended and/or compressed.

This chapter features a case study of the temporal complexities of the Photo Finish, and its relationship to early-twentieth-century conceptions of temporality. Although the Independent Group’s 1953 *Parallel of Art and Life*

exhibition included a Photo Finish image – and strip photography is a fairly commonplace photographic practice – these images are not currently included in our histories. This chapter therefore also provides an historical narrative, and will trace the conception of strip photography to several antecedents, including time-lapse, panoramic and peripheral (“rollout”) practices.

Chapter Five of this dissertation will examine the layered temporal implications of another commonplace-but-unstudied photographic practice, the National Aeronautics and Space Administration’s whole-Earth photographs. These images are made with the aid of software that blends photographs from many satellite images to produce a picture of what the Earth might look like if there were, for example, no clouds, and if the planet was bathed in full sunlight. Although they are regarded as truthful scientific inscriptions and are rarely questioned, whole-Earth photographs are the result of the seamless digital combination of separate photographs, all of which relate to *different* moments in time. Whole-Earth digital composite images are a complex synthesis of fractured time, extended duration, past time, collapsed space and simultaneity of vision. Although whole-Earth digital photographs are seldom studied in our histories, these time abstractions convey temporality as a multiplicitous, layered experience. N.A.S.A.’s Whole-Earth digital composite photographs are products of an anxious culture coming to grips with a quickening pace of life, a pace enabled by computer technology – the very tool used to compose these images.

Whole-Earth digital composite image-making has no coherent history. This chapter provides one. It also situates this practice within a family of analog techniques – including double-exposure, montage, composite picture-making and collage – that have been employed to convey the layered, competing and simultaneous nature of time in analog photography since the medium’s invention. Thus, this chapter will provide an historical context for current debates about the medium’s status as a reliable document in the age of digital mediation.

The case studies offered by this dissertation date from 1899 (the *Leighton Family* portrait), the 1930s (the emergence of device-altered Photo Finish practices), and the 1990s to today (N.A.S.A.’s digital whole-Earth composites). An analysis of photographic practices from these decades enables an interrogation of an exemplary range of photographic “time anxieties.”

VI. Closing Comments

This project was born from two observations: Many of the medium’s commentators have noted that time is a central and important issue in photography. Yet we have no in-depth historical studies dedicated to exploring the particular complexities of “photographic time.”

While time’s vital role in the medium is treated as a foregone conclusion, our current scholarship reflects a range of views about the characteristics and qualities of photography’s expressions of time which are only granted a few pages or paragraphs of study within larger volumes. Instead of working to refute or

negate these scholars' ideas in service of writing "the definitive" historical study of the medium's relationship to time, this study embraces the impossibility of defining photographic temporality through any singular approach. Our existing commentaries provide starting points for an expanded historical examination of the complex, multifarious expression of time's changing experience in the age of modernity. As an alternative, this dissertation offers a closer look at a range of possible expressions of time in actual photographs, including *narrative time*, *device-altered time* and *composite time*. Therefore, this dissertation does not promise or provide an exhaustive study of all of the various manners in which the medium may express time, but instead suggests that the possibilities are endless. Rather than possessing a single possible, fixed relationship to time, a photograph has the possibility of *many*.

This dissertation is also a self-conscious selection of exemplary, understudied, commonplace photographic practices. These objects – family portraits, Photo Finishes and N.A.S.A. whole-Earth photographs – form our everyday visual landscape. They appear in our homes, on the pages of our newspapers and magazines, in racing forms, and in our textbooks. Though quite unextraordinary, these images have a formative influence upon our knowledge of family identity and habitat, and they settle our close races with integrity. But if given an even closer look, these photographs also raise important questions, for instance, about issues of interest in our current discourses, such as the medium's complex expressions of "truth" and time. By selecting these objects whose stories

have not yet been told, this project contributes to the expanded discussion of the diverse field of the “photographic,” while also undertaking the task of investigating the medium’s many and varied articulations of time.

Chapter Two: ‘Instantaneity’

With the faster shutter speed of the modern camera,
the stream of time could be interrupted and motion
could be broken down into its constituent parts.

– Miles Orvell⁸⁶

The prevailing history of photographic time is a story of the struggle to achieve the fraction-of-a-second exposure. From the time the medium was born, its inventors were driven, according to Director of Photography at the Museum of Modern Art John Szarkowski, to overcome the challenge of their “slow films and slow lenses” in order to capture crisp representations of “thin slices of time.”⁸⁷ Indeed, most survey histories tell a chronological, positivistic story of a series of inventors who strove to make progressive technological improvements that increased the light-sensitivity of plate and negative chemistry in order to produce images more quickly, to capture motion, and to reduce or eliminate blur. For instance, the historical narrative of Beaumont Newhall’s respected 1982 edition of *The History of Photography from 1839 to the Present* begins with Nicephore Niépce’s eight-hour heliographic exposures (1826), notes that Daguerre’s process featured 15-30-minute exposures (1839), then discusses the 20-90-second

⁸⁶ Miles Orvell, *The Real Thing: Imitation and Authenticity in American Culture, 1880-1940* (Chapel Hill: University of North Carolina Press, 1989), 100.

⁸⁷ John Szarkowski, *The Photographer’s Eye* (New York: Museum of Modern Art, 1966), 10. Jimena Canales also describes the exposure times of the earliest photographs as “regrettably slow.” Canales, *A Tenth of a Second*, 104.

exposures enabled by “*quickstuff*” (1841), and finally celebrates the 10-60-second exposure times achieved with improved lenses.⁸⁸ Later processes enabled even faster exposures, Newhall notes. For instance, wet collodion photographs taken outdoors reduced exposures to ½-5 seconds (1851).⁸⁹ Ambrotypes featured an exposure time of 2-20 seconds (1851).⁹⁰ But the introduction of gelatin emulsion in 1878 allowed exposures as brief as $\frac{1}{25}$ th of a second, which decreased to $\frac{1}{250}$ th of a second by 1900.⁹¹ In sum, it was as if photography *wanted* to represent the fractional second, and the medium merely waited patiently for its inventors to improve its photochemistry and camera shutters and lenses so that it could rise to its destiny of interrupting “the stream of time” so that “motion could be broken down into its constituent parts.”⁹²

Charles Baudelaire defined this challenge – the challenge of representing the contingent in eternal form – as a task that defined the very age of “modernity”:

⁸⁸ This summary of exposure times is distilled from: Beaumont Newhall, *The History of Photography from 1839 to the Present* (New York: Museum of Modern Art, 1982), 133-136.

⁸⁹ Ibid.

⁹⁰ Ibid.

⁹¹ Ibid.

⁹² Orvell, *The Real Thing*, 100.

The aim for him [the artist] is to extract from fashion the poetry that resides in its historical envelope, to distil the eternal from the transitory. By ‘modernity’ I mean the transitory, the fleeting, the contingent, the half of art whose other half is the eternal and the immutable.⁹³

The bulk of our existing literature on photographic time focuses on the apexes of this journey toward achieving exposures of “thin slices of time,” associating this with a uniquely “modern” urge to still a vital, atomized bit of time and render its representation eternal. As mentioned previously, one of those peaks occurred in the late-nineteenth century with the motion studies of Muybridge (1870s and 1880s), and Marey (1880s-1904). These photographers’ contributions to the task of revealing the appearance of objects during “thin slices of time” – appearances that were previously inaccessible to the unaided human eye – have been much celebrated in photographic scholarship.⁹⁴ During these decades, Newhall notes, unprecedented fraction-of-a-second exposure times were possible with gelatin emulsion.⁹⁵ Advances in photo-sensitive chemistry, combined with shutter-mechanism innovations, made exposure times of 1/1000th-of-a-second possible for the first time, at least under ideal lighting conditions.⁹⁶ The camera’s

⁹³ Charles Baudelaire. “The Painter of Modern Life” (1863), in *Baudelaire: Selected Writings on Art and Artists*, ed. P.E. Charvet, (Cambridge: Cambridge University Press, 1981), 402. In the essay “Salon de 1859,” Baudelaire praised photography’s ability to aid the sciences and the arts, but only as “their very humble servant.” He warned against viewing photography as the ideal fulfillment of the goals to which painting aspired: Charles Baudelaire, “Salon De 1859: Le Public Moderne et la Photographie (1859),” in *Oeuvres Completes* (Paris: Gallimard, 1961), 2.

⁹⁴ Braun, *Picturing Time.*; Braun, “The Expanded Present.”; Braun, “Time and Photography.”; Prodger, *Time Stands Still.*; Solnit, *River of Shadows.*; Dagognet, *Étienne-Jules Marey.*; Canales, *A Tenth of a Second.*

⁹⁵ Newhall, *The History of Photography*, 133-136.

sensitivity finally surpassed that of the human eye-to-brain relay response of 1/10th of a second by about one-hundred-fold, offering viewers a radical visual abstraction from their biological experience of time.⁹⁷ Instead, observers were introduced to a unique manner of seeing the world “photographically.”⁹⁸

However, exposures even more brief than these had already been achieved using spark illumination. While working alone in Michael Faraday’s basement laboratory at London’s Royal Institution in 1851, William Henry Fox Talbot attached a page of the *London Times* newspaper to a wheel that was rotated in front of a camera containing one of his new and highly sensitive ‘Amphitype’ plates in a darkened room.⁹⁹ As the wheel turned, Talbot exposed a few square inches of the newspaper page for about 1/2,000th of a second, using spark illumination from Leyden jars. The printed letters in the photograph, Talbot reported in a note to Faraday, were “just as sharp as if the disk had been

⁹⁶ Jerome P. O’Neill, “The History of Race Photo Finish Photography: Interim Report of the Photo Finish Research Project.” [unpublished manuscript] Rochester, N.Y.: 1972, 10. According to O’Neill: “Muybridge claimed shutter speeds as high as 1/5,000 second with wet collodion plates, but sufficient exposure would have been a problem. In his later work he found that 1/600 to 1/800 [of a] second was adequate to ‘stop’ the stride of a horse....” Ibid.

⁹⁷ Max Perchick, “Extending the Frontiers of Photographic Vision,” *PSA Journal* 62, No. 11 (1996): 26.

⁹⁸ However, Geoffrey Batchen writes: “This notion of time – diachronic, evolutionary, cinematic, or more properly, photographic in nature – is in fact an invention of the late eighteenth and early nineteenth centuries. In other words, its introduction exactly coincides with the conception of photography.” Batchen, *Each Wild Idea*, 125.

⁹⁹ Gail Buckland, *Fox Talbot and the Invention of Photography* (London: Scholar Press, 1980), 107-118, 202.; Chitra Ramalingam, “Stopping Time: Henry Fox Talbot and the Origins of Freeze-Frame Photography,” *Endeavour* 32, Vol. 3 (Sept. 2008): 86.

motionless.”¹⁰⁰ About four decades later, C.V. Boys photographed bullets in mid-flight at 1,400 miles per hour, using similar techniques.¹⁰¹ In 1900, A.M. Worthington captured a crisp image of a splash of milk by employing spark illumination.¹⁰²

But it was not until Massachusetts Institute of Technology electrical engineering graduate student Harold Edgerton started becoming interested in these earlier techniques that these spark-illumination experiments received sustained attention. In 1931 Edgerton invented a stroboscopic flash device that emitted instantaneous bursts of light. He created photographs in a pitch-black room, using a camera with an open shutter and flashes of light that were one microsecond – or 1/1,000,000th of a second – long. Edgerton’s work affirmed a lesson Talbot learned in his Leyden jar experiments: that the speed of photography was no longer dictated by the speed of shutters (for they can be done away with), but rather by the much more rapid speed of light.

Edgerton’s stroboscopy is lauded as a technological milestone in the medium’s mastery of the temporal fragment. James R. Killian Jr. explains this photographic practice’s contribution in a passage from a book about Edgerton’s work:

¹⁰⁰ Buckland, 107-118.

¹⁰¹ *Ibid.*, 220.

¹⁰² *Ibid.*

Beyond the time threshold of human vision lies a world of rapid motion which can be seen only with the aid of accessories that manipulate time as the microscope or telescope manipulates space. The unaided eye cannot see the beautiful coronet-like splashes of milk drops falling in a pool, the wings of a hovering hummingbird, or the effects of a bullet in flight. Not until the development of high-speed or single-flash photography (except by the use of sparks) did it become possible to see these rapid phenomena or visually to harness time to space.¹⁰³

As Killian notes, Edgerton's stroboscopic images of accessible, familiar objects – including milk drops, hummingbirds in flight, golf clubs and tennis rackets making contact with balls, water drops and streams, shock waves, bullets in motion, and dancers – are generally regarded as truthful to the appearance of objects in a full field of space during a millionth-of-a-second time exposure, even if these images offer blatant abstractions from the known appearance of the same objects in lived time.

Edgerton's representation of everyday subject matter – rather than objects that might appeal only to his fellow scholars in the field of engineering – made his work potentially accessible to a non-specialist audience. In 1932, Edgerton's photographs were reproduced in trade publications such as *Electronics* and *Review of Scientific Instruments*, and a representative collection of his images was printed in successive months in the mainstream magazine *Technology Review*.¹⁰⁴

¹⁰³ Harold Edgerton and James R. Killian, Jr., *Moments of Vision: The Stroboscopic Revolution in Photography* (Cambridge Mass.: M.I.T. Press, 1979), 6.

¹⁰⁴ Harold Edgerton and K. J. Germeshausen, "Stroboscopic Photography," *Electronics* 5, No. 1 (July 1932): 220-221.; Harold Edgerton and K. J. Germeshausen, "The Mercury Arc as an Actinic Stroboscopic Light Source," *Review of Scientific Instruments* 3, No. 10 (Oct. 1932): 535-542.; Edgerton and Killian, *Moments of Vision*, 2. James R. Killian, Jr., who co-authored the text *Moments of Vision: The Stroboscopic Revolution in Photography* with Edgerton, was the editor of *Technology Review* at the time Edgerton's photographs were published in that magazine.

News of Edgerton's work quickly spread beyond the scientific community within just a couple years of his successful early experiments. In 1933, three of his photographs were exhibited for the first time in the Royal Photographic Society's annual exhibition in London, and his work was published in the popular periodical *American Golfer*.¹⁰⁵ In 1934, his life and work were presented in *American Magazine*.¹⁰⁶ Two years later, Edgerton was profiled in *Fortune* magazine.¹⁰⁷ But Edgerton's stroboscopic photographs became most well known as part of a recurrent feature, "Speaking of Pictures," in *Life* magazine from 1936-1941.¹⁰⁸ This feature offered viewers a collection of Edgerton's stroboscopic photographs, explained by some brief introductory text and captions. "Speaking of Pictures" appeared near the front of each issue, where reader attention was the highest. In 1937, one of Edgerton's milk-drop photographs, *Milk Drop, Coronet*, was included in the Museum of Modern Art's seminal "Photography 1839-1937" exhibition, organized by Beaumont Newhall.

Edgerton's peer and close friend, the photographer Gjon Mili, was the person who encouraged him to share his stroboscopic photographs with editors at *Life* magazine. Particularly well-received were the reproductions of Edgerton's

¹⁰⁵ Harold Edgerton and K.J. Germeshausen, "Catching the Click with the Stroboscope," *American Golfer*, Nov. 1933.

¹⁰⁶ "Interesting People," *American Magazine*, May, 1934, 48.

¹⁰⁷ "Portrait," *Fortune*, November 1936.

¹⁰⁸ "Speaking of Pictures... This is a Cock Fight," *Life*, Dec. 14, 1936, 2-3. "Speaking of Pictures... Stroboscopic Lights Make Action Stand Still," *Life*, Nov. 20, 1939, 10-13.; "Speaking of Pictures... These Show Science True and Beautiful," *Life*, July 28, 1941, 9-11.; "Speaking of Pictures... These Culminate 70 Years of High-Speed Photography," *Life*, Oct. 27, 1941, 13-15.

stroboscopic photographs of the breaking of light bulbs and of a bat and ball at impact that appeared in the November 20, 1939, issue of *Life*.¹⁰⁹ In the same year, Edgerton released a book of his stroboscopic images, *Flash! Seeing the Unseen by Ultra High Speed Photography*, which received critical acclaim.¹¹⁰ At the request of the Kodak Corporation, Edgerton set up a booth at the World's Fair in New York City that featured a baseball-shooting cannon and allowed visitors to take their own strobe pictures.¹¹¹ In short, in just eight years after he introduced the stroboscope (1931), Edgerton's photographs not only became the subject of mass-cultural fascination, and he quickly became a widely respected scientist, an exhibiting photographer, and an author.¹¹²

The mass-publication of Edgerton's work was not without precedent. For instance, in the mid-nineteenth century, contact prints of botanical specimens were translated into woodcut sketches and reproduced in magazines. Also, Muybridge's animal locomotion studies were disseminated in mainstream magazines and horse-racing periodicals as well as science journals. His

¹⁰⁹ "Speaking of Pictures...Stroboscopic Lights Make Action Stand Still," 10-13. Gjon Mili met Edgerton while the two were graduate students at the Massachusetts Institute of Technology. Mili had regularly contributed photographs as a freelancer to *Life* since the magazine's founding in 1936, and he aided Edgerton in making the right connections to get his work published in the magazine. Edgerton and Killian, *Moments of Vision*, 2.

¹¹⁰ For more about Edgerton's appeal to the masses, see: Braun, "Time and Photography," 143.

¹¹¹ Harold Edgerton and James R. Killian, Jr., *Flash! Seeing the Unseen by Ultra High Speed Photography* (Boston: Hale, Cushman & Flint, 1939).

¹¹² Edgerton remained in the public eye throughout his career. In 1940, Edgerton collaborated on the film "Quicker than a Wink" with Pete Smith. It won an Academy Award. He also directed the use of the strobos for nighttime aerial reconnaissance photography during World War II, and received a Medal of Freedom in 1946 for his work. Edgerton developed rapatronic cameras for the photographing of nuclear explosions in the following year, and worked over several decades to develop various sonar devices for photographing the ocean floor. One of those devices was responsible for locating the sunken Titanic off the coast of Nova Scotia in 1986.

photographs particularly kindled discussions among the general public about the visual departures photography offered from the experience of lived time. But the enthusiastic reception of Muybridge's images suggests mass culture's predominantly warm embrace of a "photographic" manner of seeing. Specifically, the representation of spatial relationships within a fraction-of-a-moment of time became *the* manner by which the medium was thought to convey time. The invention of X-ray images was similarly announced immediately in mainstream magazines and newspapers. Readers were fascinated by the publication of early images of the "Röntgen Rays," and created poems, cartoons and songs in tribute to the X-ray.¹¹³ The X-ray, like Edgerton's stroboscopic images, offered a photographic glimpse of a reality inaccessible to the unaided human eye.

Edgerton's photographs likewise were received with great enthusiasm and wonder. The images, Killian explains, particularly appealed to the public's thirst for seeing everyday objects engaged in "phenomena never before visible."¹¹⁴ Braun also notes that Edgerton's unprecedented views of the look of things at 1,000,000th-of-a-second collapsed "the intellectual boundary between entertainment and twentieth-century science," making science accessible to the

¹¹³ Angelika Schedel, "An Unprecedented Sensation – Public Reaction to the Discovery of X-Rays," *Physics Education*, Vol. 30, Issue 6 (Nov. 1995): 343. Probably the most popular novel about X-rays was H. G. Wells's *The Invisible Man* (1897), which was based on the notion that a man's exposure to X-rays could make his body invisible: H.G. Wells, *The Invisible Man* (1897) (New York: New American Library/Penguin Books, 2002).

¹¹⁴ Edgerton and Killian, *Moments of Vision*, 1.

masses.¹¹⁵ Largely as a consequence of these images' ready acceptance, Edgerton's photographs, Batchen notes, have come to typify a "quintessential cliché of the photographic."¹¹⁶ That is to say, they are the archetypes for our conceptions of the medium's conventional, fraction-of-a-second relationship to time.

One photograph in particular has been regarded as the most "quintessential" of Edgerton's "quintessential clichés," *Milk Drop Coronet* (1936) (**Fig. 1**). Edgerton himself acknowledges the degree to which this image has come to exemplify his work, as in this caption he provides in a catalog of his stroboscopic experiments:

A diadem, decorated with pearls above the rim, produced by a drop of milk falling on a plate covered with a thin layer of milk. In the land of splashes, surface tension fashions delicate shapes too ephemeral for any eye but that of the high-speed camera. This print is one of the classic photographs in the history of photography.¹¹⁷

Milk Drop, Coronet is a scientific study of the behavior of liquid surface tension. To make this photograph, Edgerton poured milk into a shallow plate. He then dripped a series of drops of milk down into the liquid in the dish, and calibrated the strobe lighting to flash at various intervals. *Milk Drop, Coronet* is one in a series of photographic studies Edgerton made of such drops and splashes.

In *Milk Drop, Coronet*, Edgerton's stroboscopic exposure freezes the climatic crown-like formation of a splash as the surface tension of the plate of

¹¹⁵ Braun, "Time and Photography," 136.

¹¹⁶ Batchen, *Each Wild Idea*, 125.

¹¹⁷ Edgerton and Killian, *Moments of Vision*, iii.

milk is stretched to its limit by the impact of a drop of milk. As the droplet presses into the dish of milk, a ring of liquid rises in a ring shape and shoots out into 23 tiny tentacles. A miniscule droplet forms from each of those extensions. Another falling sphere of milk approaches at the very top of the frame. Time is implied as both an active *present* (the culmination of the ephemeral splash) and an anticipatory *future* tense (as another drop of milk approaches and the tiny droplets emerging from the crown prepare to fall). The entire image also represents a millionth-of-a-second in the *past* (1936).

Viewers of *Milk Drop, Coronet* enjoy unprecedented visual access to this millionth-of-a-second, infinitesimal slice of time in which an absolutely *ordinary* event – the splash of a singular drop of liquid – provides an *extraordinary* view of a dramatic liquid crown. Here, photography reveals its capacity to extend the sensitivity of human vision and to provide a fascinating visual record of the delicate, appreciable details within our everyday world. Photographs such as *Milk Drop, Coronet* humble us. They remind us of both the limitations of our own vision and the beauty that might lie beyond our purview. But *Milk Drop, Coronet* also shows us a *new* world within our own, just as the X-ray extended the frontiers of unaided human vision three decades earlier. The mass circulation and widespread popularity of these scientific images brought about general acceptance of photography as a partner to science in providing us with a portal to these previously inaccessible worlds. Moreover, in *Milk Drop, Coronet* the entity of

time itself, Edgerton implicitly argues, is ours to explore – and perhaps even master, photographically.

Edgerton explains the peculiar and popular realism of the atomized seconds that are given visual representation in his stroboscopic images in a caption for *Placement Kick* (1934: “Every football fan has seen a placement kick, but no one has observed what actually happens in the fraction of a second when the booter’s toe meets the pigskin.”¹¹⁸ Viewers take Edgerton’s images on faith, because they have no means of verifying them. But as Philip Prodger suggests, the fraction-of-a-second exposure was regarded in the late-nineteenth and early-twentieth centuries as synonymous with “the instantaneous,” the “authentic,” and the “trustworthy.”¹¹⁹

The unique realism offered by stroboscopic photographs creates a visual frame of reference for the previously unappreciated microsecond. Moreover, Marta Braun suggests that Edgerton’s photographs “persuade us once more to accept the belief that the ultimate arbiter of reality is, finally, what can be pictured by a camera.”¹²⁰ In this sense, though, Edgerton’s images offer a natural extension of the dialogues of abstraction suggested decades earlier by Muybridge’s awkwardly trotting equines that resulted from longer fractional-second-exposures. Ironically, while Edgerton’s stroboscopic images function as abstractions with

¹¹⁸ Ibid, 76.

¹¹⁹ Prodger, *Time Stands Still*, 43.

¹²⁰ Braun, “The Expanded Present,” 184.

respect to the unaided temporal sensory experience, they persuasively transform the seemingly intangible, mathematical concept of the $1/1,000,000^{\text{th}}$ of a second into a reality. By doing so, Braun explains, stroboscopy “redefined the length of time we call an instant” a thousand-fold from Muybridge’s earlier visual representations of $1/1,000^{\text{ths}}$ of a second.¹²¹

But a detailed case study of an exemplary sample of Edgerton’s stroboscopic work also suggests that the fraction-of-a-second convention of representing time is actually layered, and rich with additional temporal complexities. This chapter aspires not to provide a reiteration of the existing field of scholarly literature on Edgerton’s stroboscopic photographs – the majority of which offers a detailed technical view of his work at M.I.T., or comments on the peculiar realism offered by the fraction-of-a-second exposure.¹²² Instead, this dissertation focuses exclusively on the temporal implications of Edgerton’s stroboscopy.

¹²¹ Braun, *Picturing Time*, 135.

¹²² Scholarly literature on Edgerton’s stroboscopic works includes: Roger Bruce, *Seeing the Unseen: Dr. Harold Edgerton and the Wonders of Strobe Alley* (Rochester, N.Y.: The Publishing Trust of George Eastman House, 1994). Bruce’s book provides a view of Edgerton’s biography and scientific interests, and details Edgerton’s photographic studies, in chronological form. Marta Braun also ties Edgerton’s work to a larger climate of interest in capturing motion with photography, an endeavor which also preoccupied Muybridge and Marey: Braun, “Time and Photography”; Braun, *Picturing Time*, 135-136. James Elkins takes a phenomenological look at Edgerton’s rapatronic photographs: James Elkins, “Harold Edgerton’s Rapatronic Photographs of Atomic Tests,” *History of Photography* Vol. 28, No. 1 (2004): 74-81. Max Perchick provides additional biographical and technical details: Max Perchick, “Extending the Frontiers of Photographic Vision,” *PSA Journal*, Vol. 62, No. 11 (1996): 26. Stephen Dalton’s book takes a look at the work of Edgerton and other high-speed photographers: Stephen Dalton, *Split Second: The World of High-Speed Photography* (Salem: Salem House, 1984). None of these works examines the layered temporalities of Edgerton’s stroboscopy.

I. Case Study: *Death of a Light Bulb* - Temporal ‘Otherness’

Death of a Light Bulb/.30 Caliber Bullet, 1936 (**Fig. 2**), consists of four photographs arranged in two rows of two images each. To make the series Edgerton placed a bulb in total darkness. His stroboscopic device was triggered when a microphone registered sound (in this case, the discharge of a bullet), and an electric current prompted the firing of a flash. Edgerton’s device emitted a burst of light lasting one $1/1,000,000^{\text{th}}$ of a second, which provided sufficient light exposure upon the film.¹²³

Yet even a millionth-of-a-second exposure, Charles Sanders Peirce suggests, embodies duration, and an easily overlooked complexity: “[e]ven what is called an ‘instantaneous photograph,’ taken with a camera, is a composite of the effects of intervals of exposure more numerous by far than the sands of the sea.”¹²⁴ Indeed, it would take 1,000 nanoseconds to comprise one microsecond, and 1,000,000 picoseconds to make one microsecond. Time, in these various infinitesimal forms, has a mathematical, abstract quality that exceeds the sensitivity of human perception and temporal experience. For instance, the sequence of events in *Death of a Light Bulb* would have unfolded faster than

¹²³ In addition to standardizing time worldwide, indoctrinating time zones, and introducing “daylight savings time,” the age of modernity also brought with it an awareness of and set of measurements for infinitesimal spans of time. A millisecond is 1,000th of a second, a microsecond (the duration of a flash of light of Edgerton’s stroboscope) is 1,000,000th of a second, a nanosecond is 1,000,000,000th of a second, and a picosecond is 1,000,000,000,000th of a second. All were introduced in the modern age.

¹²⁴ Charles Sanders Peirce, *Collected Papers of Charles Sanders Peirce*, Charles Hartstone and Paul Weiss, eds. (Cambridge: Harvard University Press, 1932), 267.

human cognition could process it, had we been the victim of the shooting. According to Max Perchick, human cognition occurs about ten-thousand times slower than the 1,000,000th-of-a-second stroboscopic exposure.¹²⁵ The impossibility of the human body's ability to relate stroboscopic time enables us to regard this photographic practice's images as abstractions and as temporal "others."

The clever title of the photographic series *Death of a Light Bulb/.30 Caliber Bullet*, provides the framework within which the meaning of these images unfolds. When "read" in sequential order (from top to bottom, left to right), the four photographs represent the sequential passage of a bullet through a light bulb, broken into presumably equal intervals of time. In other words, Edgerton leads his viewers to follow a plot of "death" from its inevitability (implied by an approaching bullet) in the first frame to the slow entry and internalization of the bullet by the bulb in the next two frames. In the final photograph, the bullet exits its victim, leaving a spattering of dust and a cracked, soon-to-collapse bulb in its wake.

The unfolding of Edgerton's narrative plot depends upon viewers to associate the images with each other, in linear order, and to imagine the unseen events that transpired within the durations left unseen that transpired between these images. Images such as *Death of a Light Bulb* – which unfold sequentially,

¹²⁵ Perchick, "Extending the Frontiers of Photographic Vision," 26.

like comic strips – create meaning by what Barthes suggests is a system of “relay.” He explains:

Here (in cartoons and comic strips) text (a snatch of dialogue say) and image stand in a complementary relationship. The words, as well as the images, are fragments of a more general syntagm, and the unity of the message is realized at a higher level, namely, at the level of the story, the anecdote, the diegesis.¹²⁶

Observers readily engage in supplementing the images with narrative (“text,” in Barthes’s terms), to create the cohesive “story” for *Death of a Light Bulb*.

Literature scholar Karen Parna points out that conjuring such narratives “enable[s] the receiver to recognize concrete objects and situations but [it] also provide[s] a means to grasp and analyse abstract notions, such as space, time, movement, change.”¹²⁷ In order to appreciate the implied duration of the light bulb’s death – from the anticipation of being shot to the reality and aftermath of such a fate – viewers must temporalize and project, imagined, creative narratives upon the series of photographs.

Viewers are eager to project these temporal dimensions upon a series of photographs, and often readily participate in this process. For instance, Batchen offers a study of the subtle details that changed between Daguerre’s successive exposed plates of *Boulevard du Temple*. Small details – such as shifted light sources and open-and-closed window shutters – reveal the passage of time

¹²⁶ Roland Barthes, “Rhetoric of the Image,” *Image, Music, Text*. ed. and trans. Stephen Heath (New York: Hill and Wang, 1977), 41.

¹²⁷ Karen Parna, “Narrative, Time and the Fixed Image,” in *Time, Narrative and the Fixed Image*, Mireille Ribiere and Jan Baetens, eds. (Atlanta: Rodopi, 2001), 31. The author’s spelling has not been changed.

between these frames of suspended, unresolved past duration, and they suggest additional unseen activities whose consequences bear upon the exposures we *do* see.¹²⁸ Observers nonetheless fill in these temporal gaps to glean a narrative of the passage of time from the apparent change of spatial relationships apparent by comparing these images.

Nonetheless, as observers conjure creative narrative times to position the images with respect to each other, they share the heightened, slowed awareness of time during what Edgerton tells us is the light bulb's final millionth-seconds of life. Edgerton grants the light bulb the personifying experience of death, leading viewers to also consider the bulb's shape as vaguely resembling that of a human head. Viewers feel sympathy for the light bulb, but also are intrigued by the macabre details of seeing every detail of its murder. An ambivalent mix of dread and curiosity pervades our experience, conjuring not only the object's death but also our knowledge of our own inevitable deaths. The title of the series thus evokes in viewers a consideration of time's perceived differential speed during the final moments of life while also prompting observers to imagine the end of their own lives at some point in the future.

As we look at photographs of a light bulb that already has "died," we are therefore reminded of Barthes's suggestion that photographs have a peculiar and complex manner of linking the finality of death to time's passage. Barthes, for example, wrote that the photograph has a peculiar capacity to represent the past in

¹²⁸ For a more detailed examination of this image than this dissertation allows, please see: Batchen, *Burning with Desire*, 133-143.

the present, and thus to testify to the passing of time.¹²⁹ Therefore, Barthes argued, all photographs speak of our own death's inevitability in the future. Thus, as viewers approach Edgerton's *Death of a Light Bulb*, multiple relationships to time are conjured simultaneously, all with death as their final consequence.

In similar fashion, André Bazin wrote that photography atomizes and “embalms time, rescuing it simply from its proper corruption.”¹³⁰ The “corruption” to which Bazin refers is the violence of lived time's steadily flowing, relentless stream – which inevitably brings death to all of us. Photography halts time, sidestepping its cruel agency and the certainty of death. Our fascination with the medium is, in part, motivated by our own time anxiety and by the fear of death.

While the title of the series implies the light bulb's “death,” it is not obvious which image – if any – in the series reveals *the* final “death” moment. Perhaps the unseen, expected collapse of the bulb marks the “death.” Maybe the bulb “dies” in the final photograph, as the bullet's damage has been done. It is unclear. By gathering four sequential images under a single title, representing a single event (a death), Edgerton implies that all photographs are simply stills from the movie of life. In the first frame, a bullet that appears as a white blur approaches the light bulb at more than twice the speed of sound from the left.¹³¹

¹²⁹ Barthes, *Camera Lucida*, 96.

¹³⁰ Bazin, “The Ontology of the Photographic Image,” 4.

¹³¹ For details about the making of this image, please see: Dalton, *Split Second*, 26-27.

The light bulb is unscathed. Time in the first frame of the series is represented as an anticipatory future tense, as viewers know that about $1/1,000,000^{\text{th}}$ of a second later, the inanimate-but-personified light bulb will be struck by the projectile and “die.”

As viewers begin to make temporal associations with the series *Death of a Light Bulb*, they are drawn to the details in each image that conjure *additional* representations of photographic time. In the first image, viewers anticipate the bullet’s contact with the light bulb, a meeting that is stilled in the photograph just before it occurred, but which transpired in 1936. In other words, we are looking at the *future* “death” of a light bulb that actually transpired *74 years ago*. Our sense of tense distinction collapses upon itself.

Compression shock waves moving at 15,000 feet per second precede the bullet in the second image, making small cracks in the bulb as the bullet begins to enter the light bulb. A puff of glass dust and several cracks precede the bullet. The compression waves move faster than the projectile itself, lending the image a sense of past tense (“*the bullet lags behind the shock waves*”), present-ness (“*the bullet just entered the light bulb*”), and future anticipatory tense (*as viewers, in a Barthesian sense, await the full collapse and “death” of the light bulb*). In addition, the shock waves and bullet operate separately, yet simultaneously and in tandem, within the same microsecond-long exposure-time duration.

In Edgerton’s third image, no bullet appears at all. The projectile is contained inside the light bulb, and viewers anticipate its continued *future* travel

through the other side – and the completion of the light bulb’s destruction and “death.” The other side of the light bulb has begun to crack even before the bullet penetrates it, as a result of the compression wave of force that precedes the bullet.¹³² It foreshadows another certain *future* event, the collapse of the bulb. The trail of the bullet is marked by the small billowing of crushed glass powder, which trails the bullet passage and implies the *past*-tense event of the bullet’s penetration of the bulb. But viewers also appreciate the peculiar tense stasis of the *present-tense* exposure-time duration, during which the bullet presumably is suspended in mid-flight inside of the bulb.

And in the final image, the bullet has finished its travel through the light bulb, leaving the bulb’s surface fully marred with cracks. The bullet’s path is filled with an arrowhead-shaped residue of glass dust. A *past* tense (*marked by the physical proof of the bullet’s travel through the light bulb*) is implied in this image, along with a *present* tense (*the bulb has not yet collapsed, but is enjoying a fraction-of-a-second of pre-collapse stasis*), and an anticipatory *future* tense (*the light bulb is going to crumble*).

But Edgerton ends his series with this image, leaving further *future*-tense possibilities unspecified. Viewers are left to wonder: *What does the light bulb’s collapse look like? Why does he deny us one more image? Where does the bullet go next?* Edgerton leaves these aspects of *Death of a Light Bulb* unresolved,

¹³² Ibid, 26.

denying his observers temporal closure. As such, a lingering uncertain future tense looms beyond the frames of this image.

II. Complications of the Altered Series

Closer examination of the light bulb's cracks in the second, third and final images reveals that they are in different locations in images two, three, and four. This divulges a secret: Edgerton's photographs were not taken in consecutive microseconds, with an even interval between exposures.¹³³ The sequence is false. Edgerton's alteration of the series reveals failings in the design of the stroboscope. Film could not be advanced in less than a microsecond, so no more than one exposure can occur for each light-bulb-shooting event.

Instead, *Death of a Light Bulb* is comprised of four images of four different light bulbs as they are penetrated by four different bullets, from a session of photographing during which, most likely, dozens to hundreds of bulbs "died" in order for Edgerton to have enough images from which to compose a series. As an altered series, Edgerton's four chosen photographs reveal microseconds of non-consecutive, non-linear, creatively reconfigured time to make a new narrative: the *Death of a Light Bulb* (not of *four* light bulbs). The individual photographs may be (unverifiably) regarded as truthful to the microsecond-long appearance of spatial relations of a light bulb and bullet in the context of four separate light bulbs' "deaths," but the series is *not* truthful to the appearance of a

¹³³ Dalton, *Split Second*, 26.

singular bullet's passage through *a* light bulb. What, then, does the series of photographs offer, if not an objective document? This image depicts not what we *see*, but what we *know* – *bullets move through space with great speed* – even if we can only see the start and end of that movement with our unaided eyes. The photograph has an estranged relationship to perceived reality, and thus is an abstraction. Still, though, Edgerton's photographs are truthful to the appearance of a bullet in mid-flight as it approaches, enters, occupies and leaves these four light bulbs.

Instead, then, of readily projecting a linear temporal narrative of imagined events that transpired between the frames to support the plot suggested by Edgerton's title (this is *a* light bulb's "death"), viewers may begin to imagine the additional narrative possibilities implied by the interventions of the photographer. One might imagine Edgerton's many failed attempts to calibrate his machines properly so that he might capture an image of a bullet in mid-flight or a bullet entering, exiting or residing inside of a light bulb. Viewers may visualize the rubble of countless "dead" light bulbs on Edgerton's laboratory floor, or may imagine his difficulty selecting photographs for the series from pages of contact sheets, and editing them with the task of implying the fairly even temporal intervals of sequential steps of the "death" of *a* light bulb.

We are left to wonder: *Why did Edgerton select these scenes to illustrate, over the possibility of others?* Perhaps we can surmise that Edgerton was drawn by the first image's uncanny suspension of a bullet in mid-air, in mid-flight.

Conceivably, the destructive, advancing force of the compression shock waves – inaccessible to the unaided human eye – likely inspired him to pick the second photograph. Capturing a visual representation of the decisive microsecond in which the bullet was contained entirely within the bulb must have involved technical prowess, trial-and-error and luck. Similarly, the final image represents a fragile, fully cracked light bulb on the verge of collapse. Perhaps the challenge of achieving such images motivated Edgerton to select a representation of these microseconds as the third and fourth photographs of the series. Knowledge of the altered nature of this series of photographs draws viewers' attention to Edgerton's hand in the image-making process. This, in turn, adds additional dimensions of time, as observers consider the temporal specificities of Edgerton's presence and various facets of his working processes.

III. 'Fraction-of-a-Second' Temporality

As this chapter has argued, a detailed look at Edgerton's four-image series *Death of a Light Bulb* reveals this work to express much more than scientific/technical advances, or "unreal realism" involving everyday objects. In addition, this series expresses the layered temporal nature of narrative time – a concept that receives more extensive examination in the next chapter of this dissertation. The group of photographs evokes multiple possible collective narratives, each possessing a creative relationship to time, and often also conjuring personal associations. In addition, an in-depth look at each of

Edgerton's images suggests that these fraction-of-a-second-exposure photographs express time in many more ways than as a brief view of a "that-has been." Every image in the series offers a wealth of multiple implied temporal expressions. Moreover, after discovering that the series itself was made not of *one* light bulb's "death" event, but of *four* different bulbs, the photographs' expressions of time expand to include the implications of the process of Edgerton's making the series. While our existing discourses tend to examine Edgerton's work as a positivist scientific/technical milestone that reveals peculiar views of the 1,000,000th-of-a-second, its expression of time is in fact far more layered and complex.

IV. The Institutionalization of 'Instantaneity'

In the decades preceding Edgerton's popularized experiments, the representation of a brief instant of time was institutionalized among the masses around the fin de siècle as *the* way that photography relates to time. Kodak box cameras, introduced in 1888 and marketed to the masses, offered exposure times of 1/20th of a second.¹³⁴ In 1900, Kodak introduced the Brownie, which featured similar shutter speeds and was so affordable that even children could own them. These popular devices – along with the popularity of Edgerton's work in the mainstream press and the introduction in the 1920s of hand-held professional cameras such as the Leica, which had shutter speeds of 1/20th to 1/500th of a

¹³⁴ Newhall, *The History of Photography*, 129; Michel Frizot, *A New History of Photography* (Köln: Könemann, 1998), 238.

second – helped to further establish photography as a medium that operates by the logic of the temporal fragment, specifically, that of the fraction-of-a-second in duration.¹³⁵

The visual expressions of the fragmented second ceased to take on the character of an urgent, positivist technological/scientific challenge after Edgerton. Instead, art historian Gilles Mora suggests that the “aesthetic of instantaneity” in mass- and fine-art- photographic practices that resulted from the quest to “master” the fraction-of-a-second exposure has several distinct characteristics: (1) It encouraged the photographing of the people, things and activities of everyday life; (2) Reality was subject to “rigorous recording,” in the interest of capturing life’s “decisive moments”; and (3) “Imperfection” was seen as a “virtue,” and a mark of sincerity.¹³⁶ These trends, Mora argues, have influenced several documentary and fine-art photographers throughout the twentieth-century, including Jacques Henri Lartigue, Lewis Hine and Jacob Riis, Henri Cartier-Bresson, Ben Shahn, Garry Winogrand, William Klein, Lee Friedlander, Larry Clark and Nan Goldin, among others.¹³⁷ Moreover, they attest to the staying power of the fraction-of-a-second view of photographic time in our existing discourses.

¹³⁵ Gilles Mora writes: “Instantaneity was a feature in work made by several enlightened amateurs during the early years of the twentieth century, notably Jacques-Henri Lartigue. But it did not become truly established among professionals until the 1920s, after the appearance of small cameras such as the easily concealed Leica; at that point it was embraced by both photojournalists and street photographers.” Gilles Mora, *Photospeak* (New York: Abbeville Press, 1998), 179.

¹³⁶ *Ibid.*, 180.

¹³⁷ *Ibid.*

Perhaps the most influential advocate of this view was John Szarkowski, former Director of Photography at the Museum of Modern Art. In the 1966 exhibition catalog *The Photographer's Eye*, he presented the parameters for a formalist study of the medium that proposed that “time” is one of the essential universal attributes of photography.¹³⁸ A photograph – or “time exposure,” in Szarkowski’s terms – is an expression of *exposure time* – the variable temporal duration during which a camera’s shutter is open and light is collected.¹³⁹ According to Szarkowski, photography provides a unique “discrete parcel” of time,” a concrete and absolutist expression of “only that period of time in which it was made” in an *autonomous past* that supersedes any subsequent efforts of contextualization and interpretation.¹⁴⁰

¹³⁸ In the 1966 exhibition catalog *The Photographer's Eye*, Szarkowski argues that all photographs share a set of five common characteristics: “The Thing Itself,” “The Detail,” “The Frame,” “Time,” and “Vantage Point.” Szarkowski, *The Photographer's Eye*, 8-11. Italics are my emphasis. Szarkowski maintains this formalist thesis and attention to the “time exposure,” or exposure time, in his later exhibition *Photography Until Now*. He writes in the exhibition catalog that photography was born from a three-fold confluence of advances in optics and chemistry, and from “the poetic idea that it might be possible to snatch from the very air a picture formed by the forces of nature.” John Szarkowski, *Photography Until Now* (New York: Museum of Modern Art, 1989), 11, 35.

¹³⁹ Szarkowski, *The Photographer's Eye*, 10. Italics are my emphasis.

¹⁴⁰ Ibid. Italics are my emphasis. Several scholars writing during the 1980s – including John Tagg, Richard Bolton and Abigail Solomon-Godeau – have argued in favor of moving beyond formal analysis and past essentialist discourses, in favor of reflecting on photography’s complexity, multiplicity, and its specific functions in different social/cultural contexts. As scholars such as John Szarkowski worked to articulate the medium’s formal essence, Tagg argued: “Photography as such has no identity. Its status as a technology varies with the power relations which invest it. Its nature as a practice depends on the institutions and agents which define it and set it to work. Its function as a mode of cultural production is tied to definite conditions of existence, and its products are meaningful and legible only within the particular currencies they have. Its history has no unity. It is a flickering across a field of institutional spaces. It is this field we must study, not photography *as such*.” John Tagg, “Evidence, Truth and Order,” in *The Burden of Representation: Essays on Photographies and Histories*, ed. John Tagg (London: Macmillan, 1988), 63. In addition, Bolton provocatively stated that “photography has no governing characteristics at all

For instance, although Szarkowski considers Callahan's expression of time in *Detroit* (1943) in formalist, material/technical terms (as multiple durations – or “thin slices” – on a single frame of film), Callahan's photograph can also be interpreted as an expression of visual simultaneity, in the service of conveying the layered sensory experience of Detroit's then-bustling, dynamic Irving Theater district. To viewers in the year 2010, this photograph further functions as a nostalgic reference to the glorious, thriving past of a city which is in great peril after a series of 1960s race riots emptied its downtown businesses and its economic lifeblood, the automobile industry, currently nears extinction. By defining photography as a “time exposure” and privileging only the exposure duration's now-present image of spatial relationships between objects in a fragment of time from the past, however, Szarkowski does not allow for social and cultural interpretations which might reveal new possible photographic expression of time. Such interpretations might destabilize the primacy of the exposure duration as *the* means by which photographs express time. His formalist definitions of the parameters of photography's study stand aloof from histories which might introduce the changeable, individually subjective temporal experiences of the modern viewer. Instead, Szarkowski's definition of photography's essence grants primacy to time's visual representation as it exists in concrete material form, autonomously expressed within the image's frame.

save adaptability.” Richard Bolton, *The Contest of Meaning: Critical Histories of Photography* (Cambridge: M.I.T. Press, 1989), xi.

In 1989, Szarkowski furthered the premise of his essence-seeking project, *The Photographer's Eye*, in the exhibition and catalog *Photography Until Now*. The book provides a chronological history of the medium's technological evolution, which includes progressive improvements in chemistry and optics, as well as the impact of mechanical reproduction and economic constraints.¹⁴¹ Szarkowski implicitly argues that time is the agent which brings successive technological improvements that enabled the medium's practitioners to "master" the medium by controlling its variables, including photo-chemical sensitivity and the mechanics of optical/camera devices. Szarkowski's essentializing history presents a positivist look at a medium in the throes of an "historic and continuing search for a renewed and vital identity."¹⁴² *Photography Until Now* upholds Szarkowski's previous definition of photography's medium-specificity at a time when the increasing presence of postmodern theoretics in photography's historical study threatened to destabilize formalist discourse.¹⁴³

¹⁴¹ Szarkowski, *Photography Until Now*.

¹⁴² Szarkowski, *Photography Until Now*, 9.

¹⁴³ Conversely, Solomon-Godeau advocates the study of the way by which photographs construct meanings and ideologies within existing social, political and gender-identity constructs. For a succinct recent statement of her position, please see: Abigail Solomon-Godeau, "Ontology, Essences, and Photography's Aesthetics: Wringing the Goose's Neck One More Time," in *Photography Theory*, ed. James Elkins (New York: Routledge, 2007), 256. Solomon-Godeau questions the degree to which a search for the medium's essence, efforts to explore its medium specificity, and defining photography's identity in indexical terms are even constructive endeavors: "[T]he impossibility of conceptualizing photography as a unitary or autonomous entity is doomed to fail, just as would be the case with any other technology that has become braided into all aspects of modernity, and now postmodernity. Whereas the debate on indexicality might have, perhaps should have, opened up the conversation to photography/photographs-in-the-world, . . . instead it has produced a great deal of conversation about photography-in-the-art-world. This is, of course, a perfectly valid subject to pursue, but it cannot lead to the promised land of

Again, “time” appears as one of the components of that identity. But in *Photography Until Now*, Szarkowski expands his former definition of the photograph as a materialized “time exposure” – or as “exposure time” – by addressing what transpires *during* an exposure. Specifically, Szarkowski writes that photography was born from a three-fold confluence of advances in optics and chemistry, and from “the poetic idea that it might be possible to snatch from the very air a picture formed by the forces of nature.”¹⁴⁴ Although this approach represents a loosening of his earlier formalist approach toward the consideration of a photograph’s context, Szarkowski’s articulation of the medium’s relationship to time nonetheless remains anchored in the materiality of the photograph, as it was technologically determined. This unique ability of the camera to “snatch” “a picture,” he argues, grants the medium historical descent from Renaissance perspective, and therefore earns photography an art-historical/canonical pedigree.¹⁴⁵

Specifically, in *Photography Until Now* Szarkowski describes light as the agent that “changes the nature and the aspect of things.”¹⁴⁶ Here, light co-mingles with time, and both are discussed by Szarkowski as ephemeral, fleeting and as entities that bring change. The photograph – literally, “light writing” – allows for

conceptualization, nor can it provide any enlightenment as to why, more than a century and a half after photography’s overdetermined debut, we still lack the means to conceptualize it.” Ibid, 269.

¹⁴⁴ Szarkowski, *Photography Until Now*, 11, 35.

¹⁴⁵ Ibid, 11, 15, 19, 35.

¹⁴⁶ Ibid, 14.

a “discrete parcel” of time – and its partner entity, light – to be stilled in two-dimensional form.¹⁴⁷ Moreover, Szarkowski suggests that photographs isolate singular ephemeral fragments of light reflected from objects during a technologically determined temporal continuum. He describes the unique ability of the camera obscura to capture “the exact quality of light, specific to a given hour,” and photography’s inventors’ view of the medium as a means to “make pictures formed directly by the agency of light’s energy.”¹⁴⁸

Exposure time, which comprised a main focus of his earlier project, is an unspoken premise of Szarkowski’s expanded definition of the medium’s unique essence: its innate ability to capture a fleeting parcel of light. The photograph’s exposure duration remains the necessary agent for Szarkowski of managing the amount of light received by the camera device. He points out that the collection of too much or too little light results in illegibility. To illustrate this point, Szarkowski describes in detail the various founding inventors’ struggles to gain mastery over exposure times, in order to create legible photographs.¹⁴⁹ Fittingly, Edgerton’s images – which epitomize the ultimate technical mastery over of the exposure – are included in both *The Photographer’s Eye* and *Photography Until Now*.¹⁵⁰

¹⁴⁷ Ibid.; Szarkowski, *The Photographer’s Eye*, 10.

¹⁴⁸ Szarkowski, *Photography Until Now*, 14.

¹⁴⁹ Ibid, 11, 35.

¹⁵⁰ Ibid, 318.; Szarkowski, *The Photographer’s Eye*, 104.

This definition of the medium has held great sway over our existing histories of photography. Photography historian Abigail Solomon-Godeau writes that formalist essentialist definitions of photography have become “*the way that photographic modernism appears today in its most academicized and institutionalized form,*” as a result, in large part, to Szarkowski’s work.¹⁵¹ The influence of Szarkowski’s work at the Museum of Modern Art upon current scholarship cannot be understated. According to art historian Christopher Phillips: “[T]he MoMA Department of Photography, [which] for nearly half a century, through its influential exhibitions and publications, has with increasing authority set our general ‘horizon of expectation’ with respect to photography.”¹⁵² That ‘horizon of expectation’ included defining the medium in concise formal terms which, according to Phillips, functioned “more or less independent of the medium’s everyday uses.”¹⁵³ Defining the medium in terms of its unique physical or formal characteristics, according to Phillips, allowed for “the theoretical salvaging of photography in its entirety from the encroachments of mass culture.”¹⁵⁴ He continues: “[Szarkowski] wished, on this account, to redefine the

¹⁵¹ Ibid, 140-141. Italics are my emphasis.

¹⁵² Christopher Phillips, “The Judgment Seat of Photography,” *October*, Vol. 22 (Autumn, 1982): 28.

¹⁵³ Ibid, 53.

¹⁵⁴ Ibid, 53-54.

medium's aesthetic nature in such a way as to set it on an irrevocably autonomous course."¹⁵⁵

In response to Szarkowski's formalist emphasis of an autonomous, un-recontextualizable "time exposure" that represents "only that period of time in which it was made," scholars such as Solomon-Godeau have argued that photographs cannot be separated from the social/cultural and interpretive constructs that give them meaning.¹⁵⁶ She suggests that "the impossibility of conceptualizing photography as a unitary or autonomous entity is doomed to fail, just as would be the case with any other technology that has become braided into all aspects of modernity, and now postmodernity."¹⁵⁷ In a review of Szarkowski's 1989 exhibition *Photography Until Now*, Solomon-Godeau argues that "the task of thinking about the medium in historical terms" "perpetually deferred," because such inquiries are "located outside the confines of the picture frame."¹⁵⁸

This project makes a contribution to the project of articulating photography's role in shaping modern vision – and vice-versa. It looks beyond a material consideration of time as an autonomous "discrete parcel" of exposure time to examine the changing philosophical, social and cultural nature of seeing,

¹⁵⁵ Ibid.

¹⁵⁶ Szarkowski, *The Photographer's Eye*, 10. Solomon-Godeau previously raised such a critique in direct response to Szarkowski's exhibition *Photography Until Now*: Solomon-Godeau, "Mandarin Modernism," 148.

¹⁵⁷ Solomon-Godeau, "Ontology, Essences, and Photography's Aesthetics," 269.

¹⁵⁸ Ibid, 183.

which is explored in tandem with the images it influences. That is to say, this is a history of photographic time, as it is located both *inside and outside* the picture frame. It considers images such as Edgerton's, which exemplify prevailing and persisting conceptions of the medium's expression of time that were championed by Szarkowski and have had staying power in our current discourses. But it also expands upon views of the conventional, fraction-of-a-second photographic time to allow for layered investigations of images' various temporal dimensions.

But this dissertation also interrogates a perception of photographic time as consisting solely of an autonomous, "discrete parcel" of "exposure time." It tests the limits of this convention by introducing the racing Photo Finish and its antecedent practices, such as the panorama, as well as N.A.S.A.'s whole-Earth composite/montage digital photography and their precedents. These practices test the parameters of Szarkowski's "thin slice" of time while suggesting that photographs have many *more* ways to represent time – perhaps as many as there are ways to experience time itself.

Chapter Three: Narrative Time

Family photographs – both snapshots and formal portraits – sometimes seem to make time shorter or to erase it. Because they make it possible to bring everyone into the present – to make dead relatives come alive – they actually help to turn time into a place! ... I get the feeling that my long dead relatives are simply living somewhere else, and these photographs I gaze at so intently bring them here. One of the barriers that keeps me from them is eliminated. I move closer to all those people from my past.

– Catherine Hanf Noren¹⁵⁹

This chapter will explore the temporal complexity of an exemplary fin-de-siècle family portrait from the American Midwest. This commonplace vernacular photographic practice is often overlooked in our histories, despite its ubiquity and complexity as a visual form. Specifically, a closer look at the *Leighton Family* portrait (**Fig. 3**) allows for the exploration of *narrative time* – a subjective, creative, often non-chronological, mutable context that is imposed upon a work by an observer.¹⁶⁰ *Narrative time* provides one manner of addressing the

¹⁵⁹ Catherine Noren, *The Way We Looked: The Meaning and Magic of Family Photographs* (New York: Lodestar Books, 1983), 5.

¹⁶⁰ Modern authors' experimentation with temporal subjectivity is the subject of a wellspring of recent scholarship in the field of literature studies. Stephen Kern presents a detailed analysis of the characteristically "modern" fracturing and reconfiguration of narrative and temporality in literature by dozens of authors, including Marcel Proust, James Joyce, and Virginia Woolf: Kern, *The Culture of Time and Space*. The newfound temporal fluidity of the age of modernity liberated authors such as Proust, Joyce, and Woolf to create imaginative fictions featuring fractured, non-linear narratives, stream-of-consciousness narration, and minimalist plots distended over hundreds of pages. In her diary, Virginia Woolf commented about this revolution of expressing non-linear temporality in modern literature: "They've changed everything now. We used to think there was a beginning and a middle and an end." Virginia Woolf, *A Writer's Diary: Being Extracts from the Diary of Virginia Woolf*, Leonard Woolf, ed. (New York: Harvest/HBJ Books, 1954), 136, 93.

possibilities of the imaginative, subjective, simultaneous, multiple-tense photographic time whose possibilities have been suggested by Benjamin and Barthes.

I. A Case Study: The *Leighton Family* Portrait

The *Leighton Family* is a group portrait of a father, Samuel Humphrey Leighton, a mother, Cynthia Belle Finch Leighton, and their eight children, Nancy Ellen, Laura Hazel, Samuel David, Jacob Lafayette, Elbye Ann, Grover Cleveland, Lilly Lucinda, and Isa Belle Leighton.¹⁶¹ A note on the back of the photograph that was written by the image's former owner, Samuel Bernard Leighton – Grover's son – indicates that one additional Leighton child, William

Modern novelists were expected to break free from “the determination of an onerous plot” and contribute to the project of interrogating the linear narrative as a “logical and progressive order.” See: Malcolm Bradbury and James McFarlane, *Modernism, 1890-1930* (New York: Penguin, 1976), 393. Kern categorizes the various new approaches to literary narrative time as such: “Three major developments can be marked in the shift away from the traditional narrative framework: the affirmation of subjective time, the subversion of narrative, and the recognition of simultaneity.” Stephen Kern, “Time and Art in Twentieth-Century Culture,” in *Tempus Fugit: Time Flies*, Jan Schall, ed. (Kansas City, Mo.: Nelson-Atkins Museum of Art, 2000), 23. Recently, a group of literature scholars in France and Belgium begun interdisciplinary work on the relationship of photography to a literary narrative temporality, and published this text of conference papers on the topic: Mireille Ribiere and Jan Baetens, eds. *Time, Narration, and the Fixed Image* (Amsterdam and Atlanta: Rodopi, 2001). The essays in this volume focus on the affinities between photographic representation and linguistic representation, and on the interplay between objects and text in images. Missing from current literary/photographic interdisciplinary discourses is an analysis of the various temporal dimensions of observer-generated narratives.

¹⁶¹ Samuel Bernard Leighton identifies the subjects of this image as: “Front Row, L to R: Aunt Ella, Grandpa, Sam H. Leighton, Aunt Hazel, Grandma Cynthia Leighton, Uncle Sam D., Uncle Jacob, Back Row, L to R: Aunt Elybe, Grover My Dad, Aunt Lucendy, and Aunt Isa.” His caption also gives the photograph the title *Leighton Family*.

Orman, had not yet been born to the couple at the time the photograph was taken.¹⁶²

The Leighton family poses in two loosely organized rows, and each member meets the direct gaze of the camera. This organization reflects conventions of subject posing that were handed down to photography from group-portrait painting.¹⁶³ Nobody smiles.¹⁶⁴ The youngest Leighton children sit still and appear well-behaved, as portrait-photography customs then dictated.¹⁶⁵ This photograph, made in the early months of 1899, follows in a tradition of family portraiture that finds precedent in Egyptian and Etruscan Art.¹⁶⁶ A painted backdrop features two joined classical columns that are met by a vertical row of geometric tiles and the hint of palm-tree foliage. These architectural details and the presence of a sprig of tropical plant growth lend exoticism to this staged group portrait of a Midwestern farming family. Although the Leightons were considered

¹⁶² Ownership of this photograph passed to Samuel Bernard Leighton's daughter, Karen (Leighton) Belden, upon his death in 2006.

¹⁶³ For a discussion of the relationship between subjects' conventional poses in family photographs and portrait-painting, see: Philip Stokes, "The Family Photograph Album: So Great a Cloud of Witness," in *The Portrait in Photography*, ed. Graham Clarke (Seattle: University of Washington Press, 1992), 192-205.

¹⁶⁴ Smiling did not become part of the family-portrait posing convention until the 1930s, after a marketing blitz by the Kodak Corporation encouraged subjects to smile in order to appear "alive": Christina Kotchemidova, "Why We Say 'Cheese': Producing the Smile in Snapshot Photography," *Critical Studies in Media Communication* Vol. 22, No. 1 (2005): 2-25.

¹⁶⁵ Stokes, "The Family Photograph Album," 192-205. At this time, children were depicted in family portraits as well-behaved and still. This convention changed shortly after this photograph was taken. In the twentieth century, parents photographed their brood in the act of play, in order to convey that a family had enough money to allow children to enjoy the luxury of leisure time. *Ibid.*

¹⁶⁶ For more about the evolution of family portraits, see: Richard Chalfen and Julia Hirsch, *Family Photographs: Content, Meaning, and Effect* (New York: Oxford University Press, 1981).

well-traveled because they had journeyed to Iowa and Kansas on the Chisholm Trail and the Rock Island Railroad, no written evidence exists to suggest that any of the subjects of this image had seen Greece, Italy or tropical plants firsthand by 1899.¹⁶⁷

A poem written about the making of this photograph by one of its subjects, Nancy Ellen (“Ella”) Leighton Miller (**Fig. 4**), suggests that the photograph was taken indoors, in a photographic studio located in the upstairs floor of a building in Dover, Oklahoma.¹⁶⁸ No studio stamps or imprints are affixed to the image, and its case or cardboard sleeve is not attached. Efforts to confirm Miller’s account and determine the maker of this image were inconclusive.¹⁶⁹

The Leightons cluster together and present themselves as a tight-knit, cohesive group. They project an image of idealized unity.¹⁷⁰ However, Barthes

¹⁶⁷ Billie Flora Leighton, “Notes on Family History,” Quinter, Kan. Property of Karen (Leighton) Belden. Dover, Oklahoma (population: 367 in the 2000 census), is located in Kingfisher County, and is crossed by Highway 81. The Rock Island Railroad currently runs along the west side of this thirteen-street town. The Chisholm Trail was a cattle/trading trail leading from southern Texas to Abilene, Kansas.

¹⁶⁸ Nancy Ellen Leighton Miller, “The Gumps’s Pitcher Taken,” (Ellis, Kan.: n.d.).

¹⁶⁹ The only turn-of-the-century photography studio uncovered in research was Schiffert Studio in Kingfisher, Oklahoma – nine miles from Dover. This studio was operational in 1909. It is possible that the photograph may have been made there, although a poem written by Miller several decades after the photograph was made suggests that the studio was in Dover: Miller, “Various Unpublished Poems,” (Ellis, Kan.: n.d.). As this chapter later will discuss, Miller’s potential mistake – if indeed it is one – finds precedent in the written comments about photographs by Walter Benjamin and Roland Barthes.

¹⁷⁰ Susan Brynteson and Rebecca L. Melvin, *Self Works: Diaries, Scrapbooks and Other Autobiographical Efforts* (Newark, Del.: University of Delaware, 1997). As this chapter soon will discuss, Miller’s poem about this photograph written several decades later suggests that several of the family members were at odds with each other during the event of being photographed. However, it would have violated portrait conventions for them to reveal such tensions in the *Leighton Family*.

reminds us of the self-awareness and artifice inherent in the event of being photographed:

In front of the lens, I am at the same time: the one I think I am, the one I want others to think I am, the one the photographer thinks I am, and the one he makes use of to exhibit his art. In other words, a strange action: each time I am (or let myself be) photographed, I invariably suffer from a sensation of inauthenticity, sometimes of imposture...¹⁷¹

By likewise lending themselves to this “strange action” of being photographed that Barthes describes, the Leightons succumb to the projection and dissemination of various “*selves*” that the image simultaneously rehearses and creates. But each of these “*selves*” enjoys a unique and changeable temporal specificity, and are not mutually exclusive. The photographic subject’s considerations of who “I think I am,” who “I want others to think I am” and “the one the photographer thinks I am” have a changeable degree of temporal precision, but these considerations exist and may evolve *in time*.

In addition, as Barthes suggests, the “*selves*” that viewers perceive when the image is exhibited in various contexts are observer-dependent and enjoy interpretive temporal fluidity. A viewer’s placement of a family portrait within a non-linear, non-sequential temporal continuum by adding a fictional narrative convolutes distinctions between *time* and *temporality*, implying that time’s basis in human reality lies in its embodiment as the temporal – as Bergson, Durkheim and Benjamin have suggested, and the previous chapter has discussed.¹⁷²

¹⁷¹ Barthes, *Camera Lucida*, 13.

¹⁷² Prior to Bergson’s writings, psychiatrist Eugène Minkowski studied his patients’ varying experiences of the perceived tempo and continuity of ‘lived time.’ Minkowski argued that time

Neurophenomenologist Francisco J. Varela provides the following summation of the “embodied philosophy” of perception that has dominated the age of modernity: “Reality is not cast as a given: it is perceiver dependent, not because the perceiver ‘constructs’ it at whim, but because what counts as a relevant world is inseparable from the structure of the perceiver.”¹⁷³ The influence of this trend has been noted by art historian Jonathan Crary, who has argued that the modern observer embodies a unique, unprecedented subjectivity. In the sections that follow, the multiple temporal dimensions of these various “selves” will be discussed in relationship to a case study of the *Leighton Family* portrait. It will be argued that Barthes’s categories of “selves” present a window for the further examination of the expanded possibilities of photographic temporality, and of photography’s engagement with modernity itself.

(expressed as “past,” “present,” and “future”) is a universal and fundamental part of human existence which was perceived differently. His work is discussed in: Kern, *The Culture of Time and Space*, xi. Francisco J. Varela points out that the embodiment of temporal subjectivity is shaped by contexts: “[C]ognition depends on the kinds of experience that come from having a body with various sensorimotor capacities; and second, those individual sensorimotor capacities are themselves embedded in a more encompassing biological and cultural *context*.” Francisco J. Varela, “The Re-Enchantment of the Concrete,” in *Incorporations*, Jonathan Crary and Sanford Kwinter, eds. (New York: Zone, 1992), 329. Italics are Varela’s emphasis.

¹⁷³ Ibid, 330. The “embodied philosophy” of human consciousness locates cognition within the biological system, and argues that cognition is subjectively and phenomenologically experienced. Varela’s work is therefore influenced by the phenomenological writings of Edmund Husserl and Maurice Merleau-Ponty.

II. The Temporal Complexity of *'The One I Think I Am'* and *'The One I Want Others to Think I Am'*

Subjects' deliberate presentations of themselves in photographs such as the *Leighton Family* portrait are efforts to connect to a more distant historical narrative. Photography historian Liz Wells argues that family photographs re-enact the plights of ancestors, recapture personal history, and therefore provide a context for individuals' lives.¹⁷⁴ They collapse distinctions between Barthes's categories of "*the one I think I am*," "*the one I want others to think I am*" and "*the one the photographer thinks I am*." In other words, in this sense alone, the *Leighton Family* has multiple cognitive temporal implications.

The first Leightons to arrive in America, Thomas and Joanna, came from Glasgow, Scotland, in 1633, and coincidentally settled in Dover, New Hampshire after arriving on the fourth passage of the Mayflower. Thomas was a wealthy urbanite who shared a bloodline with Geoffrey Chaucer, John Locke and artist Frederick Lord Leighton.¹⁷⁵ This information was passed from generation to generation in family folklore.¹⁷⁶ It shaped the Leightons' collective identity, providing the subjects of this photograph with a means of connecting to a distant,

¹⁷⁴ Liz Wells, *Photography: A Critical Introduction* (New York: Routledge, 1997), 150-151.

¹⁷⁵ Genealogy.com, "Search for 'Samuel H. Leighton'" (accessed March 13, 2007).; Perley Maynard Leighton, *A Leighton Genealogy: Descendants of Thomas Leighton of Dover, New Hampshire*, Vols. 1-2 (Boston: New England Historic Genealogical Society, 1989).

¹⁷⁶ Stories about connections to these notable figures were part of the Leighton family's folklore. These ancestral links were confirmed by genealogical research by the author of this dissertation. However, some slight embellishments did occur over the years. For instance, Mingo Native American "Morning Dove's" marriage to one of the Leighton men has been represented in family folklore as a recent event. But it occurred around the time of the American Revolutionary War (c. 1775).

ancestral past. The Leightons' conscious choice to wear crisp formal clothing conveys the social status and success expected, historically, of "Leightons."¹⁷⁷

This generation of Leightons also would have been familiar with other ancestors whose personal histories intersected with the history of America. Jacob Leighton, Samuel's father, served as a surgeon for the Union during the Civil War. Various Leightons served as soldiers in the American Revolution, and several ancestors worked as constables in early settlements in Maine and New Hampshire.¹⁷⁸ Later descendants of the Leighton family would include Presidents Warren G. Harding, George H. W. Bush and George W. Bush and pioneering pilot Amelia Earhart.¹⁷⁹

The *Leighton Family's* conscious presentation of affluence and success in an exotic, unfamiliar setting thus connects to a broader temporal continuum, positioning this group within a personal history involving stories of wealth and courage, on and *beyond* the frontier, and within American history. On April 22, 1889, these Leightons were among an assembly of 100,000 wealthy settlers who

¹⁷⁷ For more about how family snapshots relate to the projection of an image of social and economic success, see: Jeremy Seabrook, "Photography and Popular Consciousness: My Life Is In That Box," *Ten.* 8, No. 34 (Autumn 1989): 34-41.

¹⁷⁸ Following the "Leighton" family name in genealogy records produced a lineage of shopkeepers and farmers, including Solomon Leighton (1739-1809), who served in the Revolutionary War, in New Hampshire's Second (Poor's) Regiment/ Eighth Continental Regiment. Thomas Leighton, Jr. (1642-1677) served as a constable of Dover, New Hampshire. His parents, Thomas Leighton (1604-1672) and Joanna Silsby Leighton (birth and death dates unknown, married Thomas in 1634), came to America from Glasgow in 1633, aboard the fourth crossing of the Mayflower. This information was gleaned from an extensive search of records through the search engines at Ancestors.com and Genealogy.com, from June 2007 to July 2008.

¹⁷⁹ Genealogy.com, "Search for 'Samuel H. Leighton'" (accessed March 13, 2007). The author of this dissertation is the great-granddaughter of Grover Leighton, the eldest male in the *Leighton Family* portrait.

claimed “Unassigned Lands” in a rush that began at the Kingfisher stagecoach station of the Chisholm Trail.¹⁸⁰ Therefore, the *Leighton Family* photograph merges ten individual identities into a collective, “we-identity,” as brave, wealthy and adventurous Leightons.¹⁸¹ According to family folklore, the telltale traces of black hair that appear in the *Leighton Family* portrait and among today’s descendants provide evidence of the family’s scandalous intermingling with the indigenous population during the settling of the American frontier. Genealogical research confirms that Samuel Humphrey Leighton’s great-great-great-grandmother was a Mingo Native-American named “Morning Dove.”¹⁸² Even though other genetic tendencies within the bloodline certainly would have overpowered the black-hair gene over more than two centuries, it continues to be regarded within family folklore as lasting visual proof of the Leightons’ participation in the settling of America.

Philosopher Paul Ricoeur suggests that such efforts to insert oneself in a broader temporal continuum is essential, “[b]ecause my personal identity is a narrative identity, I can make sense of myself only in and through my

¹⁸⁰ Author Unknown, *Kingfisher Panorama* (Kingfisher: Times Printing Co., 1957).

¹⁸¹ Paul Ricoeur, “Narrative Time,” in *On Narrative*, William J.T. Mitchell, ed. (Chicago: University of Chicago Press, 1981), 165-186.

¹⁸² One of Miller’s poems makes reference to the exoticism of interracial relationships on the frontier: Miller, “Ok-Ar-Che.” (Unpublished Poem), n.d. ; Billie Leighton Flora, “Leightons” (Notes on Family History). Quinter, Kan., n.d. Interestingly, although stories of a scandalous interracial marriage – which could account for the prevalence of black hair in Leighton bloodline today – persist in family folklore, few tales of the settlement of America have been handed down to today’s descendants.

involvement with others.”¹⁸³ Placing oneself into a larger narrative also is an act which expresses anxieties about mortality by exceeding the limited temporal scope of the human lifespan. These Leightons, in other words, become part of the seemingly infinite story of their *Leighton-kind*.

This urge to place *the personal* within a larger temporal continuum also can be seen as a reaction to modernity’s continuing valuation of a global-minded, networked society, which extinguishes localized difference and individualism, Ricoeur suggests.¹⁸⁴ The Leighton family witnessed the birth of one of the very first of such networks, the passenger rail system. The institution of standardized “railroad time” and the time-and-space-“annihilating” railroad systems themselves sparked anxieties among the occupants of the corresponding towns that the community might lose its regionality, cultural identity and local specificity.¹⁸⁵

The Chisholm Trail – a symbol of the not-so-distant frontier past – was replaced in the 1890s by the “futuristic” Rock Island Railroad line, which provided the Leightons with expedient transportation to-and-from previous and future residences in Kansas and Iowa.¹⁸⁶ The Leighton family’s neighbors, the

¹⁸³ Ricoeur, “Narrative Time,” 165-186.

¹⁸⁴ Ibid.

¹⁸⁵ To read more about the railroad’s role in provoking tensions between the individual and the globalizing aspirations of modernity’s communications and transportation systems, see: Schivelbusch, *The Railway Journey*, 42.

¹⁸⁶ Nancy Ellen Leighton Miller, “Ok-Ar-Che” (Unpublished Poem), n.d. The Rock Island railroad line was placed on top of the Chisholm Trail in the 1890s: “A Brief Historical Overview of the

infamous group of modernity-enabled opportunists, the Dalton Gang, robbed banks and trains, and conveniently boarded trains at the Kingfisher Depot near both families' homesteads, Nancy Ellen Leighton Miller recalls.¹⁸⁷ The Leightons' familiarity with the Daltons also gives them a connection to a broader historical narrative while simultaneously acknowledging their regional specificity and individuality. The Daltons were infamous outlaws, but also were "neighborly," Miller notes.¹⁸⁸ The eldest Leighton son, Grover, helped the Dalton family with farming duties while the "Dalton Boys" were away.¹⁸⁹ Like the Leighton family itself, towns along railroad lines likewise struggled to maintain their specificity and identity while also participating in a regional technological

Chicago, Rock Island, and Pacific Railroad," Rock Island Railroad, Accessed June 18, 2008. Available online at: <http://www.rits.org/www/histories/RIHistory.html>.

¹⁸⁷ Miller, "Ok-Ar-Che."

¹⁸⁸ Miller, "Ok-Ar-Che." When they traveled by rail, the Leightons and Daltons would have encountered former slave, "Apostle" Paul Sykes, who came to Kingfisher in 1891, and began to preach on the streets of Kingfisher and in front of the jail. He also greeted passengers at the Kingfisher Depot by dancing a jig-step and singing the song "Old Ark's A-Movin'." After each performance, Sykes gathered coins thrown from the train. The lyrics to his song, which was a simultaneous ode to religion and to the new speed of transportation, are as follows:

If you expects to get to heaven when you dies

You must stop your tongue from tellin' lies

The old ark's a-movin', so move along, chillun.

The old ark's a-movin', movin' right along.

They called old Noah a foolish man

Because he built his ark on sandy land.

But the old ark's a-movin', so move along, chillun.

The old ark's a-movin', movin' right along.

I've never been to heaven, but I've been told

The streets up there are paved with gold.

And the old ark's a-movin', so move along, chillun.

The old ark's a-movin', movin' right along.

The author's spelling and grammar have not been changed. *Kingfisher Panorama*. (Kingfisher: Times Printing Co., 1957), n.p.

¹⁸⁹ Samuel B. Leighton, "Interview with Author: Leighton Family History," Fall 2002.

network, the national railroad system.¹⁹⁰ Moreover, the Leightons locate themselves within both genealogical and historical time, and also within an age of modernity that reordered previous perceptions of space and time.

Another distinctly modern “time anxiety” motivated the taking of this photograph. A poem by subject Nancy Ellen Leighton Miller suggests that the impetus to make the *Leighton Family* was to take *one last photograph together* before a critical life passage occurred – the marriage and departure of a second Leighton child, Lilly Lucinda. She would leave the family home later that year to marry Henry Schaefer, and would move to Wayne County, Iowa. Modernity’s rapid, convenient forms of transportation, such as the Rock Island Railroad, reordered familial relationships by enabling offspring such as Lilly to disperse geographically to start her own family.¹⁹¹ Anxiety over the future absence of Leighton offspring fueled the employment of a photographer to capture past moments of family togetherness in the *Leighton Family* portrait. Its further implication of an oncoming marriage, an event of the encultured “life-cycle,”

¹⁹⁰ In the quote at the start of this chapter, Catherine Noren suggests that family snapshots can “turn time into a place” by bringing long-gone relatives into the present. Thus, she argues that the photograph is capable of collapsing both space and time: Noren, *The Way We Looked*, 5. The *Leighton Family* photograph also transports its viewers temporally into the Oklahoma territory, during the late frontier days, inverting the relationship Noren describes. This photograph and the narratives it evokes function as portals for enabling a viewer’s imaginative, temporal presence in alternate times. However, as Roland Barthes points out, not all photographs inspire the same effect – or an effect at all – in every viewer. The *punctum*, for instance, is individually determined and subjectively variable: Barthes, *Camera Lucida*, 77.

¹⁹¹ Jeffrey Sconce, *Haunted Media: Electronic Presence from Telegraphy to Television* (Durham: Duke University Press, 2000), 157.

places the Leighton family in the throes of change, and within the fleeting, relentless passage of time.

The photograph is itself an attempt to freeze time, to halt its unyielding passage. This collision of past and present and future provided what Roland Barthes called photography's "madness," its ability to offer "an image of the real, of something that *was*, that we can hold in our hands...but that does not physically exist in our time and space."¹⁹² The *Leighton Family* portrait similarly evokes a Barthesian *future-anterior* tense. The photograph exists to quell unease about changes to the family unit that will occur in the future. Consequently, the image speaks to the fact of time's passage, and to the subjects' eventual and inevitable deaths.¹⁹³

III. Observers' Reinterpretations of the 'Exhibition Self'

However, the *Leighton Family* portrait provides further convolutions of temporality that exceed Barthes's future-anterior tense. In his caption for the photograph *Leighton Family*, "narrator" Samuel B. Leighton explains the absence of a family member from the portrait. William Orman ("W.O.") Leighton was not yet born at the time the photograph was made. By giving *Leighton Family* (1899) a caption which refers to a *future* event, William's birth (on October 28, 1900),

¹⁹² Sabine T. Kriebel, "Theories of Photography: A Short History," in *Photography Theory*, ed. James Elkins, The Art Seminar (New York: Routledge, 2007), 17-18; Barthes, *Camera Lucida*, 115-119.

¹⁹³ Barthes, *Camera Lucida*, 96.

Samuel reframes the photograph by inserting a presaging *future* presence and voice (from around the year 1980) upon this image. The *Leighton Family*, as narrated by Samuel B. Leighton's caption, invites viewers to transport themselves, temporally, into the S. H. Leighton family – which will welcome a baby boy a year later.¹⁹⁴ The caption provides an upbeat reversal of the Barthesian expectation that every snapshot foreshadows *death*. However, viewers who center *themselves* – rather than members of the S. H. Leighton family – as the subject of consideration may find death anxieties peaked by the eternal youthfulness of its subjects, appearances which mask the fact that all of the participants in this photograph have been deceased since 1988.¹⁹⁵ The same fate awaits all of us.¹⁹⁶ Another grim reminder of the looming specter of death – with profound influence upon *those who exist* in the present – in the *Leighton Family* photograph is the absence of four children, three of whom died at birth, and another died at age four of unknown causes.¹⁹⁷

¹⁹⁴ Samuel Bernard Leighton has a motivation for making reference to William Orman Leighton in the caption for the *Leighton Family* portrait. The two men were life-long friends.

¹⁹⁵ William Orman Leighton died on June 8, 1987, at age 87.

¹⁹⁶ British artist Jo Spence suggests that the family album might also be useful for the private exploration of memory and history, or and for the investigation of the self-censorship of our own family memories. Her work with family snapshots, which she calls “phototherapy,” was a means by which she revisited problems stemming from her adolescence: Jo Spence, “Reworking the Family Album” *Jo Spence: Beyond the Perfect Image: Photography, Subjectivity, Antagonism* (Barcelona: Barcelona Museum of Contemporary Art, 2005), 214-219.

¹⁹⁷ Flora, “Leighton Family History.” This subtext is only accessible to viewers who have knowledge of the history behind the represented figures. Varying levels of viewer knowledge about an image's context affect the interpretation of photographs – as well as works of art.

Another example of the highly personalized recasting of memory and personal history is apparent in a revised version of the *Leighton Family* photograph. An untitled montage made by William Orman's daughter, Billie Leighton Flora, in the 1980s (**Fig. 5**) completes the *Leighton Family* circle by including its *then-not-yet-born* (but *now-deceased*) member. In Flora's version of the *Leighton Family*, a photograph of William Orman as an infant has been scaled to a proportional size by photocopying, cut out with a pair of scissors, and pasted into a prominent, free-floating, front-row space of the *Leighton Family* portrait, along with the other young Leighton siblings.

This photomontage activates several tenses, simultaneously. It makes reference to the discordant *past tenses* of the exposure times of both photographs, while also indexing Flora's act of revising the image in the 1980s. This montaged *Leighton Family* portrait adds Flora's "*then-future-but-now-past*" narrative voice, and the implication that she is motivated by honoring her father's memory and continued memory by future viewers of the photograph.

This photomontage also finds a point of reference in the *past* as a photographic practice that descended from Victorian photography albums. It also joins an art-historical dialogue which includes other analog composite practices, such as double-exposure, collage, and montage techniques, by figures such as Johann Carl Enslin, William Henry Fox Talbot, Hippolyte Bayard, Édouard-Denis Baldus, and Gustave LeGray. These image-combination techniques also

were accessible by Flora through mass-media advertising, photographic postcards, and newspaper and magazine illustrations, among other sources.¹⁹⁸

Flora's montage implies her high regard for the photograph as a "document," that would be viewed by posterity as a testimonial to the full cast of offspring in her father's generation of Leightons. Interestingly, given the option of inserting her father's presence in a caption, as Samuel Bernard Leighton did, Flora instead chose to insert a *photographic* record of his existence. William is thus granted equal visual and descriptive presence to his siblings. Viewers may come to know William's appearance, its relationship to that of his siblings and parents, and possibly, its similarity or difference to their own.¹⁹⁹

¹⁹⁸ Sally Stein has argued that montage was regarded by American artists as a "bastard medium," aligned with bolshevism and the dissolution of rural life: Sally Stein, "Good Fences Make Good Neighbors — American Resistance to Photomontage Between Wars," in Maud Levin et al. (eds.), *Montage and Modern Life* (Boston: Institute of Contemporary Art, 1992), 129–189. However, Flora made this montage in the 1980s. Coincidentally, the earliest examples of digitally manipulated photographs made with Scitex, Crosfield and Hell systems appeared in the mainstream press then, too. Particularly heated debates about photography's documentary status ensued after *National Geographic* "moved" one of the Great Pyramids to better suit their vertical cover in February of 1982, and *TV Guide* placed Oprah Winfrey's head on actress Ann Margaret's body in August of 1985. These mass-culture-based discussions also inspired several scholars to debate the "displacement" of the essential "truth value" of the medium of photography: Fred Ritchin, "Photojournalism in the Age of Computers," in *The Critical Image: Essays on Contemporary Photography*, ed. Carol Squiers (Seattle: Bay Press, 1990), 28-37.; Fred Ritchin, "The End of Photography as We Have Known It," in *Photo Video*, ed. Paul Wombell (London: Rivers Oram Press, 1991), 8-15.; William J. T. Mitchell, *The Reconfigured Eye: Visual Truth in the Postphotographic Era* (Cambridge: M.I.T. Press, 1992).; Timothy Druckrey, "L'amour Faux," in *Digital Photography: Captured Images, Volatile Memory, New Montage* (San Francisco: San Francisco Camerawork, 1988), 4-9. Flora's montage emulates these early digital-manipulation practices, suggesting that in her part of the rural Midwest, the proliferation of montage had prompted it to lose its association with bolshevism and urbanism.

¹⁹⁹ My memories of William Orman Leighton differ dramatically from his presence in Flora's inserted photograph. I recall meeting him when he was in his eighties, and nearing the endpoint of his "life cycle." This photograph provides for me (and surely, Flora, too) visual record of something I already know *logically* – that he once was a baby. But I do not know of this *experientially*. The photograph allows me to more easily imagine William's childhood.

The montage provides a visual point of reference to William's existence as a toddler. By now, anyone who might have known him at that age has been deceased for several decades. Nonetheless, William's daughter Flora seeks a connection to her father as a child, a connection that might reverse the linear generational temporal order. Yet in spite of photography's capacity for great temporal fluidity, Flora can never fully recover knowledge of her father as a child from the image.

Barthes embarks upon a similar quest to Flora's. By taking a closer look at photographs of his recently-deceased mother in *Camera Lucida*, Barthes attempts to get to know her as a child – rather than as the adult, maternal figure that persists in his memory. These attempts to gain knowledge about her from the images are ridden with complication, and in the end, Barthes declares his quest unsuccessful.²⁰⁰ While the temporal complexity of photographs tantalizes us with the impossible visual experience of an intangible, inaccessible space of time, the image denies its observers true time travel. Photographs do not allow Flora and Barthes to gain more knowledge about their deceased parents. Death took that opportunity from them, leaving loss and temporal anxiety in its wake.

Flora does not disguise her photographic montage's synthetic nature. The edges of the image of William are jagged, and a caption reading: "Added W.O. Leighton born 1900," announces her fictional addendum. Seamless naturalism is not Flora's goal. Instead, what matters is that she "correct" the potentially

²⁰⁰ Barthes, *Camera Lucida*, Part Two.

misleading “truth” to which the photograph was witness by illustrating, photographically, for posterity’s sake, that the Leightons had a total of *nine – not eight* – surviving children.

Albums, snapshots, and the stories that accompany them, Martha Langford suggests, are a means by which family history and identity are passed down from generation to generation.²⁰¹ Flora – a history buff and the organizer of the annual Leighton family reunion – has a deep investment in the keeping of family history and folklore. If her father is not present, photographically, he might be left out of the recitation of family history – and so might she, and any of her present and future lineage. Although Flora’s montage does not testify to “truth-to-presence” of the *Leighton Family* in 1899, Flora’s revised image cheats the limitations of the linear “lived” time of the photograph to bear witness to her anxiety over being forgotten, in the future, after she has died and can no longer assert her own presence. Her montage conveys a need to connect to a broader span of time than the one naturally afforded to her. By pasting her father into the image, Flora expresses anxieties about life’s ephemerality and finite temporality. But Flora’s creation of the photographic montage also is motivated by the anxiety that subsequent figures might assert narrative control and, as Hayden White argues, recast history as *they* see fit. Incidentally, Flora would not return letters requesting an interview about this photograph. This alone might have been motivated by a concern about ceding narrative authority to another voice, this dissertation’s

²⁰¹ Langford, *Suspended Conversations*.

author – whose lineage, incidentally, is represented in the *Leighton Family* by the presence of Grover.

One of the photograph's subjects, Nancy Ellen Leighton Miller, gives an account that makes no reference to the then-nonexistent William. Miller, or "Ella" (front row, left), wrote an unpublished, undated poem about the day that the *Leighton Family* photograph was taken (**Fig. 4**).²⁰² "The Gumps's Pitcher Taken" places this photograph in a temporal continuum, in her version of *narrative time*, as she describes her recollection of the events that led up to the taking of this photograph, and the events that followed.²⁰³

In the poem, Miller describes the occasion for the group photograph, the *then-future* nuptials of "Lucindy." Genealogy records confirm that Lilly Lucinda Leighton married Henry Schaefer on December 24, 1899, at the Schaefer

²⁰² This poem was one of several Miller wrote, typed, and gave to Samuel Bernard Leighton. Miller wrote poems about many topics, including politics, the beauty of the frontier landscape, and growing up near Dover, Oklahoma. Her political poems capture a radical, leftist spirit whose loss is lamented in the recent popular novel *What's the Matter with Kansas?:* Thomas Frank, *What's the Matter with Kansas?: How Conservatives Won the Heart of America* (New York: Metropolitan Books, 2004).

²⁰³ In *Photo Album of Family D., 1939-64*, contemporary French art photographer Christian Boltanski borrowed family photographs from a friend, re-photographed them, and attempted to put them in chronological order. He devised an accompanying fictional chronology for the subjects of these photographs, which makes implicit reference to the fictional narratives snapshots provoke. This urge to impose linear, chronological order upon the images illustrates the desire to create an orderly narrative, and the degree to which such an approach to storytelling has become a convention. Boltanski explains: "Knowing nothing of these people, I set out to reconstitute their lives on the basis of photos taken at all the important moments of their existence, which should remain as testimonial to their lives after their deaths." He explains the resulting conclusion of the project: "I realized that these images were only witnesses to a collective ritual. They didn't teach us anything about the Family D...but only sent us back to our own past." Susan Pagé, "Interview," *Christian Boltanski- Compositions*, exhib. cat. (Paris: A.R.C./Musée d'art Modern de la Ville de Paris, 1981), 7.

farmhouse in Wayne County, Iowa.²⁰⁴ The wedding was not scheduled for “this fall,” as Miller writes. The poem, a work of prose based on Miller’s memories of events that transpired when she was six years old, combined with second-hand memories shared with her by other family members, thus abandons the pretense of objectivity. Pierre Nora argues that our memories of events are inherently flawed, lending subjectivity to even histories that claim to be objective:

Memory...remains in permanent evolution, open to the dialectic of remembering and forgetting, unconscious of its successive deformations, vulnerable to manipulation and appropriation, susceptible to being long dormant and periodically revived. ...Memory, insofar as it is affective and magical, only accommodates those facts that suit it; it nourishes recollections that may be out of focus or telescopic, global or detached, particular or symbolic – responsive to each avenue of conveyance or phenomenal screen, to every censorship or projection.²⁰⁵

Instead of aspiring to create an “objective” account, Miller’s narrative functions to help form, affirm and maintain self-perceptions, conceptions of familial relationships, romanticized conceptions of childhood, and notions of the roles and personalities of different members of the family. While these constructions are indeed rooted in folklore and conventions of self-presentation – and therefore are anything but objective and “truthful” histories – this matters very little. To detach the personal and the subjective from narratives for this image would rob the snapshot and narrative of what makes them into a living piece of personal folklore, which is shaped, molded, fashioned, refashioned, enriched and invented

²⁰⁴ Flora, “Leighton Family History,” n.d.

²⁰⁵ Pierre Nora, “Between Memory and History: Les Lieux de Memoire,” *Representations*, No. 26, (Spring 1989): 8.

by the malleable human memory – and which, according to John Paul Eakin, “is one more source of fiction.”²⁰⁶ Siegfried Kracauer further argues that expectations of the “facticity,” or “truth value,” of a photograph differ from expectations of a temporal “memory image” – in which the viewer selects only the things he/she wishes to retain. According to Kracauer, a photographic image keeps everything it sees, but the memory image selects what it sees, in the *mind’s eye*.²⁰⁷ Personal memory therefore makes the snapshot’s status as a document of secondary importance – as long as the image’s photographic “facticity” does not overwhelm the personal mythologies and narratives associated with the temporal image. Miller’s poem consciously or unconsciously participates in the modern project of disassembling master “objective” narratives, and experimenting with new, subjective approaches to storytelling.²⁰⁸

As Miller suggests in her poem, anxiety about the dispersion of the Leighton family unit prompted the taking of this photograph: “So, before the family circle wuz busted up fer good, / They loaded up the youngans to go get their pitchers took.” This photograph’s function *was* (and still *is*) to affirm individual and group identity by providing a sense of familial cohesion. The children pictured in this photograph would all end up marrying, and they lived in

²⁰⁶ John Paul Eakin. “Autobiography, Identity and the Fictions of Memory,” *Memory, Brain and Belief* (Cambridge: Harvard University Press, 2000), 290.

²⁰⁷ Siegfried Kracauer, “Photography,” *Critical Inquiry*, Vol. 19, No. 3 (Spring, 1993): 421-436.

²⁰⁸ To read more about “objective histories” and the binary positioning of history against memory, which Kerwin Klein argues is “one of the clichés of memory discourse,” and is in great need of renovation, see: Kerwin Klein, “On the Emergence of Memory in Historical Discourse,” *Representations*, No. 69 (Winter 2000): 128.

areas such as Colorado Springs, Colorado, Modesto, California, Dover, Oklahoma, Wayne County, Iowa, and in cities all over the state of Kansas. While Cynthia and Samuel Humphrey Leighton are not finished rearing children, and would, in fact, give birth to one more surviving child in 1900, the photograph is marked by the implications of biological time through references to the “life cycle” and Cynthia’s child-bearing “biological clock.”²⁰⁹

But the photograph is not only a product of temporal anxiety over the advance of the “life cycle.” The cumulative sensorial effect of the invention and popularity of rail travel, telegraphy, and telephony – all of which had been invented and assimilated into American culture by the time the *Leighton Family* portrait was made – also produced a great deal of anxiety. According to Mary Ann Doane:

²⁰⁹ Cynthia Leighton would give birth to another boy four years later. He died during childbirth. Flora, “Leighton Family History,” n.p.

It is within the context of a modernity defined by rapid industrialization and the diffusion of new technologies as well as the rapid changes of urban life that contingency emerges as a site of awe and fear, constituted as both lure and threat. Its lure is that of the passing moment, the fascination of the ephemeral, but Walter Benjamin delineates the dark underside of such a relation to contingency as shock or trauma. The concept of shock has received a great deal of attention in contemporary theory, which has linked it to the various blows and assaults upon the subject associated with urban life and modern technologies – traffic, railway travel, electric lighting, newspaper advertising. This is substantiated by Benjamin’s own explanation of the ‘complex kind of training’ to which technology has ‘subjected the human sensorium.’²¹⁰

The ambivalent mix of awe and fear incited by these technologies explains the Leightons’ compulsion to make one last group photograph, out of anxiety over losing contact and perceived family cohesiveness. The subjects of the *Leighton Family* lived in an age that redefined time and space. As Doane suggests:

At the turn of the century time became palpable in a quite different way – one specific to modernity and intimately allied with its new technologies of representation (photography, film, phonography). Time was indeed felt – as a weight, as a source of anxiety, and as an acutely pressing problem of representation. Modernity was perceived as a temporal demand.²¹¹

Miller’s poem – which attempts to provide “the” privileged, first-person recreation of *narrative time* for the *Leighton Family* portrait – tells the story of a busy, stressful day. The “youngans” – probably Ella and Hazel, who were age six and three, respectively – were “loaded up” on the wagon to go to town, and other Leighton children “jogged along at quite pace, an soon they reached the town.” Once the various Leightons arrived by wagon or on foot, they met up with “city-

²¹⁰ Doane, *The Emergence of Cinematic Time*, 13.; Walter Benjamin, "On Some Motifs in Baudelaire," in *Illuminations*, ed. Hannah Arendt (New York: Schocken, 1969), 175.

²¹¹ Doane, *The Emergence of Cinematic Time*, 4.

slicker” sister Elbye Ann – nicknamed “Phoebe Ann” in the poem – who already had married and left the Leighton home. She was proudly dressed in her brand-new gown for the occasion. As Miller later mentions in her poem, the boys were wearing brand-new squeaky shoes. The occasion of having this photograph taken was a special event, and one which allowed the Leightons to indulge themselves by buying new clothing – just for the occasion.

In her poem, Miller also takes the opportunity to point out the perceived social difference between rural-dwellers and urbanites – in her own family: “Now Phoebe Ann’s nose tilted up, from livin’ in the city, / An’ the airs she put on then an’ there, well it really wuz a pity.” Although these comments may have been made in good-natured family humor, they indicate a persistence of a familiar stereotype of rural Americans as less-sophisticated but more “authentic” and down-to-earth, and urbanites as arrogant. Miller also self-deprecatingly names her family “the Gumps,” after the fumbling “rural bumpkin,” middle-class characters in a popular mass-media newspaper cartoon strip printed from 1917 to 1959. This reference indicates that the earliest year Miller could have written this poem was 1917, eighteen years after the photograph was taken. Her nicknaming the Leightons as “the Gumps” reveals that stereotypes of “rural-dwellers” and “urbanites” were formed, in part, by the media. Miller’s assumption of unsophisticated vernacular and her nickname for the Leightons positions her as rural-sympathetic, and characterizes the Leightons as “rural,” self-aware, and as members of the middle class.

But her “rural” identification is problematic. The language Miller uses in her poem differed dramatically from the articulate nature of her own speech.²¹² The sophistication of the poem’s mechanics stand in contrast to its purposefully raw language. Given that the Leightons were farmers living in the rural Midwest – yet were fairly wealthy – the author’s vacillation between sophistication and naïvete (even mock naïvete) is especially appropriate, without appearing insincere. Farming is a dirty, labor-intensive way to make a living, even for those who make a good livelihood in the vocation.

According to Miller’s poem, on the morning the photograph was taken, bitter cold weather caused the childrens’ noses to “run like sap,” turning the Leightons’ noses red. Mother Cynthia’s reportedly commented that “’twouldn’t matter, fer red noses wouldn’t show, / In the pitcher, whether red er yellor, or as white as snow.”²¹³ This illustrates that Cynthia had an understanding for how black-and-white photography would “normalize” certain aspects of its subjects’ appearances by transforming the color of red noses into a neutral grayscale

²¹² Kris Belden-Adams, "Interview of Karen (Leighton) Belden," (Family History), Sept. 12, 2007, New York, N.Y.

²¹³ The exposure time’s precise temporal span remains elusive. However, it would have been brief in duration. The introduction of gelatin emulsion in 1878 allowed for exposures as brief as 1/25th of a second. This duration was decreased to 1/250th of a second by 1900 – shortly after this image was made. In spite of her attention to recreating a narrative of the day the *Leighton Family* portrait was made, oddly, no specific date of origin is written on the image or provided by Miller. In a typical year in Oklahoma, the weather in the months of January, February, November, and December can get cold enough to redden cheeks and make noses run. Miller’s poem thus gives the undated photograph a seasonal time frame. Because the poem mentions Lucinda’s upcoming “fall” wedding, this photograph likely was taken between January and February of 1899. The poem’s reference to weather – which is, by nature, cyclical and contingent – allows for greater specificity in placing this photograph in a temporal continuum, while positioning the image in natural, meteorological seasonal time.

spectrum. That is to say, she had been conditioned by the prevalence of photography in Midwestern American culture by 1899 to understand and anticipate its peculiar form of abstraction.

But just to be sure that the photograph did not capture any tell-tale marks of their frigid journey to town for posterity, father Samuel Humphrey insisted that the children put cornstarch on their faces. This is a source of levity in the poem: “When they finished with their primpin’, Pa laffed an’ sed, By gorry / If they didn’t look like plaster paris busts of Queen Victoria.” Miller’s prose is peppered with good-natured jokes and nostalgic, humorous stories about events, such as the “cornstarch-ing” of the Leightons’ red noses, while also making a sophisticated reference to portrait busts of the Queen of England.²¹⁴ Her poem’s account of that day is consistent with the conventions of family photography. In them, we only see the happy moments. Very seldom do snapshots commemorate the everyday routine, or incidents of hostility.²¹⁵ In her poem, Miller describes the day as quirky, fun and chaotic. She remembers it and her father’s good humor fondly.

When the Leightons reach the photography studio, Miller describes their journey of climbing up some stairs. Samuel David (“Saul David” in Miller’s poem) fell head-first down the stairs. Miller takes a good-hearted jab at her older brother Samuel’s clumsiness in her poem: “It almost knocked his senses out, tho’ I reckon he hadn’t much in him, / Fer all he ever wuz good fer wuz a blabbin’ an’

²¹⁴ Queen Elizabeth II took the throne in 1926. Her presence in Miller’s poem suggests that perhaps it was written after that date.

²¹⁵ Chalfen, *Family Photographs*.

a grinnin’.” The poem then describes mother Cynthia’s reaction to Samuel’s fall. She “boxed his ears an’ sed, / ‘Git yerself together now, er you’ll go home to bed.” All of the Leightons pitched in to help dust off Samuel, fighting the urge to laugh about his fall, and assumedly, to avoid getting reprimanded by Cynthia. The shared experience of growing up with a strict mother united the Leighton children, Miller suggests. Cynthia, according to the poem and other oral accounts, was a stern disciplinarian.²¹⁶ Their father, Samuel Humphrey, on the other hand, is represented as good-natured and jovial.

When the Leightons entered the room and lined up to be photographed, Miller notes that they looked “purty as you please,” but that they were uncomfortable with being pushed so closely together to pose. As the camera’s shutter was tripped, Miller notes that all of the Leightons – except, presumably, for Cynthia – wanted to laugh out loud after watching Samuel David fall. However, because not even smiles would not be fashionable in family photographs until Kodak marketed the convention in the 1930s, “they couldn’t laff atall.”²¹⁷ Meanwhile, Samuel David did not share the group’s sense of humor over his fall. His face “wuz puckerd tight, frum gettin’ boxed so good.” Indeed, Samuel David wears a peculiar smirk in the portrait.

At the moment the shutter was open, Miller’s poem suggests that a fly landed on Samuel Humphrey’s nose “when he couldn’t bat an eye,” because of

²¹⁶ Belden-Adams, “Interview of Karen (Leighton) Belden.”

²¹⁷ Kotchemidova, “Why We Say ‘Cheese,’” 2-25.

the time required for the camera's exposure. These details enliven the photograph, giving it a sense of temporal vibrancy. Samuel's tumble occurred in the immediate, "off-camera," *past*, and was fresh in the minds of the photograph's subjects, during the moment we see indexed by the image. His unfortunate plummet also made it difficult for most of the Leightons (except for Cynthia and Samuel David himself) to remain properly straight-faced for the photograph to be made. Hints of a smile are apparent on Isa's face, but on no one else's. The subjects' struggles to control their reaction to Samuel's fall are frozen by Miller's poem and in the photograph – in an eternal, enlivened *durée* of *present* tense that perplexingly lies in the *past*. The image provides a visual account of ten people suspended (supposedly) in an infinite temporal duration of emotional restraint – of laughter, anger, and annoyance. However, Miller's poem, which was written at a time when smiling was a convention in family photography, may be an effort to recast the stern-faced Leightons as lively and jovial. Perhaps instead of remembering an emotionally distilled childhood implied by the straight faces in this image, Miller provides an animated narrative that affirms family bonds, and expresses humor and great fondness.

On the day the *Leighton Family* photograph was taken, Miller was about six years old. She was not yet capable of writing the poem, and would not do so for several decades. Her account of that day is dependent upon her memories – which were, as *all* memories are, selective, biased, perpetually evolving, and have

a tendency to deform reality.²¹⁸ Her memories were supplemented by family folklore, and were recorded when she was an adult. Michael Ross and Anne Wilson have argued that personal memories and histories evolve to reflect parallel developments in belief, experience, knowledge, and changing goals.²¹⁹ Miller's view of her childhood is tinged with retrospective nostalgia.²²⁰ Nora argues that histories such as Miller's only are capable of operating in opposition to "objective" histories because memory is selective, biased, it perpetually evolves and it has a tendency to deform reality.²²¹ Miller's history, while striving to evoke the historical authority of the non-symbolic and the particular, indeed is inescapably ridden with subjectivity.²²²

Nonetheless, anxiety over the disappearance of a preferred, first-hand history, *her* history, for the continuum of time surrounding the *Leighton Family* snapshot drove Miller to place the image in her subjective, creative, narrative time. Her story grants the image temporal specificity, rescuing it from the symbolic and placing it in the realm of the particular. As Geoffrey Batchen argues in *Forget Me Not: Photography and Remembrance*, family photographs function to express the individual uniqueness and importance of a human life – efforts he

²¹⁸ Pierre Nora, "Between Memory and History," 8.

²¹⁹ Michael Ross and Anne Wilson, "Constructing and Appraising Past Selves." *Memory, Brain and Belief* (Cambridge: Harvard University Press, 2000), 233.

²²⁰ Miller's poem also fondly recalls a story about Samuel David, who lived in the same city as Miller around 1916. It is possible that the two may have had a stronger bond than the other siblings.

²²¹ Nora, "Between Memory and History," 8.

²²² Klein, "On the Emergence of Memory," 128.

argues are motivated by a Barthesian death anxiety, and the desire not to be forgotten.²²³

Miller has good reason to be concerned that her story could be forgotten. As time's passage progressively widens the gap between the image and its subjects, and number of people who might know of its associated family folklore diminishes with every passing day, the subjects of the *Leighton Family* come closer to operating as symbols themselves, as they gradually lose the personal specificity granted to them by individualizing family narratives. Instead, the Leightons become "types" or "characters" who evoke subjective associations in viewers. When albums or family portraits such as this one appear free from contextualizing material in museums and galleries, viewers provide new narrative contexts for the Leightons' lives and plights. Time's passage and the diminishing knowledge of the image's temporal specificity increase the *Leighton Family's* symbolic potential.

Yet, inasmuch as *every* recollection of the past is an active, reconstructive process – one which involves subjectivity – theoretically, every historical narrative is revealed to be perhaps just as subjective as, for instance, Miller's narrative.²²⁴ This debate, which is currently of keen interest in memory discourses, dissolves the boundaries between "objective" and "subjective" histories, destabilizes notions of an "absolute truth" and undermines the project of

²²³ Batchen, *Forget Me Not*.

²²⁴ This idea is discussed further in: Barry Schwartz, "The Social Context of Commemoration: A Study in Collective Memory," *Social Forces*, Vol. 61, No. 2. (Dec. 1982): 374-402.

“master” narrativity.²²⁵ Some narratives, historians might agree, are preferred to others. That argument necessarily provokes the question: Is Miller’s story for the *Leighton Family* snapshot more reliable than a third-generation, hand-me-down account of that day’s events? The photograph’s problematic status as a purveyor of “objective” history prompts additional questions: Do such concerns about narrative quality and truthfulness matter, given the family photograph’s function as an object which aids in the building and maintenance of self-concepts, personal memories, and histories by prompting the creation and maintenance of subjective narratives? If subjective temporalities are a significant element of an experience with such photographs, how can we reflect those in our histories?

Moreover, do first-person narratives have relevance to our histories? For instance, I have viewed the *Leighton Family* portrait thousands of times. As I have passed through various stages in my own “life cycle,” such as childhood, college (including studying the history of photography in graduate school), marriage, and becoming a parent, my impressions and observations about this image have changed. I previously identified with the various Leighton children. The child with whom I found a source of common ground varied, depending on my age at the time I viewed the photograph. I currently identify with the parents,

²²⁵ Jean-François Lyotard argues that the act of narrativity itself is always driven by the viewer’s *present*: “The narrative’s reference may seem to belong to the past, but in reality it is always contemporaneous with the act of recitation.” Jean-François Lyotard, *The Postmodern Condition* (Minneapolis: University of Minnesota Press, 1984), 22. In other words, Lyotard’s conception of a photograph’s observer-generated *narrative time* belongs to an eternal present. As this suspended present-tense enters temporal consciousness, however, it becomes the territory of the past and it readily replaced by subsequent associations. *Narrative time*, then, is fleeting and easily destabilized.

because my life more closely resembles their stage in the human “life cycle” narrative.

When I view this photograph, the strangers who stare back at me tell me little about the stories of *their* lives – about which I know very little, beyond the facts uncovered in genealogy research and from limited bits of oral folklore. This photograph instead becomes a springboard for thinking about the events and experiences of *my own* life. My notion of personal history is a product of my lived experience, combined with information discerned from photographs such as this one. Specifically, the *Leighton Family* portrait provides me with a means of locating myself within collective human experience. As “a Leighton,” I am a product of a mostly Western European lineage of risk-taking American pioneers. Like my grandfather, Samuel Bernard Leighton, and my great-aunts Billie Hazel Leighton Flora and Nancy Ellen Leighton Miller, and possibly, like other Leightons about whom I know very little, I am interested in history, and locating my existence in a broader spectrum of time. Thus, the *Leighton Family* is a springboard to thinking about *my own* past, present and future, simultaneously – and in no particular, or linear, order. In other words, as I self-consciously impose these additional dimensions of subjective temporality upon the photograph, the *Leighton Family* portrait ceases to be about it and instead suits *my* unique and changing concerns.

Perhaps my narrative for the *Leighton Family* embodies the worst fears of Billie Flora and “Ella” Miller. I am unintentionally eager to overlook the prospect

or authority of any *definitive* narrative time in favor of projecting *my own* unique temporal frame of reference upon the image. To me, it is just as valid as theirs. The *Leighton Family* is not a genealogical record for me, nor does it evoke memories. The subjects of the image remain strangers to me. Yet my narrative, which is rife with departures and imagined temporalities, is valuable because it addresses the multiple interpretive *times* of photographs.

IV. The *Leighton Family* Portrait in Time/s

By means of an example, this analysis of the *Leighton Family* has uncovered multiple temporalities and simultaneous *narrative times*, including: (1) *ongoing, genealogical time*: the temporal continuum of the pioneering Leighton bloodline; (2) *master-narrative time*: the Leightons' engagement in the "master-narrative" story of the founding and settlement of America; (3) the *instantaneous duration of past time* in 1899 in which the photograph's exposure was made; (4) the "*now-past-but-then-future*" tense of William Orman's birth in 1900, and Lilly Lucinda's marriage and departure from the Leighton family in late 1899; and (5) Samuel Bernard Leighton's and Billie Flora Leightons' narrative voices, which were imposed upon the image in the 1980s to give William a place in the image – and in *time*; (6) *Barthesian future-anterior time*: the inevitable death of the subjects of the photograph, and their possible *Ricoeurian, eternal time* through re-narration; (7) *biological time*: each of the subject's position in the "life cycle"; (8) *observed biological time*: points of entry for a viewer's possible identification with different subjects' positions in the "life cycle"; (9) the absence, *both "then-*

past-and-now-past” and “*then-future-but-now-past*” of four children who died in infancy and at age four; and (10) the *now-absence* of the lineages of these children who did not survive to adulthood.

The *Leighton Family* temporally indexes or prompts consideration of each of those points in time, evoking non-linear, multiple temporal vacillations between past, present, and future tenses (and combinations of these). This exemplary portrait has a complicated, unfixed, and potentially endless number of ways to relate to temporality that far exceed Barthes’s future-anterior time.²²⁶

V. The Fallible Faculty of Human Memory

This is not without precedent. Observers’ tendencies to indulge themselves in subjective departures from the “facticity” of photographs appear in the commentaries of both Benjamin and Barthes. As discussed in the introduction of this dissertation, Benjamin identifies the woman in the wedding portrait *Karl Dauthendey (Father of the Poet), with His Fiancée* as Dauthendey’s first wife who committed suicide. As Carolin Duttlinger points out, the woman in the image

²²⁶ Victor Turner and Jacques Derrida separately argue that non-linear narratives express a degree of disorder which is a characteristic of our cultural context: Turner, “Social Dramas.”; Derrida, “The Law of Genre.” Norbert Elias argues that narratives function to make order of chaos. My analysis of the *Leighton Family* snapshot was motivated by a desire to connect to a narrative that might outlast me, in order to locate a tangible expression of my life’s meaning (in the photograph, and in narrativity) that might escape the ephemeral nature of life itself. However, my attempts to “master time” were unsatisfactory. In this sense, Turner, Derrida, and Elias all reflect the function and fate of my personal narrative.

is his *second* wife.²²⁷ Benjamin does not acknowledge or discuss the error in the text. Duttlinger suggests that this mistake presents “an alternative concept of aura, one which transcends fixed historical or technological categories through the model of an imaginary encounter between viewer and image.”²²⁸ Benjamin’s error exemplifies viewers’ tendencies to create multiple possible narrative contexts for photographs that convey varying truths.²²⁹ These variegated imaginative anecdotes detach the photograph from any singular auratic experience in a fixed time and space. Instead, these narratives offer the possibility of an *infinite* number of temporal experiences.

Margaret Olin has argued that Roland Barthes makes similar deliberate “mistakes” in *Camera Lucida*. His inaccurate identifications of details from several photographs in *Camera Lucida* also make implicit claims about the dubious nature of an objective narrativity. Olin points out that Barthes describes a *punctum*-provoking necklace in a discussion of a photograph by James van der Zee that did not exist in that image, but instead appears in a photograph of his

²²⁷ Carolin Duttlinger, “Imaginary Encounters: Walter Benjamin and the Aura of Photography,” *Poetics Today*, Vol. 29, No. 1 (Spring 2008): 84.

²²⁸ *Ibid*, 79. She continues to suggest that “[t]his conception has far-reaching consequences not only for the theory of photography but also for its role within literature, as is suggested by Benjamin’s empathetic engagement with the Kafka photograph and its incorporation into his own life story.” *Ibid*. Duttlinger’s recent scholarship explores Benjamin’s role with literary studies, rather than his writing’s impact upon photography-history discourses: Carolin Duttlinger, *Kafka and Photography* (Oxford: Oxford University Press, 2007). Interestingly, Duttlinger’s use of the term “aura” often is synonymous with “temporality.” She accommodates multiple auras, such as the alternative aura created by Benjamin’s mistaken identification.

²²⁹ Margaret Olin, “Touching Photographs: Roland Barthes’s ‘Mistaken’ Identification” *Representations*, Vol. 80 (Fall 2002): 114. Geoffrey Batchen points out that this is but one point of similarity among many between Benjamin’s work and Barthes’s: Batchen, “Another Little History of Photography,” 261.

Aunt Alice, which is published in a different book, *Roland Barthes / par Roland Barthes*.²³⁰

This mistaken detail, then, not the necklace actually pictured, led Barthes to the center of pain in the photograph. . . . Indeed, the wearer of the necklace, Barthes's Aunt Alice, occupies the same place as Van Der Zee's 'solacing Mammy' in the family picture, or at least in the picture of the family, and the composition of a photograph, not the pumps or the necklace on a real person, enabled him to make the identification. Presumably, Barthes recognized the family constellation, even though to do it he had to move the detail, the *punctum*, from one photograph to another.²³¹

Although his transplanting of a *punctum* from one photograph into another could have been an oversight – and his untimely death leaves his intentions forever unknown – Olin argues that this gaff was purposeful, too.²³² Barthes's "mistake" implicitly suggests, intentionally or unintentionally, that viewers of photographs project their subjective, constructed, often fictional, narratives upon photographs, without particular concern for the images' content. The necklace – an object which never had a presence, or a *that-has-been*, in the described photograph – provided the image's *punctum* for Barthes, giving the image with its personal

²³⁰ Roland Barthes, *Roland Barthes / par Roland Barthes* (Paris: Seuil, 1975). Olin argues that Barthes's interest in photographs of his aunt and mother is an effort to pay homage to the influence of his relationships with those two key figures in his life. Barthes's aunt taught him to play the piano, and he lived with her after the death of Barthes's grandmother. However, his aunt died before his mother did, leaving Barthes absent his support system. Olin, "Touching Photographs," 114.

²³¹ Ibid, 105-107.; Barthes, *Camera Lucida*, 53, 87-88.

²³² Olin, "Touching Photographs." She further argues: "Like the pearls that were exchanged for a slender ribbon, the distance between the description and the reproduction of the photograph may have disguised the resemblance for some, although here it is the photograph, rather than the description, that is delayed." Ibid, 109.

meaning, which varies by viewer.²³³ In other words, temporal specificity is portable, mutable, and is open to imaginative interpretation.

Like Barthes's gold-ribbon necklace, Miller's poetic narrative for the *Leighton Family* conveys an anxious projection of *the personal* and specific into the snapshot that was becoming increasingly symbolic.²³⁴ Flora's photocopied montage of a photograph of her own father onto the Leighton group portrait likewise projects an external *punctum* into the portrait. My varying interpretations of the image provide yet more possible *punctums*. A photograph's tendency to be a site for such projected subjectivities runs counter to claims that the photographic image is an objective document.

Moreover, Olin and Diana Knight provocatively argue that Barthes's discussion of a photograph of his recently-deceased mother at age five – an image which never appears in *Camera Lucida*, and has yet to be discovered – may be based on a non-existent image.²³⁵ Nonetheless, Barthes vividly describes the subject of the “Winter Garden Photograph” as follows:

²³³ Olin provides an expanded definition of the *punctum*: “The *punctum* is the detail that is not there, or that one wishes were not there. Absence, in this book about loss, is presence. Like Jean-Paul Sartre's mental image in *L'imaginaire*, to which *Camera Lucida* is dedicated, the punctum is ‘a certain way an object has of being absent within its very presence,’ or perhaps present within its absence.” Olin, “Touching Photographs,” 110.; Jean-Paul Sartre, *L'imaginaire: Psychologie-Phénoménologique de L'imagination* (Paris, 1940); translated as *The Psychology of Imagination* (New York: Philosophical Library, 1948), 104.

²³⁴ The *Leighton Family*'s *then-becoming-increasingly-symbolic* status became a reality. This manuscript of Miller's poems is the only known copy, and its previous owner merely glanced at it.

²³⁵ Knight, *Barthes and Utopia*, 265-266. As Olin explains, “few readers were willing to follow this twist of the plot.” However, she admits that she was convinced: “It never seriously occurred to me that there really was a Winter Garden Photograph, but, like Knight, I have had mixed success convincing others.” Olin, “Touching Photographs,” 110.

My mother was five at the time (1898), her brother seven. He was leaning against the bridge railing, along which he had extended one arm; she, shorter than he, was standing a little back, facing the camera; you could tell that the photographer had said, ‘Step forward a little so we can see you’; she was holding one finger in the other hand, as children often do, in an awkward gesture.²³⁶

Olin points out the similarities between the hand gesture he describes and the manner by which Barthes himself holds his hands in a snapshot reproduced in *Roland Barthes / par Roland Barthes*.²³⁷ She also notes similarities between the Winter Garden photograph and an image of Franz Kafka which was described by Walter Benjamin in “A Short History of Photography” and appeared in *Le Nouvel Observateur*:

But most likely there was no Winter Garden Photograph to reproduce, or perhaps only the one of Franz Kafka at the age of six, described, with its palm trees and Kafka’s soulful eyes, as well as an oversized hat, by Walter Benjamin in his essay ‘A Short History of Photography.’ Benjamin placed the setting tentatively in a ‘kind of winter garden landscape,’ but the French translation that appeared in *Le Nouvel Observateur*’s special issue on photography places Kafka definitively in a winter garden.²³⁸

His analysis of this image – rather, his placement of it within a *narrative time* – is an effort to cheat linear time and get to know his mother as a child, according to Barthes.²³⁹ However, Olin argues that his efforts inevitably lead Barthes back to a consideration of *himself*:

²³⁶ Barthes, *Camera Lucida*, 67-69.

²³⁷ Olin, “Touching Photographs,” 111.

²³⁸ Olin, “Touching Photographs,” 108.; Walter Benjamin, “A Short History of Photography,” transl. P. Patton, in *Classic Essays on Photography*, ed. Alan Trachtenberg (New Haven, Conn., 1980), 206. Barthes writes that he chose not to reproduce the Winter Garden photograph in his book because it would mean nothing of significance to his readers. Barthes, *Camera Lucida*, 73.

²³⁹ *Ibid*, 72.

In the Winter Garden Photograph, Roland Barthes discovered not his mother, or not only his mother, but also himself, himself as a child, specifically as a child known from photographs. A chain of photographs leads Barthes, searching from image to image, to the unexpected discovery of himself as his own mother, just as he had been his mother's mother while he cared for her during her last illness.²⁴⁰

Olin here suggests that viewers project *their own* narratives into photographs, regardless of the image's unique exposure-time-oriented narrative context. The story of the Winter Garden, she suggests, is really an encounter with the "otherness" of his own childhood, which he knew partially from photographs. That is to say, for Barthes, the analysis of the Winter Garden photograph is driven by the phenomenon of knowing oneself *through photographs*, rather than from the memory of experiencing the referent slice of time during which he was *photographed*. After all, Barthes's mother might not have remembered herself at that age, either, and similarly constructed her notion of "childhood" from images such as the Winter Garden photograph. What results, in part, from Barthes's discussion is a preponderance of the modern phenomenon of knowing oneself via photographs. Moreover, as the image becomes a springboard for the projection of the viewer's associations, the existence of the Winter Garden image is unnecessary. As a family portrait from a commonplace genre of photography – like the *Leighton Family* – we can imagine the Winter Garden image without needing to see it.

²⁴⁰ Olin, "Touching Photographs," 110-111. By attempting to know his then-deceased mother, Barthes enacts a hopeful project of resurrection that Ricoeur mentions: Ricoeur, "Narrative Time," 165-186.

A future-anterior anxiety underlies Barthes's discussion of the Winter Garden photograph. He regards his mother's image and ponders not only her recent death, but the inevitability of his own. However, Barthes's suggests that additional temporal dimensions exist in his analysis. The childhood portrait gives material visual form to a span of time experienced (by his mother), but perhaps not remembered by her – except through photographs. To Barthes, photographs exceed the human consciousness and suffer no such gaps of memory.

Barthes further describes the Winter Garden photograph as paradigmatic of *all* photographs, claiming that “[s]omething like an essence of the Photograph floated in this particular picture.”²⁴¹ Barthes's Winter Garden photograph – the one image that speaks for them all – invites amalgamations, projected memories and shifting observer-generated narrative times.²⁴² The medium's power, Barthes implies, lies in the multiple, temporal associations it evokes in the observer.

²⁴¹ Barthes, *Camera Lucida*, 73.

²⁴² *Material Memories*, a volume of essays edited by Marius Kwint, Christopher Breward, and Jeremy Aynsley, argues that a photograph's material form often is overlooked in favor of its content. Marius Kwint, Christopher Breward, and Jeremy Aynsley, eds. *Material Memories* (Oxford: Berg Press, 1999). This is not to deny the tactile, material potency of many photographic practices, including other forms of nineteenth-century portraiture that was meant to be held in the hand and engages a sense of touch or smell through the addition of flowers, human hair, etc. For an examination of the importance of touch, see: Elizabeth Edwards and Janice Hart, eds. *Photographs Objects Histories: On the Materiality of Images* (London: Routledge, 2004).

VI. Vernacular History and ‘Objectivity’

In the fall of 2003, Samuel Bernard Leighton agreed to select ten photographs from about a half-dozen of his photo albums to discuss in an audio-tape-recorded oral history.²⁴³ Leighton, then 94 years old, was motivated to tell his personal history for posterity in a form that might persist after his death. Photography-history scholar Martha Langford suggests that albums, family photographs, and the stories that accompany them are a means by which family history and identity are passed down from generation to generation.²⁴⁴ Sharing these stories also allowed Leighton to quell anxieties about his inevitable death (which would come just three years later, in 2006). By telling a story for these photographs, he was able to leave behind what he hoped would be a lasting record of his life, so that it might not be so quickly forgotten.

Leighton chose a portrait of himself at age five or six to discuss first. In it, Leighton smiles as he sits in an oversized wooden chair with his arms around a long-haired white dog and an oversized teddy bear. This commonplace example of an early-twentieth-century photographic portrait was taken at Raphael Studio in St. Louis, Mo., in 1915 or 1916 (**Fig. 6**). The image is reproduced on a postcard, and within an inverted, tilted, whimsical apple silhouette. Leighton wears a crisp striped sailor’s shirt, matching shorts, an undershirt and calf-length socks. Rather

²⁴³ A version of this section of the dissertation appears in: Kris Belden-Adams, “Oral Narratives and the Reconsideration of Photographic ‘Objectivity,’” In *Image and Memory: Oral History and Photography*, eds. Alex Freund and Alistair Thomson (New York: Palgrave Macmillan, 2010).

²⁴⁴ Langford, *Suspended Conversations*.

than wear the typical rural-Midwestern schoolchild's wardrobe of either overalls or a suit, Leighton's sailor garb distinguishes him as a fully-assimilated St. Louis urbanite.²⁴⁵ He meets the camera's gaze with squinted eyes.

The letters "S.B.L."—for Samuel Bernard Leighton—are written in the bottom right corner of the postcard in Leighton's adult script (**Fig. 6**). On the back side of the print, Leighton also added these notes, which are hand-written in blue ink: "Me? / This was taken / in St. Louis / I still remember / the white dog / He was Cross / SBL." Additional notes appear below, written in a lighter blue ink, presumably during a different session of viewing the photograph: "Dad and I / lived on Market Street / St. Louis, Mo / 1914-1916 / Then came back to Kans / 1916 S.B.L.." Leighton's different textual additions reveal his urge to revisit and re-narrate this image over time. This same anxious desire motivated him to select this image to discuss in an oral history.

Also, in these hand-written notes, Leighton affirms as "fact" something to which the Raphael Studio imprint attests: the portrait was made in St. Louis from 1915-1916. (Although Leighton dates the photograph from 1914-1916, Raphael Studio would not open for business until 1915.²⁴⁶ So the date of this photograph's taking can be narrowed further to 1915-1916.) Leighton also provides the name of

²⁴⁵ Leighton commented in unrecorded conversations with his daughter Karen (Leighton) Belden that upon his return to rural Western Kansas, his schoolmates picked on him for dressing like an urbanite.

²⁴⁶ David A. Lossos, "Early St. Louis Photographers," [On-line Database, *Genealogy in St. Louis*] Updates Dec. 21, 2009. Available at: <http://genealogyinstlouis.accessgenealogy.com/tracylewis.htm>. Accessed Feb. 30, 2010.

the street on which he lived, the dates of his residence there, and he specifies the parent with whom he was living. As Batchen has suggested, the addition of signatures and other written notes to photographs is “a potent way to make a photograph more than a record of appearance,” and “an unequivocal statement that ‘I was there.’”²⁴⁷ Indeed, this additional data further certifies his presence in the city, while explaining why he—a man who would live the majority of his life working and living on the family farm south of Quinter, Kansas—would have been photographed in St. Louis. For a span of two years, Leighton here reports that he was an urbanite, rather than the rural farmer. His stylish clothing suggests that he adapted readily, and perhaps even eagerly, to life in the city in the brief time they were in St. Louis.

In this hand-written information, Leighton also mentions the angry disposition of the studio’s dog, a comment that adds a touch of humor and vitality to this static conventional child’s portrait. Would an animal that regularly was exposed to children at Raphael Studio be “cross,” as Leighton suggests? While unlikely, it is possible. More probable, though, is the prospect that Leighton might have misremembered the demeanor of the dog or amalgamated it from memories of a number of dogs he knew from his youth. Our personal histories are admittedly formed, shaped, molded, fashioned, refashioned, enriched and invented by the malleable human memory—which, according to autobiographical

²⁴⁷ Batchen, *Forget Me Not*, 41.

writing expert Eakin, is a “source of fiction.”²⁴⁸ Misremembering, Eakin suggests, is a common condition of being human. Moreover, evoking the changeable associations of the human memory is one important function of family photographs.

Seizing the opportunity to narrate his own portrait further in an oral interview, Leighton eagerly offered these additional comments about his photograph:

In 1914, we moved to St. Louis, where Dad worked for the streetcar company as a streetcar operator. I was around five years old and went to kindergarten school there. I enjoyed that very much. One day the class was taken to see the Liberty Bell, which was mounted on a railroad flat car and hung from a wooden frame. All of the kids went up and saw it and the teachers let us touch the bell. A few of them even kissed the bell. It really was the original Liberty Bell, *the* one with the big crack in its side. It was a very large bell. That was a big thrill.²⁴⁹

Curiously, the photograph reveals no trace of Leighton’s father, streetcars, his schoolmates or the Liberty Bell. He does not mention the event of being photographed, or that his father had kidnapped him and took him to St. Louis because he disapproved of Leighton’s mother working outside of the home as a teacher in a one-room schoolhouse less than a half-mile away from their homestead. Leighton does not speak of his father’s eventual arrest, his parents’ divorce, and his return to the family farmstead in rural western Kansas. Although Leighton surely missed the familiarity of the farm, his mother, his grandparents

²⁴⁸ Eakin, “Autobiography, Identity and the Fictions of Memory,” 290.

²⁴⁹ Samuel Bernard Leighton, Oral History Project, Rural Quinter, Kansas, Fall 2003. Italics are intended to reflect his spoken emphasis.

and his friends in rural Kansas very much, he instead offers us an upbeat oral history to describe his experience in St. Louis. Leighton's oral account does not contradict the image of the happy boy we see in the photograph with stories of what must have been a tumultuous and painful childhood. Studio portraits, by convention, only commemorate the *good* times for us to revisit at later moments. Like the photograph, Leighton's oral history likewise offers only fond memories for posterity.²⁵⁰ Leighton does not feel sorry for himself for having a troubled childhood, through no fault of his own. Instead, he made the most of his brief time in St. Louis—or so he claimed about 90 years later. Research psychologists Michael Ross and Anne Wilson have discovered that the urge to “improve” one's past in the process of recounting personal histories is a nearly universal human tendency.²⁵¹

One of the memories Leighton mentions specifically in his oral history involved what would be his only opportunity to see the Liberty Bell, as the artifact was on brief, well-publicized public display on a railroad car platform on its way back home to Philadelphia after being exhibited in the San Francisco Panama-Pacific Exposition. News reports confirm Leighton's account. The Liberty Bell stopped in St. Louis from 11:20 a.m. to 11:40 a.m. on Sunday, November 21, 1915, while on an extensive and slow-moving cross-country rail

²⁵⁰ For more about the subjects that are deemed appropriate in portraits and snapshots, see: Richard Chalfen, *Snapshot Version of Life* (Bowling Green, Ohio: Bowling Green University Popular Press, 1987).

²⁵¹ Ross and Wilson, “Constructing and Appraising Past Selves,” 233.

tour. Although the bell stopped for just five minutes in smaller cities such as Greenville, Ill., St. Louis was fortunate to have a twenty-minute window in which to celebrate the artifact's visit. At each stop, the Liberty Bell was met by a coordinated crowd cheering men, women and children, of bands playing patriotic music, soldiers making military salutes, and parades.

Leighton and his schoolmates participated in this fanfare, and seeing the Liberty Bell was one of the more memorable events of his childhood. He recalls the event of its visit with vivid detail. Leighton spoke of the bell's display on a wooden frame atop a flat rail car. He recalled stepping up onto the platform and touching the bell, and remarked that some people – excluding Leighton, who never liberally displayed physical affection – kissed the Liberty Bell. Archival photographs of the Liberty Bell's 1915 tour confirm these details about the bell's display and the interaction of visitors with the artifact.²⁵²

In 1915, many countries in Europe and Asia were engaged in a World War as America remained watchfully aloof. The bell's tour was designed, in part, as a publicity stunt to rally national unity, just in case America might need to cash in this patriotism and aid its allies. In the eyes of many Midwesterners, the Liberty Bell was associated with a remote East-Coast culture and governing system that understood very little about what lie "out west." The bell's visit to middle America broke that region's sense of geographic isolation and gave

²⁵² Archival photographs of the Liberty Bell in St. Louis are in: Glass Plate Photography, Thomas Kempland Collection, J. R. Eike Photography, St. Louis, Mo. 1914-1917.

Midwesterners a sense of connection to a history and identity beyond its own region. America's history, symbolized by the Liberty Bell, became *their* history, too.

As Leighton speaks of participating in this patriotic event, he connects to a master historical narrative much larger than just *his* story. Moreover, photography historian Liz Wells suggests that family photographs also re-enact the plights of ancestors, recapture personal history, and therefore provide a context for individuals' lives.²⁵³ Although Leighton's Midwestern life may have seemed distant from that of America's founders, his relatives participated in the colonization of America and fought in just about every war in which the country was engaged.²⁵⁴ He also knew that his father, Grover Cleveland Leighton – one of the subjects of the *Leighton Family* portrait – was among an assembly of 100,000 wealthy settlers who claimed "Unassigned Lands" in a rush that began at the Kingfisher, Oklahoma, stagecoach station of the Chisholm Trail on April 22, 1889. Thus, the Liberty Bell's connection to the founding of America allowed Leighton to ponder his family's involvement in a broader temporal continuum. Incidentally, Leighton is not unusual in this respect. The previous case study revealed Nancy (Leighton) Miller's urge to connect to a broader master narrative of the country's history, too, in the details she added to her poem to narrate her

²⁵³ Wells, *Photography*, 150-151.

²⁵⁴ Genealogy.com, "Search for 'Samuel H. Leighton'" (accessed March 13, 2007). Perley Maynard Leighton, *A Leighton Genealogy: Descendants of Thomas Leighton of Dover, New Hampshire*, Vols. 1-2 (Boston: New England Historic Genealogical Society, 1989).

family's group portrait. In addition, Leighton's relationship to a broader historical master allows him to exceed the limited temporal scope of the human lifespan.

However, given its prominence in Leighton's oral history, the Liberty Bell's conspicuous absence from the image raises questions about the photograph's status as a prompt for the oral communication of memories which are only tangentially related to the subjects of the image. The photograph, instead, is a site for an amalgamated projection of "that-*never*-has-beens." As discussed previously, Olin and Knight have provocatively suggested that Barthes's "mistaken identifications" of objects in a photograph of his then-recently-deceased mother at age five suggest that viewers readily project *their own* narratives into photographs, regardless of the image's unique exposure-time-oriented narrative context.²⁵⁵ As a photograph becomes a site for an amalgamated projection of various memories, it represents a genre of images so familiar that its physical presence may be regarded unnecessary, beyond being an initial springboard for storytelling.

The tendency for images such as Leighton's portrait to invite a wealth of changeable and subjective oral histories that do not correspond with objects or events visible in the photographs themselves is problematic in our current discourses. In many of our current discussions of the medium—perhaps exemplified most clearly by the various commentaries offered in James Elkins's

²⁵⁵ Knight, *Barthes and Utopia*, 265-266.; Olin, "Touching Photographs," 110.

2007 book *Photography Theory* – “indexicality,” or “objective truthfulness” is considered in an absolutist claim that is “intertwined” with photography’s “medium specificity,” or so Abigail Solomon-Godeau argues.²⁵⁶ The polemical nature of our arguments about the “indexical” essence of the medium, Solomon-Godeau suggests, reflect various investments in the conceptualization of photography’s history with respect to the continuing interest in Modernism’s “medium specificity.”²⁵⁷

However, while Barthes wrote of photography’s stilling of a “*that-has-been*,” his “mistaken” identifications of items in photographs deconstruct any possible absolutism of this claim as he makes it. As such, Barthes implicitly argues that perhaps the medium’s relationship to “the real” is variegated and complex. Siegfried Kracauer also suggests that the human memory and photography operate in different realms:

An individual retains memories because they are personally significant. Thus they are organized according to a principle that is essentially different from the organizing principle of photography. Photography grasps what is given as a spatial (or temporal) continuum; memory images retain what is given only insofar as it has significance. Since what is significant is not reducible to either merely spatial or merely temporal terms, memory images are at odds with photographic representation.²⁵⁸

As Kracauer suggests, memory and oral histories are inherently cognitive, and cannot possibly be encapsulated by, or bound to, the temporal/spatial matrix of

²⁵⁶ Solomon-Godeau, “Ontology, Essences, and Photography’s Aesthetics,” 265

²⁵⁷ Ibid, 259-269.

²⁵⁸ Kracauer, “Photography,” 47-63.

the photograph – if indeed the medium’s relationship to the real can be defined in such clear terms.²⁵⁹ Therefore, Kracauer’s position suggests that Leighton’s narrative has no obligation to coincide to the photograph.²⁶⁰ Family photographs such as Leighton’s portrait instead invite the projection of oral stories that may take on the air of folklore and are not bound to the mannerisms of a photographic “real.”

Leighton’s oral history also presents a challenge to the integrity of “objective histories,” according to Nora. “Subjective” histories, he suggests, operate in opposition to “objective” histories because memory is selective, inherently biased, it perpetually evolves and it has a tendency to “deform reality.”²⁶¹ Yet, insomuch as any recollection of the past is an active, constructive process – one which involves subjectivity, so that a historical narrative can be formed from bits of memory which were subjectively collected – even “objective”

²⁵⁹ Although the discussion escapes the purview of this essay, several scholars have disputed the idea that photographs have ever possessed a fixed relationship to “the real.” For instance, Joel Snyder argues that the medium does not universally replicate vision, or enjoy “a natural or privileged relation between picture and world.” Joel Snyder, “Picturing Vision,” *Critical Inquiry*, Vol. 6 (1980): 500. If photography’s “indexical” status were to be removed from its discursive place as a polemical ontological imperative, the concept could, instead, be helpfully adapted to consider a range of multiple nuanced manners in which photographs may relate to a diversity of “truths” or “realisms.” Such an inquiry would accommodate the examination of the means by which a photograph’s complicated truth value may be shaped or even constructed by an individual object’s unique function and reception context. For example, this approach allows for study of Leighton’s portrait as a springboard for subjective storytelling and for the exploration of individual and family identities.

²⁶⁰ The same cannot be said for other photographic practices—including mug shots, passport photographs, driver’s license pictures, forensic images, legal evidence, scientific photographs and photojournalism—which operate under the expectations of providing a combination of narrative and image that have an absolute truth value.

²⁶¹ Nora, “Between Memory and History,” 8.

history is also revealed to be perhaps just as subjective as, for instance, Leighton's personal oral history. This argument, currently popular in memory discourse, theoretically (and perhaps, idealistically) dissolves the notions of "objective" and "subjective" histories, and allows for the reworking of the very boundaries of history. It suggests possibility for the further exploration of oral histories and personal folklore—which often are dismissed in our photography-history discourses as frivolous. Family photographs also are objects that may threaten to destabilize a presumed historical voice of "objectivity," as they also present a challenge to our prevalent canon of masterworks of "fine-art" images by "master" artists. However, operating on the power of their ability to evoke personal history and memories, the uniquely subjective family photograph presents an opportunity for exploring the possibilities of a history that abandons the pretense of supposed "objectivity" in order to articulate the function of such images as objects that aid in the building and maintenance of personal memories and histories.

Leighton's oral history is plagued by the impossible fallibility of human memory. His stories are partial, mutable, innately personal, and ripe with obvious omissions and the addition of absent items and/or events. It also is overly optimistic, revealing for posterity none of his parents' dramatic marital struggles or other unfortunate events that took a toll on him during the years in which this portrait was made. A close study of Leighton's oral history reveals such accounts to follow the same conventions that family portraits themselves do: Representations of sad times or suffering are a violation of normative

expectations. Instead, by convention, our family photographs and the stories they evoke should present an idealized view of a perfectly functional, happy family, jolly children, and lives lived free from pain, turmoil or angst.

Thus, the tendency for images such as these to be ready sites for projected subjective oral interpretations that challenge many current claims that a photograph is essentially an objective document. However, Leighton's account contributes to a more nuanced understanding of the varying possible range of interpretive photographic "realisms." Family photographs such as Leighton's portrait instead invite the sharing of oral histories that often take on the air of folklore. This is precisely why this genre of photographs is made, kept and narrated. They operate in the realm of the subjective, in order to aid in the building and maintenance of personal memories and histories.

Chapter Four: Asynchronous Time

[P]ossibilities exist, whether in art or politics or both, to move within that network, to play with its temporal fortunes, to show us something about that time – even manipulate it – as it would seem to manipulate us in turn.

– Pamela Lee²⁶²

This chapter will introduce device-altered photography, another means by which the medium conveys a range of expressions of time. A device-altered photograph is produced by a camera with a modified focal plane, shutter, and/or film advance system. These images offer a departure from the usual expectation that a photograph represents the appearance of a subject in a fixed, rectangular field of space at a fraction of a moment of time – a convention complicated in the previous chapter of this dissertation.²⁶³ Instead, in a device-altered photograph, time and space may be represented as asynchronous, accumulated, distended and/or compressed.

Some photographic practices featuring device-altered representations of time include (but are not limited to): time-lapse photography, peripheral (or

²⁶² Pamela Lee's passage continues: "Postmodernism's instabilities, in other words, might facilitate a relationship to time which presages endless potentiality." This dissertation, however, is working to illustrate that the preceding innovations and anxieties of *modernity* also prompted visual explorations into time's fluid nature and expansive expressive possibility that were apparent even earlier than the 1960s. Pamela M. Lee, *Chronophobia: On Time and Art of the 1960s* (Cambridge, Mass., and London: M.I.T. Press, 2004), 263.

²⁶³ The "fixed, rectangular space" of a photograph made with a 35-millimeter camera without alterations to its focal plane has a 3:2 width-to-height aspect ratio. This ratio has become a standard for photography – both film-based and digital: "Image Aspect Ratios: Common Aspect Ratios for Digital Images, Photography, Cinema, and Television," <http://home.comcast.net/~igpl/Aspect.html> (accessed Aug. 23, 2007).

“rollout”) photography, panoramic photography, stroboscopy, and strip photography – an approach to image-making that includes synchroballistic, aerial, and Photo Finish photographs.²⁶⁴ In strip photography, relatively sharp images of objects in motion are recorded by a stationary camera loaded with film that moves at a speed comparable to that of the recorded objects.²⁶⁵

This chapter will feature a case study of the unique manipulations of time found in a commonplace, yet understudied, application of strip photography, the racing Photo Finish (**Fig. 7-8**). To date, this practice has no published history.²⁶⁶ When the Photo Finish is discussed at all, it is featured in horse-racing magazines, users’ manuals, and in technical papers by practicing artists/scholars such as

²⁶⁴ These categories are by no means an exhaustive representation of all photographic practices which depict device-altered time. Some other seemingly infinite variations and their applications are described in technical detail in: Ron Jegerings, "Photography: Motion Effects Techniques," *Darkroom & Creative Camera Techniques*, Vol. 14, No. 1 (1993): 20. The technical specificities of film-based streak, strip, panoramic, peripheral, stroboscopic and synchroballistic photography are discussed in several articles by Andrew Davidhazy of the Rochester Institute of Technology, most of which are also available on this web site: <http://people.rit.edu/andpph/articles.html>. Several articles of particular relevance to this study include: Andrew Davidhazy, *Simplified Streak/Strip and Scanning Photographic Systems* (Orlando, Fla.: International Panoramic Photographers Association Conference, Feb. 5, 1985), n.p.; Andrew Davidhazy, "A New Spin on Panoramic Photography," *Photo Educator International* (1992); Andrew Davidhazy, "Camera for Conical Peripheral and Panoramic Photography," *Current Developments in Optical Engineering and Commercial Optics*, Vol. 1168 (1989). Available online: <http://portal.acm.org/citation.cfm?id=1281505>. Andrew Davidhazy, "A Simplified Stroboscopic System for Motion Pattern Photography," *Tech Directions* Vol. 59, No. 7 (February 2000): 12-16.; Andrew Davidhazy, "Synchroballistic Photography," "Alternative Velocity Measurement Techniques in Synchroballistic Photography," [On-Line Essays], <http://people.rit.edu/andpph/articles.html> [accessed Oct. 15, 2009], n.p.

²⁶⁵ In digital strip-photography practices, the recording surface is calibrated to emulate analog technology and register only subjects that are moving at a determined speed.

²⁶⁶ A brief unpublished report by a photographer/journalist/former Photo Finish technician provides an overview of the phases of the history of the Photo Finish, and suggests the promise of further research: O'Neill, "The History of Race Photo Finish Photography." Many thanks go to Jerome (Jerry) O'Neill for sharing this report and his insights with me.

Andrew Davidhazy, Professor of Imaging and Photographic Technology at the Rochester Institute of Technology.²⁶⁷

However, three works of scholarly art-historical literature make brief reference to strip photography. In a paragraph of *Picturing Australia: A History of Photography*, Anne-Marie Willis makes reference to the Photo Finish's peculiar representation of time: "[t]he usual concept of a photograph, spatial relations depicted at a given moment of time, is reversed: the race finish photo shows a fixed space, the winning post, over time."²⁶⁸ Willis elaborates no further, other than to claim its invention for Australia, but at least she suggests the promise the Photo Finish might offer for an expanded look at the heterogeneity of photographic time.

In the article "Photography, Vision, and Representation," Joel Snyder and Neil Walsh Allen cite the Photo Finish as an example of one of several photographic practices that complicate essentialist claims that the medium has a fixed relationship to "the real."²⁶⁹ They note that the strip-photography Photo

²⁶⁷ Omega Sports Timing recounts its corporation's history of timekeeping at the Olympic Games in: Jean-Pierre Bovay, *Le Sens du Temps: Time Photographs and Perspective* (Bienne, Switzerland: Omega Sports Timing Corporation, 1988). This book includes a brief, non-scholarly account of the development of Photo Finish technology, in the service of providing an historical context for his company's contributions. However, as footnote number three suggests, Andrew Davidhazy has produced the bulk of scholarship on the various approaches to device-altered photography, and he actively experiments with these techniques in his studio practice. In effect, Davidhazy's contributions have introduced this set of practices to the academic community, and to contemporary photographers.

²⁶⁸ Anne-Marie Willis, *Picturing Australia: A History of Photography* (North Ryde, Australia and London: Angus & Robertson Publishers, 1988), 116.

²⁶⁹ Joel Snyder and Neil Walsh Allen specifically argue: "The mechanical relations which guarantee the validity of the photograph as an index of a certain kind of truth have been almost

Finish has a peculiar manner of expressing time and space that departs from the medium's conventions.²⁷⁰

Of course, once we know how a photofinish picture is made, it upsets *us*. We are accustomed, when we see five horses occupying five different positions in a photograph to think that we are looking at a picture of five horses that were all in different places at the same time. In a photofinish, we see five horses that were at the same place at different times. When we look at the nose and tail of a single horse in the picture, we are still looking at things which were recorded as they occupied the same place at different times. As we move from left to right across the picture, we are not looking at distance, but at time.²⁷¹

Although Snyder and Allen only discuss the Photo Finish in passing, they raise several questions: How exactly can this photographic practice be both truthful and abstract, simultaneously? And how is it that in a Photo Finish, “we are not looking

completely severed from the creation of visual likeness.” Joel Snyder and Neil Walsh Allen, “Photography, Vision, and Representation,” *Critical Inquiry*, Vol. 2, No. 1 (Autumn, 1975): 159.

²⁷⁰ *Ibid*, 143-169. Interestingly, although Snyder and Allen describe the strip-photography Photo Finish in the text of this essay, the image they selected to illustrate this article (Fig. 5, p. 158) is a rare hybrid made by two different processes. The contact print along the top edge of the Photo Finish featured divided, separate, sequential frames, and was made by an “Eye-in-the-Sky” video camera. These systems were quickly outmoded because they featured problematically slow shutter speeds of 165 frames per second and frequently failed to record an image of the first-place finish. The dominant image below the contact print reveals traces of “ghost legs,” an artificial “finish line,” streaked turf, spool imprints, and oval-shaped wheels. Those details are telltale signs of the strip-photography process. Sportsman’s Park – or Hawthorne Park (Chicago, Ill.) – was unfortunate enough to have *just* purchased Harry I. Day’s “Eye-in-the-Sky” video-camera system for \$300,000 (about \$4.5 million in 2007) during the Great Depression in the summer of 1936, mere months before the strip-photography Photo Finish (developed by Lorenzo Del Riccio) was patented, sold to racetracks and almost immediately became the industry standard. This image, a highly unusual hybrid of both techniques, suggests the racetrack’s reluctance to discard the “Eye-in-the-Sky” system entirely. Rather, the “Eye-in-the-Sky” camera system at Sportsman’s Park apparently was integrated with Del Riccio’s strip-photography camera and a mirror system invented in 1946 by Athol Shmith and B. Altson Pearl in this undated photograph. While this image is not an exemplary sample of strip photography, it suggests that an awkward technological adolescence followed the introduction of Photo Finish systems.

²⁷¹ *Ibid*, 159.

at distance, but at time”?²⁷² If a Photo Finish is an image of “time,” then what, precisely, does it express about *time*? These questions find further investigation in this chapter.

Chilean-born video-installation artist Tania Ruiz Gutierrez mentions the time-and-space distortions of the strip-photography Photo Finish in a few pages of her doctoral dissertation in the Art and Science of Art for the University of Paris - Panthéon-Sorbonne.²⁷³ In this project, Gutierrez analyzes and charts various approaches to expressing time in a vast range of videos and device-altered photographic practices. She develops a mapping system called an “OST” – for “des Objets Spatio-Temporals,” or “Space-Time Objects” – to provide a “volumetric interpretation of the time captured in a cinematographic, videographic or even photographic recording.”²⁷⁴ Although cinematic works are the focus of Gutierrez’s project and her studio practice, she positions the Photo Finish within a survey of an expanded group of artistic media that manipulate time-and-space coordinates and defy conventional expectations that objects are afforded but one static presence in time and space.

Thus, this chapter offers the first expanded art-historical look at the Photo Finish. Through a close examination of the historical, social and technical

²⁷² Ibid.

²⁷³ Tania Ruiz (Gutierrez), “Études sur le Temps et l’Espace dans l’Image en Mouvement: Tissage Vidéo, Objets Spatio-Temporels, Images Prédicatives et Cinéma Infini,” (Université Paris 1, 2004): 184-198. For a view of her video installation work, see: <http://www.taniaruiz.info/index.html>.

²⁷⁴ Ibid, 151.

contexts of this photographic practice, this dissertation will articulate the specific complications and possibilities that the sculptural representation of time in a Photo Finish image presents for our current historical and theoretical discourses.

I. A Pre-History of the Photo Finish

Before the Photo Finish was invented, horse-racing enthusiasts hailed photography for its perceived promise of temporal mastery after seeing Muybridge's published photographs of running horses in 1878. They were specifically impressed by the medium's ability to provide a visual record of a fraction-of-a-second of time that surpassed the sensitivity of the human eye. An unnamed editor at the horse-racing periodical *The Spirit of the Times* was the first to comment in print on October 11, 1879, that photography might be useful for determining race finishes:²⁷⁵

²⁷⁵ Muybridge applied for a United States Patent for a "Method and Apparatus for Photographing Objects in Motion" in June, 1878, and patent No. 212,865 was granted to him in March of 1879: Eadweard Muybridge, "Improvement in the Method and Apparatus for Photographing Objects in Motion," United States Patent Office (United States of America: 1879). Muybridge first began photographing a horse in motion for Leland Stanford in the summer of 1872, and published his images in 1878. For the most part, they were met by worldwide acclaim. By all written accounts, horse-racing enthusiasts especially praised Muybridge's studies as "unerring": *The Spirit of the Times*, (June 3, 1882): 513.

There is an immense field for electro-photography, which Muybridge, with the facilities at his command, seems competent and determined to occupy. It has occurred to us, by the way, that electro-photography might be turned to practical account on racehorses by depicting the finishes of heats. It seems entirely feasible, and would finally do away with all question as to the winner in a close finish. No suspicions could be cast upon a judge of this character, charges of bribery or partiality could not be made, and we commend the idea to Muybridge as one which may benefit him and the sporting public.²⁷⁶

Muybridge himself also claimed to have been the first to recognize the value in photographing race finishes. In a letter published in 1882 – three years after *The Spirit of the Times* journalist's article was published – Muybridge wrote: “I venture to predict, in the near future that no race of any importance will be undertaken without the assistance of photography to determine the winner of what might otherwise be a so-called ‘dead heat.’”²⁷⁷

Indeed, in horse racing and in historical writing, particular competitive emphasis is placed on *who crossed the finish line first*. However, to set aside debates about the origin of the idea to photograph race finishes for a moment, these comments – and a flurry of others sparked by them in various racing periodicals – collectively speak to a widespread enthusiasm for the fraction-of-a-moment-exposure photograph's potential to provide an unbiased visual record of

²⁷⁶ "Progressive Photography," *The Spirit of the Times* (Oct. 11, 1879): 252. The author of this passage refers to Muybridge's experiments as “electro-photography,” because Muybridge's shutters were operated by electricity. The harnessing of electricity for use by motors first became possible in the 1830s, after Michael Faraday invented the electric motor and the electric generator (to power his motor). For more about the revolutionary impact of electrical experiments and innovations in the nineteenth and twentieth centuries, see: Carolyn Marvin, *When Old Technologies Were New: Thinking About Electric Communication in the Late Nineteenth Century* (New York: Oxford University Press, 1988).; Sconce, *Haunted Media*.

²⁷⁷ Eadweard Muybridge, "A Dead Heat," *Nature*, Vol. 26 (1882): 81.

the decisive span of time during which horses cross the finish line. Underlying that faith is the belief that an image made by a machine – the camera – can master time.

Cinema scholar André Bazin echoes this sentiment in his statement that photography is “an impassive mechanical process” that is therefore obligated to document the presence of objects in a specific temporal and spatial matrix.²⁷⁸

The objective nature of photography confers on it a credibility absent from all other picture making. In spite of any objections our critical spirit may offer, we are forced to accept as real the existence of the object reproduced, actually *re-presented*, set before us, that is to say, in time and space.²⁷⁹

Placing faith in neutrality and infallibility of machines was widespread in the nineteenth and twentieth centuries. The subject has been much-historicized by various scholars of technological modernity. Historian Gerald Stanley Lee comments that the machine was regarded as “the symbol of the man’s highest self. His own soul beckons to him out of it.”²⁸⁰ Lee also suggests that machines may outlive their creators, provided the machine did not become obsolete in future generations.²⁸¹ As such, these objects might allow humanity to experience an infinite time that bypasses – and perhaps “cheats” – the biological limitations of the human life span.

²⁷⁸ Bazin, “The Ontology of the Photographic Image,” 13.

²⁷⁹ André Bazin, *What Is Cinema?*, Vol. 1 (Berkeley, Los Angeles and London: University of California Press, 1967), 13.

²⁸⁰ Lee, *The Voice of the Machines*, 58.

²⁸¹ *Ibid*, 58.

Historian of media and technology Scott McQuire characterizes the decades surrounding photography's invention as a reason-seeking, empiricist age.

He suggests that inventions such as the camera satiated positivist urges:

The machine was valued not simply because it was labour-saving, but because it was seen to surpass the capacities of the fallible human observer. Unstinting, methodical, uniform, durable, ever alert, incapable of being swayed by emotion or passion, the machine was invested as a paragon of Victorian virtues. Insulation from the spectre of individual judgment provided by all kinds of machines of measurement and recording consolidated the empirical orientation of the positivist project, in which physical appearances investigated by the armature of reason were increasingly treated as unambiguous facts.²⁸²

Technology historian Howard Besser adds that the grounded, unemotional machine might salvage objectivity from the destiny of dissolving into an anarchy of contingency.²⁸³

However, how can photography provide such stabilizing, empiricist solace if fraction-of-a-moment-exposure photographs themselves represent departures from the appearance of objects in ongoing, continuous, lived time? This contradiction can be further elucidated by taking a closer look at a set of Muybridge's photographs of "Sallie Gardner," which were broadly regarded as proof of the medium's temporal objectivity by the horse-racing community.²⁸⁴

²⁸² Scott McQuire, *Visions of Modernity: Representation, Memory, Time and Space in the Age of the Camera* (Sage, London, 1998), 34-35. The author's spelling has not been changed.

²⁸³ Howard Bessner, "Elements of Modern Consciousness." <http://www.gseis.ucla.edu/~howard/Papers/consciousness.html#component> (accessed March 16, 2008), n.p.

²⁸⁴ "Is It a Push or a Pull?" *The Blood-Horse* (March 22, 1947): 833. Editors of *The Blood Horse* magazine, for instance, declared: "Anything written prior to instantaneous photograph was mere observation and opinion, and as such, can be discarded." Ibid.

A. Pre-History of the Photo Finish: Abstraction and the *Fraction-of-a-Second-Exposure* Image

In Muybridge's series of photographs titled *The Horse in Motion: 'Sallie Gardner,' Owned by Leland Stanford: Running at a 140 Gait over the Palo Alto Track, 19th June, 1878*, a horse is depicted in silhouette, striding in front of a white gridded background marked by consecutively numbered segments of uniform size. "Sallie" runs at an estimated speed of about forty miles per hour past Muybridge's battery of twelve cameras, which are equipped with stereoscopic lenses.²⁸⁵ As the horse passes the cameras, she trips threads to release camera shutters.²⁸⁶ The group of photographs represents a duration of elapsed time that is assumed to be linear and continuous, and is expressed in twelve separate images, each representing a light exposure of an estimated 1/1,000th of a second.²⁸⁷ As Muybridge's title implies, the series represents the narrative story of

²⁸⁵ Using stereoscopic lenses allowed Muybridge *two* images to choose from for each frame of *The Horse in Motion*. This decreased Muybridge's chances for technical error, although it also implies another level of editorial decision-making in Muybridge's selection of the "best" images for the series. Additional temporalities are implied not just by the instants of the photographs' taking and the time represented by each image – and the series as a whole. The time of Muybridge's technical experimentation, the time needed to process the images, the time he used to select images, and the time needed to compose the series also are implied in the final image. Yet more temporalities are implied at the time of viewers' reception of the images. The material aging of Muybridge's images also has temporal implications. Muybridge's interventions therefore complicate Bazin's earlier statement that photography is an impassive mechanical process that is therefore obligated to provide a truthful visual record of the temporal and spatial existence of objects within a fraction-of-a-second of time.

²⁸⁶ Muybridge published his motion studies in these volumes: Eadweard Muybridge, *Animals in Motion* (London: Chapman and Hall, 1899).; Eadweard Muybridge, *Animal Locomotion: The Muybridge Work at the University of Pennsylvania* (Philadelphia: J. B. Lippincott Co., 1888).

²⁸⁷ Muybridge was not the only photographer experimenting with shutter speeds at this time. German photographer Ottomar Anschütz patented a focal-plane shutter in 1888 which could open

a horse in the act of running.²⁸⁸ These images are “read” as a text might be in the Western world: in a linear sequence, from top-to-bottom, and from left-to-right. One-half-second-long gaps of temporal duration lie between each of Muybridge’s images, implying elapsed unseen time, during which “Sallie’s” body presumably moved to the position we see in the next frame.²⁸⁹ Time’s passage is therefore implied by changes in the spatial location of “Sallie” and her various body parts over time. These half-second-long durations of unseen time provide temporal spaces for viewers to fill with their own narratives, given the interpretive framework offered by Muybridge’s descriptive title, *The Horse in Motion: ‘Sallie Gardner,’ Owned by Leland Stanford: Running at a 140 Gait over the Palo Alto Track, 19th June, 1878.*

The series of photographs begins with Sallie in full gallop. Muybridge’s title reinforces what we see by reminding us that the horse is *in motion*. Images and text collaboratively imply the existence of these represented moments within a temporal continuum, as part of an action that began *before* the 1/1000th-of-a-second view of spatial relationships that was captured in the first photograph.²⁹⁰

and close as quickly as 1/1,000th of a second. For more on Anschütz’s experiments, see: Keith James Laidler, *To Light Such a Candle: Chapters in the History of Science and Technology* (Oxford and New York: Oxford University Press, 1998), 108.

²⁸⁸ Placing the subject in front of a grid was Muybridge’s way of lending the project scientific credibility, Marta Braun argues: Braun, "Time and Photography," 134-135.

²⁸⁹ These gaps, perhaps, have a biological familiarity. They are similar to the breaks in the continuity of vision that we experience when we blink.

²⁹⁰ We also experience life this way. Although we cannot remember the event of our birth, we do remember our lives in progress, starting around three or four years of age. Presumably, we also consciously will experience the endpoint of our lives.

In other words, we do not see Sallie begin her run, but the images we do see could not have existed without those off-camera moments. But perhaps because Sallie's choppy start might not "read" as easily as a sequential series, Muybridge does not represent them, in favor of revealing the horse in full gallop.

However, in defiance of Muybridge's title, "Sallie's" run ends amazingly abruptly in the final image (**Fig. 10**). In the twelfth photograph, numbers on the grid defy the previous sequential order, and Muybridge appears to have disregarded the estimated half-second interval that appears to have elapsed between the other frames. Even if the grid's numerical count repeated between the last two photographs, the rider would have undergone a sudden change in speed – from an average speed of covering *one* quadrant per half-second to a "slow-down" speed of covering at least *five* quadrants per half second. In other words, "Sallie" would have accelerated to five times her speed, to about two-hundred miles per hour, between the last two frames. This is implausible for two reasons: first, racing horses reach a running speed of about fifty-five miles per hour. Secondly, it would have been impossible for "Sallie" to come to an abrupt and complete stop in one-half of a second. The final image thus breaks the temporal cadence of a half-second gap of elapsed time between each 1/1,000th-of-a-second exposure, and it fractures the linear progression of time viewers are conditioned to expect from the other images.²⁹¹

²⁹¹ On March 6, 2008, I taught *Horse in Motion* to a group of animation majors at the Kansas City Art Institute. One of their assignments for an animation class was to re-animate Muybridge's *Horse in Motion* by filling in the gaps between these twelve photographs. My students unanimously agreed that every one of Muybridge's photographs – except for the last one – were

It is therefore probable that Muybridge added this image from another sequence of photographs in order to give an expected narrative closure to this series – and to indicate the completion of the act of running. Muybridge was known for making alterations to his other motion studies by adding non-sequential photographs to “complete” a set, as Marta Braun notes.²⁹² Muybridge’s decision to insert a concluding image of Sallie at rest closes the series as a finished duration, as a “becoming” that finally “became.” The final photograph in the series provides temporal closure, ending possible speculations about the fate of the run.

Although Muybridge’s fraction-of-a-moment exposures offered visual departures from viewers’ experiences of time as an ongoing continuum, the scientific community readily accepted these photographs as “truthful” to the mechanics of equine movement.²⁹³ In the decades prior to Muybridge’s experiments, scientists granted photography the liberty of a fluid relationship to veristic realism. For instance, contact prints of botanical specimens made in the 1830s-1850s by Talbot and Anna Atkins may have lacked surface detail and accuracy to the plants’ specific hues, but they still were regarded as persuasive documents. The microscopic photographs of Léon Foucault and Hippolyte Fizeau

sequential, plausibly separated by a half-second interval of time, and obeyed the mechanics of linear equine movement.

²⁹² Marta Braun, "The Expanded Present: Photographing the Moment," in *Beauty of Another Order: Photography in Science*, ed. Ann Thomas (New Haven: Yale University Press, 1997), 153. Braun also discusses several of Muybridge’s altered motion studies in relationship to Marey’s work in: Braun, *Picturing Time*, 238-249.

²⁹³ Solnit, *River of Shadows*, 221.

(c. 1845), daguerreotypes of the Moon made with the Great Refractor Telescope by George Bond and John Whipple (c. 1851), and Wilhelm Röntgen's X-ray images (1895-) all represented realities unverifiable by the human eye, but which nonetheless were eagerly accepted by the scientific community. Photography historian Josh Ellenbogen has argued that the forensic images of Alphonse Bertillon, the eugenics photographs of Francis Galton, and the motion studies of Étienne-Jules Marey similarly required a conditional understanding of the operations of the photographic document.²⁹⁴

Muybridge's work, Braun suggests, was motivated by his interest in mechanics, science, and by the imperative of uncovering the "laws that govern motion."²⁹⁵ The photographs were largely successful in achieving that goal, she argues: "Although the resulting photographs showed hardly more than black silhouettes against a white background, they had an authority no drawing could ever claim."²⁹⁶ Muybridge's images were regarded as purveyors of objectivity by the man who commissioned them.²⁹⁷ In two of the frames of Muybridge's *Horse in Motion* series, all of Sallie's feet were off the ground. This provided the proof

²⁹⁴ Josh Ellenbogen, "Photography and the Imperceptible: Bertillon, Galton, Marey," (Ph.D. diss., University of Chicago, 2005).; Josh Ellenbogen, "Authority, Objectivity, Evidence: Scientific Photography in Victorian Britain," *Studies in the History and Philosophy of Science*, Vol. 39 (Spring 2008).; Josh Ellenbogen, "Camera and Mind," *Representations*, Vol. 101 (Winter 2008): 86-115.

²⁹⁵ Braun, "The Expanded Present," 153.

²⁹⁶ Braun, "Time and Photography," 133.

²⁹⁷ Braun, *Picturing Time*, 134-135. Braun distinguishes Muybridge's altered images of movement from Marey's scientific – and therefore more "truthful" – endeavors to record time's passage by representing movement.

that Muybridge's patron, the tycoon/politician Leland Stanford, needed in order to win a bet.²⁹⁸

As Muybridge's "instantaneous" equine locomotion photographs were published in mainstream-culture magazines and newspapers worldwide, they continued to be regarded as truthful documents. An article written by the editor of horse-racing magazine *The Spirit of the Times* hailed Muybridge's photographs as "unerring," while also pointing out that "it is difficult, to the verge of impossibility, to explain why what we see with our own eyes on the race-course differs so much from what we see on the plate of the photographer."²⁹⁹

Art historian Thierry De Duve notes this difference and argues that Muybridge's instantaneous photographs represent a paradox in photography's representation of time: the medium's contradictory ability to represent with great apparent fidelity a series of instantaneous-time *movements*, while not representing *movement*, or corresponding to the appearance of subjects as they appear to us as we behold them in the ongoing continuum of lived time:

²⁹⁸ Muybridge's scandalous life and his contributions to the media of photography and cinema have been the subject of many books and articles. Three fairly recent publications which look at Muybridge's exploration of instantaneous time include: Prodder, *Time Stands Still*.; Solnit, *River of Shadows*.; Braun, "Time and Photography."

²⁹⁹ "Muybridge's Horses," *The Spirit of the Times* (June 3, 1882): 513.

Muybridge's snapshots of a galloping horse demonstrated what the animal's movements were, but did not convey the sensation of their motion. The artist must have felt squeezed between two incompatible truths that can be approached in terms of a contradiction in aesthetic ideology. But basically this contradiction is grounded in the paradoxical perception of photography in general, for which the example of Muybridge is simply an extreme case. ... The paradox of the unperformed movement and the impossible posture presents itself as an unresolved alternative. Either the photograph registers a singular event, or it makes the event from itself in the image. The problem with the first alternative is that reality is not made out of singular events; it is made out of the continuous happening of things.³⁰⁰

Jonathan Crary similarly remarks that the *Horse in Motion* series is a "blunt dismantling of apparent continuities of movement and time" in which "empirical similitude" is distanced from a "reality effect."³⁰¹ As a result, Muybridge's images, Crary argues, "exposed not naturalness of vision but... its systematic and constructed character."³⁰² Indeed, time in Muybridge's images is isolated into 1/1000th-of-a-second visual fragments, which are then reconstructed as a grid to evoke a narrative of duration. This series of photographs reveals not only the "constructed character" – to borrow Crary's term – of photography's representation of time, but of *time itself*. Both are abstractions.

³⁰⁰ De Duve, "Time Exposure and Snapshot," 115.

³⁰¹ Jonathan Crary, *Suspensions of Perception: Attention, Spectacle, and Modern Culture* (Cambridge, MA: The M.I.T. Press, 1999), 140. The year after he made *Horse in Motion*, Muybridge – who is acknowledged as one of the founding fathers of cinema – announced his design for an early version of a movie projector, which he called a "zoopraxiscope." This device presented replayable movement, another form of what Crary calls "reality effect." Crary's book *Techniques of the Observer* posed the possibility that photography did not, due to a technological connection to the camera obscura, embody perspectival systems of seeing from the Renaissance. Instead, Crary argues that medium might instead embody a condition of modernity that included a collapsing of the boundaries between observer and observed, subject and object, and representation and real: Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, MA.: The M.I.T. Press, 1990).

³⁰² Crary, *Suspensions of Perception*, 138.

This phenomenon did not go unnoticed. The unique “reality effects” of instantaneous photographs such as Muybridge’s sparked a heated discussion among artists, who debated whether the elegant horses painted by Theodore Géricault were superior to the awkward equines of Muybridge’s photographs (**Fig. 11**).³⁰³ French sculptor Auguste Rodin thrust himself into the center of this debate, in a 1924 discussion with Paul Gsell about the instantaneous photography of Muybridge and Marey, boldly declaring that “[i]t is the artist who is truthful, and it is the photograph that lies; for in reality time does not stop”³⁰⁴ In his defense of painterly “truth,” which he claimed was at odds with a photographic “truth,” Rodin argues:

Géricault is criticized because in his *Racetrack at Epsom*, from the Louvre, he painted horses that gallop ... in a familiar expression [the “flying gallop” position]. ... [I]n the instantaneous photograph, the front legs of the horse are drawn in earlier, after having given propulsion to the whole body... The four legs almost look as if they are suspended in air. They give the animal the appearance of sauntering in place, and of being immobilized in this position. ... Géricault reasoned against the photographic [view of a moving horse].... At the same time his view is false, it is truthful [, for instance,] when the start [of a gallop] is observed successively..., since it is [Géricault’s representation of the gallop] which we see, and that which impresses us.³⁰⁵

³⁰³ Jules Portefin, “French Horse Painters of the Nineteenth Century,” *The British Racehorse* (Nov. 1950): 395. Portefin argues that Theodore Géricault’s passion for horses drove him to study art under Carle Vernet – who had a fiery disposition, but a great gift for painting horses. *Ibid*, 394. Interestingly, Géricault died from a horse-riding accident at the age of thirty-three.

³⁰⁴ Auguste Rodin, *L'Art: Entretiens Reunis par Paul Gsell* (Paris: Bernard Grasset, 1924), 86. Rodin’s original quote is: “c’est l’artiste qui est véridique et c’est la photographie qui est menteuse; car dans la réalité le temps ne s’arrête pas.” The above translation is mine.

³⁰⁵ Rodin’s original quote is: “Ils critiquent Géricault parce que dans sa *Course d'Epsom*, qui est au Louvre, il a peint des chevaux qui galopent ventre à terre, selon l’expression familière, c’est-à-dire en jetant à la fois leurs jambes en arrière et en avant. Ils disent que la plaque sensible ne donne jamais une indication semblable. Et en effet dans la photographie instantanée, quand les jambes antérieures du cheval arrivent en avant, celles d’arrière, après avoir fourni par leur détente la propulsion à tout le corps, ont déjà eu le temps de revenir sous le ventre pour recommencer une

In Géricault's *Derby/Racetrack at Epsom*, all four horses have their legs extended outward from their bodies, as Rodin describes. This "flying gallop" posture, according to Irma B. Jaffe, was *the* conventional way of representing running horses in Western and Eastern art until the publication of Muybridge's book of animal locomotion studies in 1887 revealed this pose to be an "artistic convention" that was "not true to nature."³⁰⁶ From that point on, the "flying gallop" disappeared from European art, Jaffe argues, and artists began representing horses in the climax of a gallop, with all four legs flexed under the body.³⁰⁷ A new convention of representing running horses was based on emulating poses from Muybridge's instantaneous photographs of *The Horse in Motion*. In it, although the horse's legs are all off the ground at the same time in two instances (top row, middle two images, **Fig. 9**), Sallie's legs are never extended in a "flying gallop." Rather, the horse contracts all legs, holding them close to her body. Even in the two frames of Muybridge's series in which all four legs are extended outward in a pose most similar to the one represented in

foulée, de sorte que les quatre jambes se trouvent presque rassemblées en l'air, ce qui donne à l'animal l'apparence de sauter sur place et d'être immobilisé dans cette position. Or, je crois bien que c'est Géricault qui a raison contre la photographie : car ses chevaux paraissent courir : et cela vient de ce que le spectateur, en les regardant d'arrière en avant, voit d'abord les jambes postérieures accomplir l'effort d'où résulte l'élan général, puis le corps s'allonger, puis les jambes antérieures chercher au loin la terre. Cet ensemble est faux dans sa simultanéité ; il est vrai quand les parties en sont observées successivement et c'est cette vérité seule qui nous importe, puisque c'est celle que nous voyons et qui nous frappe." This quote is published in: Rodin, *L' Art*, 86. The above translation is mine.

³⁰⁶ Irma B. Jaffe, "The Flying Gallop: East and West," *The Art Bulletin*, Vol. 65, No. 2 (1983): 183.

³⁰⁷ *Ibid*, 183, 185.

Géricault's painting (middle row, last two images), one of "Sallie's" legs touches the ground. Muybridge's photographs proved that horses do not ever position themselves – even for just a fraction of a moment – in a “flying gallop.”

But as Rodin argues, Géricault's preferred, painterly form of “truthfulness” was based on observations made with the unaided human eye – which does not see time as constituent, atomized units, but as a continuous flow of events and objects in motion. Rodin maintained that an artist committed to the “truthful” representation of nature should *only* depict what is visible to the eye, as it appears to the unaided human senses. According to Rodin, the photograph therefore “lies” at representing visual “realism.”

Race-track patrons, on the other hand, also noted the difference between the “reality effect” of the optically centered visual experience and the abstract, camera-based one. However, they were dazzled by the camera's ability to surpass their own observations and operate by the logic of the temporal fragment. Racing fans regarded Muybridge's images as unbiased images of the mechanics of a horse's gait – even though the appearance of the animal in motion was less graceful than they were conditioned to anticipate.³⁰⁸ In the eyes of racing fans, Muybridge's images encapsulated photography's unique capacity to halt and capture a 1000th-of-a-second of time as a lasting visual document that may be viewed and reviewed in multiple points in later lived time.³⁰⁹ This unique

³⁰⁸ "The Instantaneous Process," *The Turf, Field and Farm* (June 18, 1886): 524.

³⁰⁹ Prior to the photographing of race finishes, Jerome O'Neill explains: “The judging of horse races in this era was more casual than modern practice, and probably less accurate, as well. The

representation of photographic time, Bazin suggests, “embalms time, rescuing it simply from its proper corruption” – the “corruption” of our experience of time as a continuous, indivisible flow.³¹⁰

B. Capturing Race Finishes with the Fraction-of-a-Second, Full-Field Photo Finish

Despite its capacity for abstraction with respect to the experience of lived time, the fraction-of-a-second-exposure photograph was used to photograph race finishes starting in the late nineteenth century. Ernest Marx of Plainfield, N.J., claimed to have made the first single-exposure finish-line photographs in 1888, panning his camera as horses passed the finish line and using a trip wire to release his shutters.³¹¹ Published records can neither confirm nor deny whether Marx knew of Muybridge’s prior use of trip wires in the Palo Alto experiments. However, because an article detailing Muybridge’s experiments was published in one of the industry’s most popular magazines, *The Spirit of the Times*, on June 3, 1882, and Muybridge’s horse photographs first were published in *Scientific*

judges stood in a low stand or platform, usually in the infield, on the opposite side of the track from the public. Thus they neither had a particularly *good* view of the finish nor even the *same* view as the public. Such an arrangement was bound to lead to unpopular decisions, and in fact the judges’ location may have been partly designed to give them some protection from outraged bettors!” O’Neill, “The History of Race Photo Finish Photography,” 2-3.

³¹⁰ Bazin, “The Ontology of the Photographic Image,” 13.

³¹¹ “Editorial Notes,” *Photographic Times and American Photographer*, Vol. 18 (1888): n.p. In some sources, Ernest Marx’s last name is spelled “Marks.” The name “Marx” appears more frequently in racing periodicals and in other primary source material. Consequently, this dissertation uses that spelling of his name.

American several years earlier, in October 19, 1878, it is likely that Marx was familiar with Muybridge's techniques.³¹²

None of Marx's photographs survive today.³¹³ But race-track photographers, such as Marx and J. C. Hemment, made sketches of their Photo Finishes for reproduction in racing periodicals (**Fig. 12-13**).³¹⁴ Two of Hemment's sketches of instantaneous Photo Finishes were reproduced on the June 26, 1886 front page of *The Spirit of the Times*. These sketches' existence suggests that the first fraction-of-a-second-exposure Photo Finishes may have been made two years earlier, in 1886.³¹⁵ The oldest surviving sample of this phase of Photo Finish photography is Hemment's image of the Salvator-Tenny race from 1890 (**Fig. 14-15**).³¹⁶

However, what once was a source of enthusiasm – the implementation of an unbiased machine, the camera, to produce a reliable testimony to the order of race finishes that exceeded the sensitivity of the human eye – was discovered to

³¹² Eadweard Muybridge, *Scientific American*, Vol. 39 (1878): 239.

³¹³ Most of the oldest Photo Finish images have not survived because photographers and race tracks saw no reason to keep them. J. C. Hemment was an exception to this tendency. He assembled albums of his race-track images, which included Photo Finishes, photographs of jockeys and owners, race-track employees, and patrons. The Keeneland Library in Lexington, Kentucky, houses Hemment's albums.

³¹⁴ These sketches also were regarded as "documents" that testified to the truthful order of race finishes, even though they were produced by the human hand. The sketches' source material – Photo Finish photographs – lent the drawings a perceived truth value and credibility.

³¹⁵ *The Spirit of the Times* (June 26, 1886): 702.

³¹⁶ Incidentally, in Hemment's own album of race-track photography, either Hemment himself or his assistant misidentified the year of this race (as 1891, instead of 1890). I am grateful to Kathy Schenck of the Keeneland Library for pointing this out.

have flaws. Almost immediately, shortcomings were detected in the fraction-of-a-second-exposure Photo Finish. Almost all of the cameras employed on race tracks used horizontally advancing camera shutters that exposed film from top to bottom and allowed the horses closest to the photographer to be exposed on film slightly later. This advantage was discernable to the human eye, and once discovered, the horizontal-shutter advantage called the veracity of this photographic practice into question.³¹⁷ However, vertical shutters were immediately implemented as an industry standard, and this solution satisfied race-track patrons, owners, Photo Finish technicians and journalists.

Then, the fraction-of-a-second-exposure Photo Finish was deemed problematic because it so frequently “missed” *the* decisive finish-line-crossing moment, and because it left subsequent finishes unrecorded.³¹⁸ In 1937 in France, a fraction-of-a-second-exposure Photo Finish actually incited a riot:

At St. Cloud on July 4, placing judges, after looking at a photograph of the finish, declared Grande Beaute winner over Valombrosa, and backers of the latter set about smashing the judges’ stand. So judges glanced again, awarded the race to Valombrosa. Backers of Grande Beaute smashed perimutuel booths, sent a police captain and two gendarmes to a hospital, about a dozen of their own number to jail. Mounted guardsmen restored order, eventually.³¹⁹

³¹⁷ Robert Harron, "Eye in the Sky," *Collier's Illustrated Weekly* (Sept. 19, 1936).

³¹⁸ Tracks invited members of the press to “tests” of the new devices, in order to convince the public of the reliability of the instantaneous Photo Finish. Journalists were not easily won-over by improvements in the camera device: "Finish Photography," *The Blood-Horse* (June 20, 1936): 743.

³¹⁹ "French Photography," *The Blood-Horse* (July 10, 1937): 7-10-37, 53.

The following colorful account of the incident was offered by “Faraway,” the French correspondent for London’s *Horse and Hound*:

Being anxious to hoist the photograph for public inspection, and allow racegoers to get away from the course, the film was put up, still wet and not completely developed. ...But as the photograph dried out it gradually appeared that the nose of La Valombrosa was in front of that of the grey, and naturally enough the mistake was immediately corrected by changing position of the numbers. This was the signal for one of the most disgraceful riots I have ever seen on a racecourse in any part of the world. ...The crowd...broke windows, made bonfires of paper, attacked the perimutuel booths, and did much damage. The situation looked so ugly that, in addition to the large force of police, the mounted Garde Mobile has to be called out to take a hand, and it was not until an hour and a half had passed that the riot was quelled and the public left the course.³²⁰

Indeed, outrage and doubts about the credibility of the fraction-of-a-second Photo Finish peaked from 1900 to the 1930s. Coincidentally, these decades also brought the mass-publicized destabilization of time’s fixity by Bergson, who suggested that our consciousness of time is mutable, and by Einstein, whose groundbreaking studies gave theories such as Bergson’s scientific validity by proving the Relativity of our efforts to measure and regulate time.³²¹ Sports journalist Ralph Powers writes of the general skepticism among race-track patrons in the 1930s:

In some of the well known eastern tracks, the camera finish equipment was so poor that the average layman was willing to go back to the bookie, or bettor at the track, and make a second bet against the cameraman, so that he might cover his losses.³²²

³²⁰ "Faraway," "Explanation of a Riot," *The Blood-Horse* (Aug. 21, 1937): 241.

³²¹ Kern, *The Culture of Time and Space*, xii.

³²² Ralph Powers, "Photography at the Race Track," *Photo Technique* (June, 1939): 30.

As Powers notes, a loss of faith in the Photo Finish was directed at the faulty engineering of the camera mechanism and trip wires, not at the medium of photography's ability to isolate a decisive, finish-line-crossing, fraction-of-a-moment of time. Indeed, in the early decades of the twentieth century, scientists had, in fact, disproved time's stability and coherence. But the hope of surpassing the human capacity to understand time was invested in photography – a medium that had proved that it could access unseen realisms. After all, despite the fact that the Great Depression caused race tracks to lose money, many chose to cut back on landscaping but did not hesitate to spend a staggering \$300,000 in 1936 (the equivalent of \$4,488,739 in 2007) for Harry Day's soon-to-be-outdated, single-exposure camera, the "Eye in the Sky."³²³ This decision paid off, because purses doubled when cameras were implemented at the most famous American race tracks – Santa Anita (Calif.), Narragansett Park (R.I.), Arlington Park (Chicago, Ill.) and Hawthorne Park (Chicago, Ill.).³²⁴ For instance, in Santa Anita, the "handle" the day before the camera was installed was \$221,537 (\$3,314,739 in 2007).³²⁵ The next day it was \$536,000 (\$8,019,880 in 2007). In just a few days, the cameras had paid back their expense. In other words, despite the cameras'

³²³ "In the Wake of the News: Arlington Park," *Chicago Daily Tribune* (June 29, 1936): 19.; "Roman Soldier to Campaign at Arlington Park," *Chicago Daily Tribune* (June 25, 1936), 24.; "The Inflation Calculator." [On-Line Resource] Accessed April 19, 2008. Available at: <http://www.westegg.com/inflation/infl.cgi>.

³²⁴ Harron, "Eye in the Sky," 59-60.

³²⁵ These figure are from: Powers, "Photography at the Race Track," 31-32.

technical quirks, the public's faith in *photography* never wavered, and accommodated any necessary mechanical retooling.

II. The Strip-Photography Photo Finish

Engineers and photography technicians focused in the early decades of the twentieth century upon creating a camera that had the sensitivity and accuracy of the fraction-of-a-second exposure, but could more reliably capture the decisive finish-line-crossing moment. Engineers tried employing “photo cells” to trigger the release of camera shutters and experimented with movie cameras to increase the odds of capturing *the* finish-line-passage duration. The resulting images still often missed the critical moment of the race finish and were deemed unreliable. Engineers and technicians turned their attention to inventing a camera that never “blinked” and recorded continuously. Such a device *had* to capture the finish-line-crossing moment. But track owners also recognized the merit of having a visual record of subsequent finishes by later horses, too.

It would take several decades for such a camera to be invented. As with the invention of the medium of photography itself, multiple inventors from different countries have claimed to have been the first to create the strip-photography Photo Finish. British inventor Robert Capon filed for a patent in 1926 (**Fig. 16**) for a camera that, according to *The British Racehorse*, “is in fact the sire of the modern racecourse camera,” even though it “does not appear to have been regarded by the inventor as having any particular application to horse

racing.”³²⁶ In other words, it was a technological antecedent – if not an antecedent in practical application. The Capon Camera was a shutter-less camera that featured a vertical slit for an aperture and film that – if calibrated properly – moved at the same speed as the moving subjects and successively recorded moving objects over a duration. The Capon Camera was used to photograph moving aircraft and automobiles, but was never employed at a race track.³²⁷

Strip photography first was adapted for race-track use in 1937 by Lorenzo Del Riccio, an optical engineer for Paramount Pictures’ technical research laboratories, for debut at the inaugural horse race at Bing Crosby’s Del Mar Turf Club – the luxurious race track of the rich and famous of Hollywood (**Fig. 17-18**).³²⁸ This technology became the standard in the Americas and in Europe.

³²⁶ Robert Capon, "Improvements in or Relating to Recording Apparatus for Use in Investigating Speed," British Patent Office (United Kingdom: Nov. 10, 1927).; "Photo Finish," *The British Racehorse* (Nov. 1950): 407. It should be noted that staking claim to inventing the Photo Finish also was a matter of national pride. After the Del Riccio camera had become popular in England, the British were swift to find grounds to contest Del Riccio’s status as the creator of that technology. (Curiously, British journalists overlooked The British Museum’s peripheral camera – the strip camera’s ancestor technology. It will be discussed in detail shortly.) The patriotic pride at stake in claiming this invention echoes the nationalism that also was a driving force in the invention of the medium of photography, as well.

³²⁷ Capon, "Improvements in or Relating to Recording Apparatus for Use in Investigating Speed," 407.

³²⁸ Although Bing Crosby is most well known for being a singer, he also was a technophile. In addition to facilitating the adaptation of strip-camera technology for use at horse-racing tracks, he also pioneered the use of the microphone, and was instrumental in bringing the technology of magnetic tape recording from Germany to America. This new advance allowed entertainers to revise and perfect their radio performances, and even record them in advance. It also served to collapse the distinction between live performances and previously taped ones. Shows with tape-recorded segments allowed present and past temporalities to mingle freely, sometimes misleading listeners into thinking that the entire radio show was a live broadcast. Like photography, the invention of tape-recorded performances presented listeners with a baffling absence/presence conundrum. For more on Bing Crosby: *The South Bank Show: Bing Crosby*, (Tele-Line, for B.B.C. Television), Parts 1-3. Incidentally, after inventing a race-track strip camera, Del Riccio formed a company (Photochart) with Crosby to market the camera technology. However, when

However, Australians Athol Shmith and B. Altson Pearl also laid claim to the invention of a strip camera for use to determine race finishes. The Shmith and Pearl camera system, or “Camera-Graph,” was based on the same technology as Del Riccio’s and Capon’s cameras. Even though their camera system only dated back to 1946, Shmith and Pearl added a mirror on the far side of the finish line to allow cameras to be able to “see” blocked horses and saddle numbers. This system became the standard in Australia, New Zealand, Africa and Asia.³²⁹

Within a few years, these mirrors soon became a global racing standard.

Del Riccio began making cameras for competing companies, Photochart (which still exists today, under the name Plusmic) sued Del Riccio for breaching the non-compete clause in his contract. Del Riccio claimed that he did not know that the contract still applied. To add insult to injury, Del Riccio then refused to pay his part of the legal fees to help Photochart fight off copyright abusers. Del Riccio and Photochart entered a court battle that lasted about a decade, and finally ended in 1954. Del Riccio was no longer allowed to claim royalties, and his extended contract and non-compete clause were both found to be valid. *Del Riccio Vs. Photochart / Photochart Vs. Del Riccio*, (Civil Court - State of California 1946 (No. 15293) / 1949 (No. 17115) / 1952 (No. 19362) / 1954 (No. 19855)). Del Riccio later was hired by the United States Army Corps. of Engineers to work with Captain (later, General) George Goddard to develop a form of strip camera for use in aerial photography. For more about the making of aerial photographs, see this manual: United States Corps of Engineers, *Engineering and Design: Photogrammetric Mapping, Manual* (Washington, D.C.: Department of the Army, 2002). Aerial strip photography was replaced in the 1970s by satellite mapping and imaging.

³²⁹ Anne-Marie Willis names Athol Shmith and B. Altson Pearl as the inventors of Photo Finish technology: Willis, *Picturing Australia*, 116. Australia, incidentally, is home to the only known strip-photography Photo Finish that *ever* has been publicly retracted as “untruthful.” In a close finish, the 80-to-1-odds horse Rimfire was declared the winner over the more-favored Dark Marne for the 1948 Melbourne Cup. This was the first time Photo Finish equipment was used at the Flemington race track, and it was installed incorrectly. This mistake was discovered months later. The decision remained in the record books, and money was not refunded. “Did the Camera Lie?” *The Sydney Morning Herald* <http://www.smh.com.au/articles/2003/11/03/1067708135702.html?from=storyrhs> (accessed Feb. 23, 2007).; ABC News, “The Track” <http://www.abc.net.au/tv/thetrack/ep4trans.htm> (accessed March 23, 2007). Despite this error, Photo Finish technology enjoyed a warm reception in Australia. Americans also eagerly accepted the Photo Finish. Don Morehouse – who has been making Photo Finish images for race tracks for more than thirty-six years for the New York Racing Commission – claims that Photo Finishes are not capable of inaccuracy, because the proper installation and operation of cameras is monitored closely by his employers, the state of New York’s Racing Commission: Don Morehouse, “Tour of Aqueduct Race Track Photo Finish Booth, Interview by Author,” (March 11, 2005).

With the exception of upgrades such as the addition of timing systems, mirrors, and digital data processing to Photo Finish practices, the basic camera technology has changed very little in the seven decades since its invention. Digital Photo Finish cameras have been in widespread use since the late 1990s.³³⁰ They have maintained the same aperture, focal-plane and mobile-recording design as their film-based predecessors.

A. The Time-and-Space Matrix of the Strip-Photography Photo Finish

To record a horse race, strip-photography Photo Finish cameras are positioned in a booth in the grandstands above the finish line, and are focused on a four-to-eight-inch-thick vertical slice of space at the line (**Fig. 7-8**).³³¹ When horses approach the finish line, a technician activates the camera's film-advance motor by flipping a switch. In an analog Photo Finish, film begins to move past the vertical slit of an aperture and is exposed to light. Racing horses pass the

³³⁰ Ibid. Race track Photo Finish technicians (who do not call themselves "photographers") use two cameras to record finishes, just in case one camera runs out of film or breaks. Since the late 1990s, most tracks have converted to semi-automatic digital technology, to reduce operator error and transmit photographs to judges sooner. A backup camera is still used. Ibid.

³³¹ An elevated view of the finish line is advantageous because it allows the camera to see any horses which may be blocked by the horse in the foreground. To read more about experiments with tower heights and the possibility of suspending the camera on a cable directly over the finish line, see: French Lane, "Improvements in Arlington Make It Ideal Track: 'Eye-in-the-Sky' and New Odds Board Features," *Chicago Daily Tribune* (June 22, 1936): 22.; "Arlington Park Opens 30-Day Meet Tomorrow," *Chicago Sunday Tribune* (June 28, 1936): Section 2, Page 4.; Braven Dyer, "The Sports Parade: Column Conductor Finds Bing Crosby's Del Mar Plant Architectural Gem; Track Ready for Grand Opening," *Los Angeles Times* (1935): A14. Incidentally, gambling is even more profitable today. In an average weekday in 2005, Aqueduct Race Track made about \$12 million from on-site and off-track betting: Morehouse, "Tour of Aqueduct Race Track."

exposure space at (ideally) the pre-calibrated speed of the film's movement, and are recorded on film.³³²

Only moving objects are recorded in strip photography. Static subjects appear as streaks, reversing the conventional expectation that blurs are visual notations of moving subjects and reversing the convention of anticipating that a photograph represents still objects within a full visual field.³³³ While a strip-photography Photo Finish might appear at first glance to offer a fraction-of-a-second view of objects within a full field of space, it instead provides a peculiar representation of time as a finite, relative duration.

For instance, in the analog Photo Finish titled *Photo for Win, June 29, 1956, Roosevelt Raceway* (**Fig. 19**), six harness-racing horses finish the fifth race of the day. The image is rife with abstractions. The strip of ground at the finish line area remained still, so the turf is recorded on the film as a streaked field of grey. Only moving objects are recorded in strip photography. Static objects become streaks. In the Photo Finish, we see an abstraction, an elapsed "smear" of a brief, subjective span of accumulated *durée* that marks a departure from the manner that a full-field, fraction-of-a-second-exposure photograph relates to the

³³² The average estimated speed of running horses on dry ground is 55 feet per second: Oswald Ziegler, ed., *Australian Photography* (Sydney: Ziegler Gotham Publications, 1947), 24.

³³³ A strip camera may record movement on the film from left to right, or vice-versa. The direction of film's movement does not affect the veracity of the resulting image: Andrew Davidhazy, "Interview by Author," (2005). However, if racing objects are depicted running in one direction on film when they ran the other way in reality, patrons might lose faith in the Photo Finish's truth value. For this reason, race track technicians print display Photo Finish images of subjects moving in the "right" direction: Morehouse, "Tour of Aqueduct Race Track."

time-and-space matrix.³³⁴ The photo-finish reveals a static image of a state of linear becoming, a state which ended with the achievement of the moment we see – the crossing of the finish line. This moment has great consequences in later time, including lost or gained fortune and glory. A span of subjectively determined time in the slice of space in the finish line is anointed by the very existence of the Photo Finish as a *more important* time and space than others we experience. That linear, finish-line-crossing, span of a few seconds of time is so very crucial monetarily that a camera has been deemed necessary to extend our visual sensitivity threshold and to boost our perception of spatial relationships over time in that prioritized space. In a Photo Finish, all “times” are not created equal, especially those whose consequences involve the exchange large sums of money.

But additional abstractions also appear in *Photo for Win, June 29, 1956*. A crisp white “finish” line appears at the nose of the winning horse (**Fig. 20**). It does not, however, bow in the wind, or adhere to the nose of the winning horse as it passes. In fact, racing patrons never would have seen this white finish line at all. Because the entire photograph represents an ongoing series of finish-line-crossing moments, *every* part of a Photo Finish represents the finish line. In order to

³³⁴ I have borrowed the phrase “smear of time” from Andrew Davidhazy, Professor in the Imaging and Photographic Technology department, School of Photographic Arts and Sciences, Rochester Institute of Technology. Interestingly, the words “time smear” also have been used to describe lenticular images – which also complicate any preconceived notions that there might be only *one* way to consider a two-dimensional image’s relationship to time: K. Jaffey and S. M. Dutta, “Time Smear Corrected Multiplex Holographic Display of Computerized Tomography Data,” Selected International Society for Optical Engineering Papers on CD-ROM, Vol. 12, Disc 1. Conference: “Stereoscopic Displays and Applications” (1983); Malgorzata Machniewska, “With the Wink of an Eye,” *Afterimage*, Vol. 29, No. 6 (2002): 11.

produce the expected finish “line,” and to provide a point for comparing the distance between one finishing horse’s nose and another’s, a photo-finish technician carefully placed a straight wire in a perpendicular position to the track (using the short white vertical marks on the top and bottom of the image as guides), and exposed a piece of photographic paper with the wire on top (**Fig. 20-21**).³³⁵ The wire obscures the thin strip of paper under it from being exposed to light. An analog Photo Finish image is part contact-, part enlarger-exposed print. The edges of the image are also marked by the camera with notations that likewise were never seen by race-track patrons, including the date of the image, the name of the race track, sequential numbers from two to nine, and evenly spaced white marks. This information is imprinted on the film as it advances by a spindle inside of the camera.

Also, in the *Photo for Win*, the horses’ legs disappear and chariot wheels appear to be oval-shaped. The photograph fails to depict objects as they appear to us with our own vision. What we see is illogical. A chariot with an oval-shaped wheel could not move at all, let alone, at the rate of fifty-five feet per second.³³⁶ Given these departures from reality and photographic convention, how do we reconcile the Photo Finish’s abstract nature with the fact that it is so reliable and wholeheartedly trusted that a Photo Finish is legally binding in a court of law as

³³⁵ For a step-by-step description of the making of a photo-finish, see: Kent Hollingsworth, “Fast Camera, Tick Marks Lay Wire on Horse’s Nose in Photo Finish,” *Lexington Leader*, April 22, 1959.

³³⁶ Jegerings, “Photography: Motion Effects Techniques,” 19-22.

the *only* fail-safe method to determine the winner of a race – and thus, to determine the fate of gold medals or millions of dollars?

If the film in a Photo Finish camera is calibrated to move faster or slower than the racers, then subjects will be distorted. Quicker objects appear compressed. Slower ones are elongated (**Fig. 22-25**). Wheels moving faster than 55 miles per hour (such as the ones on the harness-racing chariots in *Photo for Win*) appear oval-shaped. If a horse steps on the finish line as it passes the aperture's field of view, the horse's partially still leg will appear as a faint smudge on film.³³⁷

Even more pronounced distortions occur in finish photographs for sports which involve a number of moving parts or limbs. The Photo Finish is used to document race finishes in the sports of cycling, canoeing, motorboating, speed-skating, roller-skating, track events, dog-racing and rowing. Rowing crews frequently appear out of synchronicity in photo-finish images (**Fig. 26-27**). For instance, in the 1968 Olympic finals, teams were rowing in perfect synchronicity, and had rigid, functional oars. But because the crew and oars were constantly moving in different directions as the boat passed the camera exposure space at the finish line over a duration of time, crew members' oars appear to be curved, and the crew itself appears to be out of synchronicity in the resulting photo-finish.³³⁸

³³⁷ Morehouse, "Tour of Aqueduct Race Track."

³³⁸ Many thanks also go to Andrew Davidhazy for his assistance in my understanding of Photo Finish technology.

Yet more distinct examples of photo-finish distortions are apparent in photo-finishes from track-and-field events. Because runners commonly step on the finish line, or advance their legs at the speed of the film's movement, photo-finish images often feature missing, stretched and deformed human legs (**Figs. 28-29**). The likenesses we see in a Photo Finish do not match our knowledge of the appearance of the represented subjects.

But Photo Finish images, for all of their abstractions, *do* represent the temporal intervals between objects with absolute fidelity (**Fig. 30**). No matter how elongated or compressed an object might appear, the relative intervals between it and other objects will be recorded with precision within 1/2,000th of a second.³³⁹ An object cannot appear on film until the precise moment when it moves past the finish line. No amount of distortion can make an object reach the aperture's recording field any sooner. This is why a Photo Finish is upheld as absolutely truthful to the order and presence of racers at a finish line during a finish.³⁴⁰ Thus, the Photo Finish reconciles what Barthes called photography's peculiar temporality to its capacity for a certain kind of realism: "false on the level of perception, true on the level of time."³⁴¹ Specifically, a Photo Finish is regarded as failsafe, and as absolutely indexical to *one* kind of time (determining the order of finishes in a finite, linear duration) – but it does not provide an accurate account

³³⁹ United States Rowing Club, "Digital Timing and Photofinish: What Can You Expect to See?" (2000), n.p.

³⁴⁰ Morehouse, "Tour of Aqueduct Race Track."

³⁴¹ Barthes, *Camera Lucida*, 115.

of the appearance of the racers. As such, a Photo Finish displays another phenomenon described by Barthes: that a photograph's power to certify presence may exceed its power to represent appearances accurately.³⁴² Nonetheless, a Photo Finish is an abstraction that enjoys the truth value of indexicality. It is consistent with Charles Sanders Peirce's own notion of the "index," which leaves the photograph room for contingency, so that it can slip in and out of semiosis.³⁴³

The Photo Finish prompts us to question photography's relationship to veristic "truth," as Joel Snyder and Neil Walsh Allen have suggested.³⁴⁴ But the Photo Finish's representation of time as simultaneously indexical and abstract (or "symbolic" in Peirce's terms) suggests that photography as a whole cannot universally be defined accurately by any fixed relationship to time, but by the possibility of *many*.

B. Strip Photography in Technological Context

A strip-photography Photo Finish departs from "conventional," fraction-of-a-second, full-aspect-ratio photographs in three ways. It is (1) a time-lapse

³⁴² Ibid, 89.

³⁴³ Peirce, "Logic as Semiotic," 1-23.

³⁴⁴ Snyder and Allen, "Photography, Vision and Representation," 61-91.

exposure that is (2) made through a limited, altered aperture field, (3) using a mobile light-sensitive surface.³⁴⁵

As the combined product all three conditions, the Photo Finish is a descendant of panoramic and peripheral (“rollout”) photography (**Figs. 31-33**).³⁴⁶ The first of these practices to emerge was panoramic photography, which features 100- to 360-degree-wide views of a subject that are recorded on long plates or strips of film using mobile lenses or plates/film.³⁴⁷ Single, extended-duration-exposure panoramic cameras fit into three categories: (1) wide-angle-lens cameras with instantaneous exposures (such as a 35-millimeter camera equipped with a fish-eye lens); (2) swing-lens cameras such as Friedrich von Martens’s, in which the camera’s body does not move, but the lens swings in an arc of up to 270 degrees, exposing the film gradually; and (3) cameras with rotating bodies and stationary lenses, such as the Kodak Cirkut Camera – in which the entire camera

³⁴⁵ As an extended-duration exposure, the Photo Finish finds a plethora of precedents, including the time-lapse images of the medium’s earliest practitioners such as Niépce, Daguerre and Talbot, the “chronophotography” of Étienne-Jules Marey, the Futurist “photodynamism” of Anton Giulio Bragaglia, Harold Edgerton’s stroboscopic images, and the “scientific management” studies of Lillian and Frank Gilbreth, to name a few. A detailed examination of these numerous extended-exposure predecessors of the Photo Finish falls exceeds the capacity of this case study.

³⁴⁶ The word “panorama” is Greek in origin, and means “all seeing.” The term was used in 1792 in the London *Times* to announce the exhibition of a 360-degree painting made by Robert Barker of a city view from an elevated vantage point and expanding to the distant horizon: Angela Miller, “The Panorama, the Cinema, and the Emergence of the Spectacular,” *Wide Angle*, Vol. 18, No. 2 (1996): 34. Other recent scholarship includes this look at panoramic vision, which precedes photography’s invention: Stephan Oettermann, *The Panorama: History of a Mass Medium*, trans. Deborah Lucas Schneider (New York: Zone Books, 1997). This exhibition catalog also explores the various panoramic techniques: Joachim Bonnemaison, et. al., *Collection Panoramas: Bonnemaison Photographies, 1850-1950* (Arles: l’Espace Van Gogh, 1989).

³⁴⁷ The history of the use of Kodak’s Cirkut Camera is detailed in: Robert B. MacKay, *America by the Yard: Cirkut Camera Images from the Early Twentieth Century*, 1st ed. (London: W. W. Norton, 2006), 8.

pivots to cover a span of up to 360 degrees.³⁴⁸ Within these three types are many variations, including panoramas comprised of multiple exposures (**Fig. 34-37**).³⁴⁹ Swing-lens and rotating cameras both are shutter-free, and feature a scanning slit that allows for the exposure of the film or plate to light over an elapsed duration of time. (**Fig. 37**).³⁵⁰

These varied “scanning camera” panoramic techniques evolved from photographers’ efforts to extend the limited aspect ratios of conventional photographic views. Perhaps the most popular of such images was made by Antoine Claudet. In 1842, Claudet photographed views of London from atop the Duke of York’s column. He joined several separate daguerreotype plates to create a panoramic image that replicated the extended views of panoramic paintings. C. F. Sargent took Claudet’s fused daguerreotype images and made them into a continuous view using sixty connected boxwood blocks, and engraver Ebenezer

³⁴⁸ The Cirkut Camera was invented by William J. Johnston and patented in 1904. The Rochester Panoramic Camera Company manufactured it until the company was acquired by Eastman Kodak three years later. Kodak’s aggressive marketing campaign was largely responsible for popularizing the Cirkut Camera. The Cirkut was mounted on a tripod, and the entire camera rotated in one direction while the film advanced at the same speed in the opposite direction. Cameras came in five sizes (#5, 6, 8, 10 and 16), which corresponded to the size of the film (which ranged from 5 inches by 3 inches [#5] to 1 foot 4 inches by 20 *feet* [#16]. Ibid, 10-11. Very few original Cirkut Camera negatives survive: “Once the class graduated, the convention adjourned, or the brigade disbanded, there was little chance of additional orders or incentive to find space to store bulky Cirkut images.” Ibid, 6.

³⁴⁹ Several computer programs currently are able to translate photographs with conventional 3:2 aspect ratios into composite images that appear to be device-altered photographs. For instance, Stitcher software blends various 3:2-aspect-ratio photographs to make a 180-degree panoramic image.

³⁵⁰ Early-twentieth-century Cirkut Cameras were marketed toward commercial photographers, although Kodak’s advertisements worked to stir interest in the panoramic group photography by advertising the Cirkut to a mass audience. For more about Kodak’s savvy marketing strategies, see: Douglas Collins, *The Story of Kodak* (New York: H.N. Abrams, 1990).; Dan Meinwald, “Picture Perfect: The Selling of the Kodak Image,” *Frame/Work*, Vol. 1, No. 2 (1987).

Landell prepared the image published in the January 7, 1843, issue of the *Illustrated London News*. The panorama was a “gift” for customers who had purchased six-month subscriptions to the new weekly publication, and it contributed to the immediate success of the newspaper. Subscriptions rose from 26,000 to 66,000 from May to December of 1842.³⁵¹

According to Stephan Oettermann, the pre-photographic panorama and its variants – cosmoramas, dioramas, neoramas, cycloramas, and moving panoramas – “came to epitomize an international hunger for physically, geographically, and historically extended vision” in the early-to-mid nineteenth century.³⁵² He attributes this desire for an “extended vision” to the displacement of formerly fixed notions of time and space that was encouraged by the sciences and by various developments of the modern age, including airborne travel, rapid transportation and instantaneous communication.³⁵³ He warns, however, that this new manner of seeing was foreign to human biology, but wholly “modern” in its genesis:

³⁵¹ Ralph Hyde, “Comments by Ralph Hyde on ‘The Grand Panorama of London from the Thames,’” (2000). Available at: www.motco.com/panoramas/001/hyde.asp (Accessed April 12, 2008), n.p.

³⁵² For more about the panorama’s connection to a desire for extended vision, see: Shelley Rice, “Boundless Horizons: The Panoramic Image,” *Art in America* (Dec 1993). According to Stephan Oettermann, enthusiasm for extended views of the landscape was sparked after the first unmanned hot-air-balloon flight in 1782 in France: Oettermann, *The Panorama*, 14.

³⁵³ *Ibid*, 13.

It [the panorama] is the vision demanded by the natural sciences, which were developing rapidly at that time. The panorama is both a part of this process of transforming human vision and a product of it; as an art form, it is a response to a way of seeing that its viewers are already presumed to have, while at the same time it instructs them how to see in this manner. The discovery of the horizon reflects the historical experience that the known world is contained within it and an unknown world begins beyond it; both worlds should be explored. . . . Even the feeling of giddiness that accompanied this discovery is simulated in the panorama. According to contemporary accounts, a great many ‘ladies with delicate nerves’ and ‘young dandies’ became seasick at the first exhibitions.³⁵⁴

In *Technics and Time*, philosopher Bernard Stiegler suggests that technological advance produces “a divorce . . . between the rhythms of cultural evolution and the rhythms of technical evolution.”³⁵⁵ This produces a situation in which human biology rebels and “[t]echnics evolves *more quickly* than culture.”³⁵⁶ Stiegler further argues that this tension results in a condition in which “there is both advance and delay, a tension characteristic of the extending . . . that makes up any process of temporalization.”³⁵⁷ For instance, the decades surrounding the invention of photography brought a flurry of innovation, followed by a brief lull.³⁵⁸

³⁵⁴ Ibid.

³⁵⁵ Bernard Stiegler, *Technics and Time, 1: The Fault of Epimetheus* (Stanford: Stanford University Press, 1998), 15.

³⁵⁶ Ibid.

³⁵⁷ Ibid.

³⁵⁸ The public introductions of time-and-space-collapsing innovations including the passenger train (1830), computer (1833), photography (1839), and the trans-Atlantic telegraph (1844), occurred within a few years of each other. From the 1870s to 1940s, another surge in the introduction of time-and-space-collapsing inventions – including the photographic practices featured in this chapter’s case study – occurred. This period brought the invention of the telephone (1876), automobile (1890s), cinema (1894), radio (1900-1910), the airplane (1903) and television (1939). It has been acknowledged as the longest period of sustained time-and-space collapsing

Despite the jarring effects of such technologies upon some viewers, enthusiasm for an extended vision of the landscape – exemplified by the popularity of Claudet’s panorama – inspired several innovators to develop single-exposure cameras that might make the fusion of plates unnecessary. Joseph Puchberger received a patent for a swing-lens panoramic camera that used curved daguerreotype plates in 1843. His camera employed curved daguerreotype plates that were 19 to 24 inches long, and had an 8-inch focal-length lens. Puchberger’s photographs spanned 150 degrees. The same year, Calvert Richard Jones developed a “double picture” panoramic camera, which he pivoted to make two separate, successive, overlapping calotype exposures of a single subject.

Von Martens patented his Megaskop camera – which made 150-degree photographs on 4.7-inch-by-15-inch curved daguerreotype plates that later were straightened for viewing – in 1844.³⁵⁹ His resulting panoramic images offer a unique collision of naturalism and abstraction. For instance, one such image, Von Martens’s *View of Paris* (1845) (**Fig. 38**), provides a laterally reversed, black-and-white image of the city scene it represents. Although von Martens’s camera appears in the image to have been positioned near today’s Musée d’Orsay (7^e arrondissement), it actually was placed on the Left Bank near the Gare d’Austerlitz (13^e arrondissement), just south of the foregrounded Austerlitz Bridge. In von Martens’s panoramic view, Parisians saw a scene that did *not*

innovations, according to authors such as Stephen Kern: Kern, *The Culture of Time and Space*. This span of time encompasses the case studies offered in this chapter.

³⁵⁹ MacKay, *America by the Yard*, 9.

resemble the city they knew. Yet the daguerreotype indeed represented an image that was recognizably *Paris* – from the decorative details on the side of the Austerlitz Bridge to the distant proud rise of Notre Dame on the Ile de la Cité. Moreover, the reflective metal daguerreotype plate enabled viewers to see a large mirror image of their own face surrealistically superimposed in comparably large scale, in the laterally reversed, but highly detailed, black-and-white Paris cityscape. As Paris rests in eternal stasis in photographic grayscale, a viewer's own image discordantly enjoys motion and full-color realism.

Further tensions between realism and abstraction also occur when arc-shaped photographic plates are used in swing-lens cameras such as von Martens's. The rounded photographic plate coincided with the shape of the swinging lens's circular trajectory. But after arc-shaped plates are flattened for display, many features of the image are represented as more arc-shaped than they are in actual appearance. For instance, although the Right Bank of the Seine in von Martens's *View of Paris* is fairly straight, it curves outward dramatically at the left edge of the image. The Austerlitz Bridge sags slightly.

Like its later descendant, strip-photography, the panorama also represents a finite duration of light captured sequentially, in linear time. As panoramic photography was adapted for taking group portraits in the late-nineteenth to early-twentieth centuries, photographers anticipated these distortions, and compensated for them accordingly. In order to produce a final portrait in which the subjects appeared to be standing in straight horizontal rows, photographers using revolving

cameras (such as the Kodak Cirkut Camera), and arranged the group in a large circle, with the camera positioned at its center. Often, they drew circular chalk marks on the ground and built towers at the site of the portrait to aid in the image's execution (**Figs. 39-40**).³⁶⁰ The resulting panoramic photograph, however, does not reveal any evidence of the group's positioning (**Fig. 41**). Instead, the image is truthful to the *presence* of its subjects rather than to the *appearance* of the group's arrangement. Rounded space is flattened and reconstituted by photography, as space also was distorted by other inventions of the modern age. The "unreal realism" of panoramas required "a considerable suspension of disbelief," Miles Orvell argues.³⁶¹ Yet "the viewer accepted the ... [panorama] as a kind of model, an artificial construction made out of 'real' pictures."³⁶²

The subjects of panoramic photographs occasionally took playful advantage of the camera's extended-duration, sequential-time exposure. In the anonymously made panoramic photograph *E-Troop, 101st Calvary, Pine Camp, N.Y., 1937* (**Fig. 41**), a subject positioned near the end of the circle, Walter Devereux, ran behind the camera to uncannily appear on two ends of the resulting

³⁶⁰ Ibid, 17.

³⁶¹ Miles Orvell, "Reproduction and 'The Real Thing': The Anxiety of Realism in the Age of Photography," in *The Technological Imagination: Theories and Fictions*, eds. Teresa De Lauretis, Andreas Huyssen and Kathleen Woodward (Madison: Coda Press Inc., 1980), 79.

³⁶² Ibid.

group portrait.³⁶³ This “double-ender” panoramic portrait questions conventional expectations fostered by instantaneous photography: that a photograph represents spatial relationships in a fraction of a moment of time. Instead, subjects such as Devereux have the opportunity for more than *one* singular presence and relationship to space in the photograph’s represented time. Devereux here realizes a distinctively “modern” desire: the sensation of the annihilation of the perceived rules of space and time. He defies the laws of Euclidean geometry and rationalist seventeenth- and eighteenth-century Newtonian physics, which dictated that a subject’s was afforded *one* physical presence in space in an instant of linear time. Device-altered photography reflects an age in which understandings of time and space radically and creatively have been reconfigured.

Oettermann attributes the panorama’s extension of the metaphorical and literal horizons of the photographic aspect ratio to modernity’s expanded conceptions of the temporal and spatial matrix. Swift new forms of transportation such as the railroad, automobile, and airplane, he argues, “reduced the sensation of being closed in by the horizon,” so that “[t]o the modern eye the horizon no longer appears as a painful barrier. It has become little more than a metaphor, ‘pierced’ in a thousand places by supersonic airplanes and satellite television.”³⁶⁴

³⁶³ “Double-enders” have a higher market value than other panoramic photographs: MacKay, *America by the Yard*, 15. Another relationship to temporality, the duration of Devereux’s run, also is implied by his double-presence in the image.

³⁶⁴ Oettermann, *The Panorama*, 21. The panorama also appeared at the beginning of a technological revolution that brought other innovations that eliminated other natural limits to human eyesight, including binoculars and microscopes, according to Oettermann. *Ibid.*, 21.; Ierley, *Wondrous Contrivances*, 19.

The panorama, as Oettermann and Merritt Ierley have argued, was hailed as an ideal medium for reflecting the public's perceptions of temporal and spatial fluidity in an age of new order, modernity.

C. Peripheral Photography as a Precedent

Photo Finish technology also is related to peripheral, or “rollout,” photography (**Fig. 42**). In peripheral photography, the camera may or may not move as it continuously records the 360-degree surface of the outer periphery of a cylindrical or near-cylindrical subject on a flat, light-sensitive photographic surface.³⁶⁵ To make a peripheral image, a subject is first placed on a turntable. Film inside of a camera is calibrated to move at the same speed as the subject. As the film slides through the camera and the subject revolves, an image is recorded progressively as light falls upon the film through a thin vertical, slit-shaped aperture. The end result is a long thin image of the subject's entire surface (such as the surface of the tire, **Fig. 43**). What was once a three-dimensional cylindrical surface is translated into a long, flat image.

³⁶⁵ Although “peripheral photography” is the preferred term used by experts such as Andrew Davidhazy of the Rochester Institute of Technology, this form of photography goes by several other names. Mayanist art historians and archaeologists refer to the practice as “rollout photography.” Europeans use the terms “roundshot photography” and “turntable photography.” Davidhazy, “Camera for Conical Peripheral and Panoramic Photography.”; Justin Kerr, “A Short History of Rollout Photography,” International Photographic Archive of Mayan Art (On-Line Journal) <http://research.famsi.org/rollout.html> (accessed Feb. 13, 2007). Peripheral photography is also similar to aerial photography, in which the camera records the Earth's surface as the planet, the airplane, and the film in the camera all are moving. Like a Photo Finish, aerial photographs are images of elapsed time over a changing field of space. For more about the history of aerial photography, see: Denis Cosgrove, “Contested Global Visions: One-World, Whole-Earth, and the Apollo Space Photographs,” *Annals of the Association of American Geographers*, Vol. 84, No. 2 (1994): 279.

Peripheral cameras come in two varieties: (1) stationary cameras that allow the subject to move in synchronicity with the speed of the film, and (2) cameras that revolve around a still subject. Like the strip-photography Photo Finish, swing-lens panoramas, rotating-camera panoramas, and both categories of peripheral images all feature the gradual recording of a subject over elapsed, linear sequential time. (Please see these diagrams, **Fig. 44-47**, for a visual comparison of the varying representations of time and space in each of these device-altered practices.)

Peripheral cameras – a technological improvement over the previous process of making “rubblings” of objects’ surfaces – are commonly used to make “rollout” photographs of the surface ornamentation on sculptures, pottery and architecture. Although little is known about the origins of the peripheral camera, a report published in May of 1895 states that Arthur Hamilton-Smith from the Greek and Roman Antiquities department at the British Museum designed an instrument for photographing the painted surfaces of the ancient pottery works from its collection.³⁶⁶ The camera system later was expanded for use by other departments at the British Museum.³⁶⁷

³⁶⁶ Curators and representatives of the British Museum do not have any additional information about their institution’s role in the invention of the peripheral camera. Most sources cite this 59-year-old brochure as the “latest” research: Research Engineers Ltd., *Periphography with the R.E. Periphery Camera* (London: Research Engineers Ltd., 1950), 1. The 1895 account of the peripheral camera’s invention is reproduced in this 1950 report.

³⁶⁷ The Nebaj and Fenton vases are two of the most famous pottery works documented by the British Museum, using Hamilton-Smith’s peripheral camera. Kerr, “A Short History of Rollout Photography,” n.p. “Rollout” photographs of Mayan vases first were introduced on a wide scale to archaeologists and art historians in 1978. Until that time, all “rollout” images were hand-drawn by artists. Michael Coe’s publication accompanying an exhibit of Mayan vases at the Princeton

In a peripheral “rollout” image, viewers are prompted to visualize a three-dimensional object, given a flat, two-dimensional image. This process of abstracting three-dimensional objects into two-dimensional form is not unique to the peripheral photography. Swing-lens and rotating-body panoramic images, as mentioned previously, also distort the appearance of the spatial arrangement of their subjects while also offering unique abstractions resulting from the images’ linear, extended-duration exposures.

III. Conclusions

Highly experimental, mechanical and technical in nature, device-altered photography exemplifies and enables the medium’s insistent struggle to master time’s passage, to extend the capabilities of unaided human vision, and to find photography’s time-depiction loopholes and conquer them. This set of photographic practices is scientifically positivist in spirit, but offers a paradoxical, complex blend of realism and abstraction. Perhaps fittingly, this set of photographic practices emerged as recent theories of modern physics and mathematics rendered the time and space matrix non-linear, unfixed and relative, and a flurry of inventions reinforced this sensation of temporal/spatial fluidity. Device-altered photography is a uniquely appropriate means for expressing states of contradiction and flux, of reality and unreality, of absence and presence, and of

University Art Museum featured photographs by Justin Kerr. The publication of these peripheral photographs prompted a re-evaluation of the study of Mayan vase iconography: Ibid.

indexicality and abstraction – opposing concepts which form and inform modern consciousness. Photography contributes a distinct medium for expressing of what it means to live in a time of modernity – with all of its exhilaration, scientific and technological advance, and the resulting anxieties it stirs over the forced and synthetic nature of the acceleration of embodied temporality. Device-altered photography specifically provides a means for manipulating the recording of time's irregular passage, and expressing not how time *appears*, but an expression of how it *feels*.

Chapter Five: Composite Time

With new forms of technology, it becomes less simple to define photography as depicting nothing but past time. Streaming video, web cams, video conferencing, photographic instant messaging and the instant rendition of the lens viewpoint onto the screen of a digital camera can offer photography in real time. The erasure of the time previously required to develop film, and the various options the dark room offered for digital manipulation, has created a sense of the photograph as depicting what one might call an ‘expanded present,’ one that intrudes briefly into the past but is experienced as a continuum.

– Nicholas Mirzoeff³⁶⁸

This chapter will address the temporal complexities of a particular practice of digital photography, the National Aeronautics and Space Administration’s whole-Earth composite images. Although these photographs appear to represent a singular, full-field exposure of a fraction-of-a-moment of time – and are regarded as truthful scientific inscriptions with their veracity rarely questioned – whole-Earth images present a seamless digital synthesis of imaginary, hypothetical, idealized, multi-layered, *composite* time. These photographs are made with the aid of computer software that blends visual data from dozens of satellites and produces an image of what the Earth might look like if there were, for example, no clouds, and if the entire planet were immersed in full sunlight. Whole-Earth images result from the seamless digital combination of countless separate photographs, all of which relate to *different* moments in time, into a composite

³⁶⁸ Nicholas Mirzoeff, *The Visual Culture Reader*, Second Edition (New York: Routledge, 2009), 258.

picture presenting what appears to be a *single* moment in time. Images such as whole-Earth digital montages exemplify Batchen's suggestion that digital photography is "*in* time but not *of* time."³⁶⁹ Specifically, these photographs testify to the perplexities of both time and the photographic image. They offer a complex, imaginary synthesis of fractured time, extended duration, multiple past tenses, collapsed space and simultaneity of vision. Whole-Earth composites, therefore, exceed the expectations of Nicholas Mirzoeff, who suggests that time in digital photography offers an "expanded present."³⁷⁰ Moreover, the unique digital "time abstractions" that appear in digital whole-Earth composites are products of an anxious culture trying to come to grips with the quickening pace of life enabled by the proliferation of computer technology – the very tool used to compose these images.

This chapter takes a look at the multifarious representations of time offered by whole-Earth images. It does so by first placing this practice within a history of planetary photography, then introducing and examining digital whole-Earth composite photographs' rich temporal implications. This chapter provides these images an unprecedented scholarly study. In closing, the chapter locates the strategies of N.A.S.A.'s digital composite photographs of the Earth within their respective historical trajectories, as a means to interrogate claims that digital photography represents a unique representation of *today's* temporal anxieties.

³⁶⁹ Batchen, *Each Wild Idea*, 140.

³⁷⁰ Mirzoeff, *The Visual Culture Reader*, 258.

I. The Development of Planetary Photography

The task of photographing the Earth and other celestial bodies is as old as the medium of photography itself. One of the medium's founding fathers, Louis-Jacques-Mandé Daguerre, photographed the Moon in order to impress François Arago and inspire him to help promote the daguerreotype:³⁷¹

Even before the first public announcement of his process, Daguerre had tried, at Arago's suggestion, to photograph the moon, but his daguerreotype plates were so lacking in sensitivity that even a very long exposure gave only a faint image, completely lacking in detail.³⁷²

The first photograph that successfully captured the appearance of the Moon was made in 1840 by John William Draper, after he developed a means for improving the light-sensitivity of his daguerreotype plates.³⁷³ Astronomer George Phillips Bond and portrait photographer John Adams Whipple improved upon Draper's achievement in 1849 by taking the first series of daguerreotype photographs of the surface of the Moon through the Great Refractor Telescope at the Massachusetts Institute of Technology, while tracking the Moon as it moved through the sky.³⁷⁴ Like Muybridge's 1870s-1880s *Horse in Motion* studies, these images of the Moon offered sequential views of a subject's transit – thus testifying to the passage of time itself. However it is important to note that such images are deceptive; they appear to be showing us the moon as caught at a single moment in

³⁷¹ For a brief history of planetary photography, see: Cosgrove, "Contested Global Visions," 279.

³⁷² Daniel Norman, "The Development of Astronomical Photography," *Osiris* 5 (1938): 560.

³⁷³ *Ibid.*

³⁷⁴ *Ibid.*, 562.

time, but they are in fact multiple-exposure images incorporating an extended duration of time. Nonetheless, these images were celebrated milestones of scientific advance, and were recognized at The Great Exhibition of the Works of Industry of all Nations at the Crystal Palace in London in 1851. Thereafter, photography was very quickly and eagerly embraced by scientists including C. R. Davidson, A. C. D. Crommelin, Edward E. Barnard, Hippolyte Fizeau, Léon Foucault and Pierre-Cesar Jules Janssen as a means to photograph and study the Moon, eclipses, comets, the sun, sun spots, the Transit of Venus, and other astronomical phenomena.³⁷⁵

However, other forms of planetary photography were motivated not by the promise they offered for scientific study, but for the new perspectives and expanded vision they offered. The making of aerial imagery representing the Earth's surface began with the work of Nadar (Gaspard-Félix Tournachon), who photographed the village of Petit-Bicetre in 1858 from a hot-air balloon that was tethered to the ground about 262 feet below and equipped with a built-in darkroom.³⁷⁶ In the mid-to-late nineteenth century, elevated views of the landscape were more readily accessible from the high-rise buildings and various

³⁷⁵ Specifically, photography was employed to document eclipses (C. R. Davidson and A. C. D. Crommelin, 1919), capture images of the Transit of Venus (Pierre-Cesar Jules Janssen, 1874), to make an image of a comet (Edward E. Barnard, 1911), and to photograph the sun (Léon Foucault and Hippolyte Fizeau, 1845). For a timeline of the developments of other outer-space phenomena, see: *Ibid.*; Thomas, "Capturing Light," 186-219.

³⁷⁶ Cosgrove, "Contested Global Visions," 279. Nadar's earliest photographs have not survived. The oldest aerial photograph is James Wallace Black's image of Boston from a hot-air balloon from 1860. Nadar's earliest known aerial image is of Paris from 1866.

airships (propelled balloons, blimps and zeppelins), and decreased the novelty of the aerial image.

Shortly after the turn of the century, the invention of airplane travel sparked a renewed interest in aerial photography. Wilbur Wright took the first aerial photograph from an airplane in Italy in 1909, while he was there to try to sell Italy airplanes for use on the African front during World War I. In 1914, the first photograph was made over enemy territory by the British Flying Service. Thomas Eugene Avery suggests that “it was World War I that brought together the airplane, improved cameras and films, and a real need for aerial photography.”³⁷⁷ Futurist poet and spokesman Filippo Tommaso Marinetti declared such views to be “the artistic perspective of the future.”³⁷⁸

However, aerial photographs were more than just useful in wartime. In 1928, *National Geographic* fueled the public’s fascination with the “bird’s-eye” view by publishing a series of articles on geography that were accompanied by aerial photographs and celebrated the achievements of the Italian Argonauts (long-distance pilots).³⁷⁹ Cultural geography scholar Denis Cosgrove suggests that in the 1920s and 1930s, the new perspectives offered by aerial photography were more than just new vantage points from which to view our familiar world:

³⁷⁷ Thomas Eugene Avery, *Fundamentals of Remote Sensing and Airphoto Interpretation* (New York: Macmillan Publishing Company, 1992), 21.

³⁷⁸ Ibid.

³⁷⁹ Cosgrove, “Contested Global Visions,” 279.

The romantic association of (generally male) youth, power, and will with the Apollonian perspective offered by air flight allowed for an heroic construction that attributed the airman with distinctively Modern qualities of scientific objectivity, technical mastery, global vision and, ultimately, *mission*.³⁸⁰

Such extraordinary extended views of the Earth's surface became accessible to the masses when the first commercial airlines began offering passenger travel in 1940s and 1950s.

Almost immediately, after aerial photography from within the Earth's atmosphere was regarded as "mastered," a new technological challenge was declared: capturing images of the planet in its entirety, from outer space. In 1948, the British astronomer Fred Hoyle enthusiastically embraced this new "mission" and declared that an image of the entire Earth could change humanity's relationship to the planet: "Once a photograph of the Earth, taken from the outside, is available, we shall, in an emotional sense, acquire an additional dimension...and a new idea as powerful as any in history will be let loose."³⁸¹ Specifically, Hoyle suggested that seeing our planet diminished by the vast darkness of outer space might humble humankind, while also presenting yet more opportunity and inspiration for further scientific advance in understanding the frontier of outer space.

³⁸⁰ Ibid.

³⁸¹ Hoyle is quoted in: Vicki Goldberg, *The Power of Photography: How Photography Changed Our Lives* (New York: Abbeville Publishing Group, 1991), 52.

This insatiable appetite for seeing the Earth from new vantage points was inextricably bound to a broader cultural enthusiasm for extended vision encouraged by various revolutionary ruptures in perceptions of space and time in science and technology. Temporally, the photographic medium lends viewers the opportunity to enjoy pictures of multiple spaces and times through the camera's surrogate eye. Absent viewers enjoy a delayed virtual presence as observers to subjects across the space/time continuum. Viewers also may review photographs at other points in time, further multiplying and confounding this binary play of temporal absence and presence.

It was not until 1966 that a demand arose among the masses for photographs of the planet Earth in its entirety. Stewart Brand, while standing on his rooftop in San Francisco, had a revelation, which launched an obsessive quest. After taking one-hundred micrograms of LSD, he had a similar epiphany to Hoyle's, and declared that a color photograph of the Earth, as seen from outer space, would inspire humankind to take better care of the planet.³⁸²

When Brand woke up the next day, he ordered hundreds of buttons and posters bearing the slogan '*Why haven't we seen a photograph of the Whole Earth yet?*' and mailed them to various staff members at N.A.S.A., to members of the United States Congress, to diplomats, officials from the United Nations, and to Soviet scientists.³⁸³ Aspiring to capitalize upon the newly coalesced youth

³⁸² Stewart Brand's role in the development of N.A.S.A.'s whole-Earth photography is detailed in: *Ibid*, 53-55.

³⁸³ *Ibid*, 54-55.

movement, Brand also sold buttons for twenty-five cents at the University of California at Berkeley, Stanford University, Columbia University, Harvard University, and at the Massachusetts Institute of Technology.³⁸⁴

Although Brand's international campaign gained respectable mass support, its influence over N.A.S.A. is a matter of debate among scholars.

Although photography historians such as Vicki Goldberg suggest that Brand's mass-marketed drive held sway, Marta Braun disagrees.³⁸⁵

N.A.S.A. wanted high-resolution photographs of proposed lunar landing sites as well as locations of scientific interest. . . . [N]o one had thought of photographing the earth from lunar orbit. Anders' photograph [*Earthrise*], the first one ever made of the earth from deep space, as well as the first to be widely reproduced, was made on impulse.³⁸⁶

Information from N.A.S.A. suggests that photography's scientific credibility as a document held more influence than Brand's campaign.³⁸⁷ However, the medium's reproducibility and its resulting capacity to rouse public enthusiasm for the space program also must have been a consideration in N.A.S.A.'s decision to photograph on its missions.

In November of 1967, an unmanned craft, the Applications Technology Satellite - III, photographed the Earth in color to observe air-mass motion, cloud heights, rainfall, pollution and natural disasters. A Multi Color Spin Scan Camera (MCSSC) camera automatically snapped photographs every half-hour, for twenty-

³⁸⁴ Ibid.

³⁸⁵ Ibid.

³⁸⁶ Braun, "Time and Photography," 141.

³⁸⁷ N.A.S.A., "Gateway to Astronaut Photography of the Earth."

four hours, at a distance of about 23,000 miles from the planet's surface (**Fig. 48**). One of the resulting images represented the entire Earth in full sunlight, with a prominent view of South America (**Fig. 49**). Swirls of cloud cover represent a planet in the throes of dynamic meteorological change. Strong storms wreak havoc on the Great Lakes and Eastern Canada, and dense cloud cover approaches the western edge of South America. Thick cloud cover coalesces at both poles. Land masses are a varying hue of chocolate brown, and bodies of water in the center of the Earth appear black in the ATS-III photograph. The edge of the bottom half of the planet is more illuminated than its counterpart at the top of the Earth, suggesting differential atmospheric light refraction.

These ATS-III photographs, which were relatively blurry images, were published in newspapers and magazines worldwide, and in the fall of 1968, Brand compiled the images from this mission and published them as a book titled *Whole Earth Catalogue*. The book sold well, generating public interest and support for N.A.S.A.'s missions.³⁸⁸ This, in turn, encouraged N.A.S.A. to document their explorations of outer space with photography, in order to hold public support and gain additional government funding.

On December 22, 1968, astronaut William Anders from the Apollo 8 mission photographed the Earth in color, from a distance of 240,000 miles away

³⁸⁸ The *Whole Earth Catalog* became a periodical which was published twice a year from 1968 to 1972, and occasionally thereafter, until 1998. These magazines disseminated the ideas of the counter-culture and environmental movements that we now attribute to the 1960s and 1970s: Goldberg, *The Power of Photography*, 54-55.

(**Fig. 50**).³⁸⁹ The image, titled *Earthrise (View of Rising Earth about Five Degrees Above the Lunar Horizon)*, revealed the planet in partial darkness. The Apollo 8 crew did not notice this “Earthrise” on their first three orbits around the moon because they were busy with other tasks. Although one of the Apollo 8 astronauts’ missions included taking photographs of potential lunar landing sites and other views of scientific interest, *Earthrise* resulted from an inspired impulse to photograph, rather than a scheduled assignment.

In *Earthrise*, the planet Earth is represented in the center of the frame with its land masses obscured in swirls of cloud covering. The gray, crater-marked surface of the Moon fills the right edge of the photograph, revealing the point-of-view from which the image was made. *Earthrise* humbly represents our known world as a small, delicate, isolated, planet dwarfed by the vast darkness of outer space. Poet Archibald MacLeish wrote of *Earthrise*: “Earth was no longer the World, but a small, wet, spinning planet in the solar system of a mirror star off at the edge of an inconsiderable galaxy in the immeasurable distances of space.”³⁹⁰ According to Cosgrove:

³⁸⁹ Commander Frank Borman noticed the scene, and scrambled – along with William Anders – to take photographs. *Earthrise* was not on the N.A.S.A. photography schedule. Interestingly, Borman claimed to have taken the now-famous *Earthrise* photograph. Anders, a good friend of Borman’s, ceded authorship to him. It was determined thirty years later that Anders took the photograph. For more about this authorship dispute, see: Robert Zimmerman, “Photo-Finish: A Thirty-Year Controversy Over the Famous Apollo 8 Earthrise Picture Is Finally Resolved,” *The Sciences* (1998): 16-18.

³⁹⁰ Goldberg, *The Power of Photography*, 56.

MacLeish's world dramatically underlined Modernist beliefs in the mimetic truth of photography, the power of the synoptic gaze (which his language clearly regarded as gendered male), and equally, one-worldism, that is, the claims of American missionary ideology, of which this image stands as empirical proof.³⁹¹

The photograph evokes viewers' knowledge of both the *known* and the *unknown* as humankind's home is revealed as a diminutive component of a larger, fairly-unexplored universe. *Earthrise* rhetorically fuels positivist advance and exploration by illustrating the next frontier of American technological and scientific conquest.

But *Earthrise* also illustrates the complexity of the relationship of the photographic medium to temporality. Based on the speed of light, the instantaneous-time photograph of the Earth represented light that was about a second "old" at the time of its recording on camera. It marks a departure from the "fresh," split-second immediacy of light travel from an object to a camera that we have come to expect of the fraction-of-a-second exposure. *Earthrise* makes multiple references to the past by also implying the variable duration of the speed of light's differential travel from the atmospheres/surfaces of the Earth and Moon to the film inside of the camera aboard the Apollo 8 spacecraft. Light refracted

³⁹¹ Cosgrove, "Contested Global Visions," 283. As Anders himself noted, the Earth "should be thought of as [a] fragile Christmas-tree ball which we should handle with considerable care." Goldberg, *The Power of Photography*, 56. His photograph *Earthrise* inspired widespread public attention to the relatively new environmental movement, which previously only had been popular within the "hippy" counter-culture. Dozens of new environmental groups formed, memberships to existing ones soared, and donations to environmental causes reached a new peak. Goldberg, *The Power of Photography*, 57. Before environmental activism became more widespread in America, two pieces of legislation passed, indicating receptiveness on the part of the U.S. government to these issues. In 1963, the Clean Air Act was passed, followed in 1965 by the passage of federal emissions standards for cars: Ibid, 53.

from the Moon is less deferred than that from the Earth. Therefore, *Earthrise* represents a generalized past of a Barthesian *that-has-been*, while also to the deferred past of the Moon's reflected light, and the even-more-deferred past of the Earth's reflected illumination.

Earthrise also represents two celestial bodies in the throes of their respective and ongoing temporal acts of rotation and orbit. Upon viewing *Earthrise*, Marta Braun comments that “this photograph is a picture of movements – the diurnal rotation of the earth and the much longer rotation of the moon,” despite the fact that this movement is “too slow” to find representation on the camera's film.³⁹² Braun suggests that these processes are nonetheless implied in *Earthrise*. The simultaneously operating, cyclical planetary movements define seasons, nights/days, and years – the very parameters by which humans measure time. Swirls of clouds in the photograph imply that Earth also is dynamically engaged in various changeable processes of meteorological phenomena which are affected by seasonal cycles. The surface of the Moon, in comparison, is not subject to as much apparent meteorological dynamism and change. The Earth, in comparison, is intrinsically and intensely temporal.

The still photograph *Earthrise* represents an isolated fragment of time that is abstract and estranged from our experience of Earth's planetary time as an ongoing set of processes in a continuum. For instance, the repetitive process of the *Earthrise* – and its inevitable antithesis, Earth-“sunset” – comprise our

³⁹² Braun, "Time and Photography," 140-141.

familiar concept of the “day,” and are thus intrinsic to our very conception of time itself. But while the “day” is a known quantity to us, it differs from the length of a “day” on the Moon, and from all known planets in our solar system. Humankind’s temporal concept of the “day” is therefore a relative concept. Like the experience of time itself, photography’s fragmentary views of time are equally abstract.

Even after N.A.S.A.’s publication of the ATS-III and *Earthrise* photographs, Brand’s grassroots campaign for a color photograph representing the entire Earth in full sunlight – taken by a human being – remained unfulfilled.³⁹³

During its coast toward the Moon, one of three astronauts aboard the Apollo 17 spaceship, Jack Schmitt, shot a sequence of eleven color photographs of the Earth with a hand-held Hasselblad camera (which later broke, damaging most of the other photographs).³⁹⁴ At 5:33 a.m., Eastern Standard Time, on December 7, 1972, an astronaut captured image AS17-148-22727, more commonly known as *Big Blue Marble*, at a distance of about 21,750 nautical miles from the Earth’s

³⁹³ In 1969, however, two American astronauts walked on the Moon, and the event was documented photographically to provide visual proof of the accomplishment for an international audience. Photography provided a means to prove these competitive scientific milestones. For more about the chronology of the space race, and photography’s role in it, see: Goldberg, *The Power of Photography*, 52. According to art historian Pamela M. Lee, the Apollo 11 “Moonwalk” photographs sparked a resurgence of a wave of public utopian enthusiasm for technological and scientific positivism, while enabling the perception of photography as a facilitator of such advance: “That picture [of the Moonwalk] has come to stand as among the most profound in the history of technology, offering a view of the 1960s buoyed by the Enlightenment platforms of reason and progress. A utopian vision, perhaps, it is a vision of unflagging optimism, of limitless horizons, and the can-do ethos of American invention.” Lee, *Chronophobia*, 5. Space travel was the subject of great national rivalry between the United States of America and Russia during the Cold War era. The U.S.S.R. began the “space race” by launching Earth-orbiting spacecraft Sputnik in 1957. They also sent the first human being into outer space for an orbit of the Earth, in 1961. From that point forward, N.A.S.A. rallied to compete with the Russians. The United States of America led the “space race” in lunar orbitals and landings in the late 1960s and early 1970s.

³⁹⁴ Cosgrove, “Contested Global Visions,” 270.

surface (**Fig. 51**). In this photograph, the Earth appears, center-frame, and basking in full sunlight. (The only “imperfection,” as some North American commentators saw it, was the fact that Africa and Antarctica, not the United States of America, were the points of focus.³⁹⁵) The Sahara Desert appears cloud-free, but swirls of clouds covering Antarctica imply dynamic time and motion.³⁹⁶ The continent of Africa enjoyed exposure to daylight sunshine, and because the December solstice was eminent, Antarctica also was illuminated.³⁹⁷ The photograph conveys seasonal and astrological temporal specificity. N.A.S.A.’s official caption for *Big Blue Marble* describes it as follows:

³⁹⁵ Ibid, 278. Denis Cosgrove argues that “representations of the globe and the whole Earth in the twentieth century have drawn upon and constituted a repertoire of sacred and secular, colonial and imperial meanings, and...these representations have played an essentially significant role in the self-representation of the post-war United States and its geo-cultural mission. While the Apollo lunar project signified the achievement of the technocratic goals and universalist rhetoric of Modernism, the project’s most enduring legacy is a collection of images whose meanings are contested in post-colonial and postmodernist discourses.” Ibid, 270.

³⁹⁶ N.A.S.A. estimates that fifty percent of the Earth’s surface is covered in clouds in this image: Image Science and Analysis Laboratory, “The Gateway to Astronaut Photography of Earth,” Johnson Space Center, Houston <http://eol.jsc.nasa.gov/> and <http://eol.jsc.nasa.gov/scripts/sseop/photo.pl?mission=AS17&roll=148&frame=22727> and <http://eol.jsc.nasa.gov/FAQ/genEarth.htm> and <http://svs.gsfc.nasa.gov/vis/a000000/a002680/> and <http://history.nasa.gov/alsj/a17/images17.html#MagNN> (accessed February 7, 2007).

³⁹⁷ Ibid.

View of Earth as seen by the Apollo 17 crew traveling toward the moon. This translunar coast photograph extends from the Mediterranean Sea area to the Antarctica south polar ice cap. This is the first time the Apollo trajectory made it possible to photograph the south polar ice cap. Note the heavy cloud cover in the Southern Hemisphere. Almost the entire coastline of Africa is clearly visible. The Arabian Peninsula can be seen at the northeastern edge of Africa. The large island off the east coast of Africa is the Republic of Madagascar. The Asian mainland is on the horizon.³⁹⁸

According to N.A.S.A., the image has a specific “narrative time” context, within the Apollo 17 mission. It was made in a fraction-of-a-second exposure time with an unspecified duration that occurred at five hours and six minutes after launch, and about one hour and forty-eight minutes after the spacecraft left its parking orbit around the Earth to begin its trajectory to the moon.³⁹⁹ That is to say, N.A.S.A.’s documentation for *Big Blue Marble* is temporally specific to the minute, yet not to the second – or fractional second. Astronauts participated in flight simulations in advance of the mission, in part to learn how to take photographs that compensated for spacecraft roll, limited sight-lines, odd angles, sun coverage, and planetary rise and set times. Windows for taking the Apollo 17 photographs were computed in advance. According to Cosgrove:⁴⁰⁰

³⁹⁸ This image (titled *Big Blue Marble*, from Apollo 17) is labeled AS17-148-22727. This naming convention conveys that the photograph is from mission AS17 (or “Apollo 17”), roll 148, frame 22727.

³⁹⁹ Image Science and Analysis Laboratory, “The Gateway to Astronaut Photography of the Earth.”

⁴⁰⁰ Cosgrove, “Contested Global Visions,” 275. Whole-Earth photographs are used by scientists as comparative data to look for evidence of erosion, to track the location and damage of forest fires, to measure the size of hurricanes, and to study the effects of global warming. *Big Blue Marble* also appeared at the start of the movie *An Inconvenient Truth*, former Vice President Al Gore’s award-winning documentary on global warming: Davis Guggenheim, (director), “An Inconvenient Truth,” (Lawrence Bender Productions, 2006).

The extremely detailed plans for photographic procedures left little room for initiative on the part of the astronauts. Among the major constraints were: exposure times in the absence of light-diffusing atmosphere; insufficient time to determine optimal settings and vantage points; and weight limits on the number and variety of lenses and film.⁴⁰¹

While *Big Blue Marble* exists within the “narrative time” context of this particular Apollo 17 mission, it also is positioned within the broader cultural phenomenon of the “space race,” within a narrative of these astronauts’ experience of the morning of December 7, 1972. As Chapter Three of this dissertation has discussed, this dimension of the “narrative time” contexts of a photograph is mutable, multifarious, countless, creative, and varies from viewer to viewer.

Moreover, in order to publicize and garner public support for the Apollo missions, N.A.S.A. placed *Big Blue Marble* in the public domain, so that it would be available at no charge to the media and the public.⁴⁰² The original photograph was rotated to align the top of the image with the Earth’s ordinal direction of “north,” in compliance with mapping conventions. The image also was cropped to center the Earth in the frame before distribution.⁴⁰³ N.A.S.A. representatives have speculated that *The Big Blue Marble* has become the most widely distributed image in history.⁴⁰⁴ Thus, the photograph’s potential interpretive “narrative times” are especially rich with possibility.

⁴⁰¹ Cosgrove, “Contested Global Visions,” 275.

⁴⁰² Cosgrove, “Contested Global Visions,” 274.

⁴⁰³ Image Science and Analysis Laboratory, “The Gateway to Astronaut Photography of the Earth.”

⁴⁰⁴ Eric Hartwell, *Apollo 17: The Big Marble*. Accessed Sept. 5, 2007. Available at: <http://www.ehartwell.com/Apollo17/>. Upon return, Apollo 17’s Preliminary Science Report gave

In *Big Blue Marble*, time is represented in several other ways, too. Like *Earthrise*, the light refracted from the Earth reached the astronauts' camera approximately one second later to make *Big Blue Marble*. Thus, this image does not represent its subject's presence in a conventional past tense – or in Barthes's terms, a *that-has-been* – but it also implies a *second-deferred* past tense. The delay caused by time's travel is virtually undetectable in the photographing of objects that are positioned just *yards* away – as opposed to *light-years* away – from the camera. The photograph thus makes implicit reference to a duration of time during which light traveled from the planet to the camera's light-sensitive surface, a temporal duration that typically escapes our attention, but is inherent in all photographs.

II. Big Blue Marble's *Re-Generation*

Despite a flurry of excitement over these technological milestones, funding and interest in America's space program began to wane in 1972, when Americans' attentions instead turned to the country's involvement in the Vietnam

little attention to the Earth photographs, according to Cosgrove: "The popular response was...more enthusiastic. Indeed the very ubiquity of 22727 [*Big Blue Marble*], endlessly reproduced on postcards, lapel buttons, flags, calendars, political manifestos, commercial advertisements, and tee-shirts serves to deflect close scrutiny of the image's content. In some cases its reproducers have unconsciously and unobservedly reversed the image as, for example, when the BBC TV News used 22727 [*Big Blue Marble*] as the logo for their week-long coverage of the Rio Earth Summit in 1992. All of this suggests that the formal qualities of the image outweighed its cartographic content." Cosgrove, "Contested Global Visions," 276. It is important to note that the Library of Congress also claims that "Migrant Mother" by Dorothea Lange is the most requested and reproduced photograph. For a discussion of the impact of reproduction upon the function of "Migrant Mother," see: Robert Hariman and John Louis Lucaites, *No Caption Needed: Iconic Photographs, Public Culture, and Liberal Democracy* (Chicago: The University of Chicago Press, 2007), 53-67.

War.⁴⁰⁵ As a result, Apollo 17, the spacecraft from which *Big Blue Marble* was photographed in 1972, was *the only manned spacecraft ever* to orbit far enough away from the Earth that it could view the entire planet.⁴⁰⁶ Later missions (including Space Shuttles, Soyuz and I.S.S., and various satellites) have flown too close to the Earth to observe the globe in its entirety.

Therefore, according to William Stefanov, Senior Geoscientist for N.A.S.A.'s Image Science and Analysis Laboratory, any image representing the entire Earth in full sunlight created after 1972 is a composite photograph. Since the 1990s, N.A.S.A. has been creating digitally manipulated whole-Earth images, which, since the year 2000, have been titled *Big Blue Marble: Next Generation* in tribute to the Apollo 17 mission.⁴⁰⁷

These images are made with the aid of computer software, which blends photographs taken over a duration of time from dozens of satellite images to produce an image of the Earth in full sunlight. *Big Blue Marble: Next Generation* digital composite images are difficult to distinguish from unaltered photographs from space, such as *Big Blue Marble*. According to the website of one of the producers of whole-Earth digital-manipulation software, ARC Science Simulations, the goal of the programs is to produce “photo-realistic,” “accurate,

⁴⁰⁵ For more about the decline of interest in America's space program, see: Cosgrove, "Contested Global Visions," 274.

⁴⁰⁶ Stefanov, "Interview by the Author and E-Mail Consultation."

⁴⁰⁷ N.A.S.A. has called its digital composite photography of the *Earth Big Blue Marble: Next Generation* since around the year 2000. Ibid.

high quality earth imagery...[that] can compare remarkably well to photographs from space.”⁴⁰⁸

The process of making whole-Earth photographs is arduous and expensive.⁴⁰⁹ ARC Science Simulations’s popular composite-generating software, for instance, connects computer operators to dozens of steady streams of instantaneous photographs of the surface of the Earth that are taken continuously by the company’s satellites, which are programmed to photograph every part of the Earth’s surface, without cloud covering, at least one time.⁴¹⁰ For instance, in 1992, *each* LANDSAT satellite orbited the Earth fourteen times each day.⁴¹¹ Daylight imaging passes are southbound (“descending”), northbound passes cover the dark side of the earth (“ascending”). In 1992, it took 252 orbits – which transpired every eighteen days – for each satellite to cover the entire Earth. In other words, a singular satellite passes over the same point on the Earth’s surface once every 18 days. This time has gradually been reduced. Because dozens of satellites are orbiting the Earth at any given time, sections of the planet are

⁴⁰⁸ ARC Science Simulations, "Face of the Earth," www.arcscience.com/face.htm and www.arcscience.com/gallery.htm (accessed December 9, 2006).

⁴⁰⁹ In addition to N.A.S.A., these other organizations and companies also use ARC’s software and data: the Russian Centre of Cosmonaut Training, the Department of Defense, SPAWAR (Space and Naval Warfare Systems [U.S.A.]), UNAVCO (The University NAVSTAR Consortium, [U.S.A.]), Raytheon, and Lockheed Martin. ARC also sells programs for making images of Mars, Jupiter, the Moon, and for mapping the surface appearance of the Earth up to six-hundred-million years ago: Ibid. Anyone with \$7,200 to spare – and a lot of time to learn the intricacies of the complicated computer program – can purchase software to generate a whole-Earth image through a company such as ARC Science Simulations. The Museum of Natural History and the Smithsonian Institution, for instance, have featured ARC images in their exhibitions.

⁴¹⁰ This proves most difficult when photographing the polar ice caps, which cannot easily be distinguished from cloud covering. Ibid.

⁴¹¹ The first data satellites were dispatched in 1972.

photographed multiple times. This satellite data is accurate to a resolution of five-hundred meters, or about 1,640 feet, per pixel.⁴¹² N.A.S.A.'s Image Science and Analysis Laboratory employs a customized version of ARC's system and supplements that data with additional information from N.A.S.A.'s eighteen satellites.

Data collected by various satellites are transmitted to ground receiving stations for processing, labeling, correction, and storage as binary code.⁴¹³ When the software determines that the various satellite cameras have gathered sufficient information to create an image of the mathematical "probability of appearance" of

⁴¹² Ibid.

⁴¹³ All photographs are labeled by date, geographic coordinates, sun elevation angle, sun azimuth, type and brand of sensor, and scene identification number. Additional fields of information may be added to digital images, as deemed necessary by their processors. Thomas Eugene Avery explains the nature of the conversion of "In physical form, a digital image is a two-dimensional array of small areas called pixels, or pels (contractions of *picture elements*), that correspond spatially to relatively small terrain areas called ground resolution cells. The horizontal rows of pixels are called lines, and the vertical columns of pixels are termed samples....Because of this ordering, the origin of a grid referencing system for a digital image is always the upper left pixel; its coordinates are line 1, sample 1." Thomas Eugene Avery, *Fundamentals of Remote Sensing and Airphoto Interpretation* (New York: Macmillan Publishing Company, 1992), 406. Data may be "corrected" for several reasons. Each satellite's data are slightly and uniquely skewed with respect to the angle of their view of the Earth. Skew is corrected mathematically, according to Avery: "Each scene is deskewed by an algorithm that shifts scan lines by a calculated number of pixels – a number dependent on the estimated latitude for the scan line being processed with respect to the starting line of the image." Ibid, 414. Satellite data also have "nonsystematic distortions," including the satellite's roll, pitch and yaw. The resulting image is compared to a map and corrected. Ibid. Blurring is also solved by using three correctional algorithms to "average" the nearby data and add it in place of the missing details. Ibid, 414-416. Sometimes, satellite images have periodic six-line stripes added accidentally by the scanner, specks of scanning "noise," or lines of data are missing. These imperfections are fixed by using a complicated mathematical formula (the digital number of input pixel at line J, sample S multiplied by the product of the standard deviation of the entire scene divided by the standard deviation of individual detector. That number is added to the mean DA value of the entire scene minus the mean DA value of the individual detector - after the mean DA value of the individual detector is multiplied by the standard deviation of the entire scene divided by the standard deviation of the individual detector.)" Ibid, 417.

details on and above the planet's surface, the digital compositing process begins. The data-collection span of time is subjective. The image from 1996 (**Fig. 52**), which soon will be discussed in detail, was made from *four months* of data. The whole-Earth photograph from the year 2000 (**Fig. 53**), in comparison, was made from *one week* of data collected in late March.

To make a whole-Earth image, the numerical visual information from multiple photographs is “averaged” to determine the most likely appearance of that parcel of the Earth over an exemplary, arbitrarily, and mechanically selected slices of time. For instance, if clouds covered most of America during the period of data collection, the country likely will be obscured by clouds in the resulting image.

At this point, surface-appearance data are reshaped mathematically and perspectively to adhere to the spherical output model of the entire globe. In this process, photographs of half-second-deferred light captured by satellites much closer to the planet is represented as second-deferred light from at least 20,000 nautical miles from the Earth's surface. Any skewed photographing angles are “corrected.”

However, operators can choose to override the computer-generated “average-appearance” cloud cover produced by the data set and mathematical figures – also called the computer's “decision trees.”⁴¹⁴ They can opt instead to

⁴¹⁴ For instance, the Museum of Natural History, one of ARC Science Simulations's clients, wanted to display a globe revealing land masses – especially the home country of most of its visitors, the United States of America. To create such an image, a technician overrides the “probable appearance” of the composite image to create a globe with lighter-than-mathematically-

make a thinly clouded, or even cloud-free, picture of the Earth.⁴¹⁵ Because an organization such as N.A.S.A. uses its images as points of visual comparison to track phenomena such as erosion, to monitor the location and damage caused by forest fires, and to study the effects of global warming, it is essential for their visual representations to appear plausibly realistic. Therefore, N.A.S.A.'s Image Science and Analysis Laboratory technicians claim to avoid overriding the mathematical "decision trees," unless an element like clouds, for instance, might obscure the view of the desired surface phenomenon.⁴¹⁶ Modifications also are made to the data gleaned from the dozens of satellites, according to N.A.S.A. technician Reto Stöckli, to correct the "cloudy pixels, missing time periods, and processing artifacts [that] can disturb satellite-derived data" by "compositing based on empirical filters...to remove such irregularities."⁴¹⁷ After satellite data is "cleaned," reshaped, mathematically "averaged," and subjected to operators' aesthetic alterations, a digital whole-Earth composite photograph is generated.

The digital whole-Earth photograph titled *The New World: GOES (Geostationary-Orbiting Environmental Satellite) Clouds Over the Face of the Earth, Aug. 2, 1996* (**Fig. 52**) is a composite image that appears very similar in

determined cloud covering to reveal more of the desired land mass. ARC Science Simulations, "Face of the Earth."

⁴¹⁵ For much more about the way that "decision trees" operate to simulate cloud cover, see: Smadar Shiffman, "Cloud Detection from Satellite Imagery: A Comparison of Expert-Generated and Automatically-Generated Decision Trees," *The Intelligence Report* (2005).

⁴¹⁶ Stefanov, "Interview by Author and E-Mail Consultation."

⁴¹⁷ Reto Stöckli, "The Big Blue Marble Next Generation: A True Color Earth Dataset Including Seasonal Dynamics from Modis," N.A.S.A. Goddard Space Flight Center, Earth Observatory <http://earthobservatory.nasa.gov/Newsroom/BlueMarble/bmng.pdf> (accessed March 13, 2007).

hue saturation, cloud covering and degree of surface detail to the 1972 *Big Blue Marble* single-exposure photograph.⁴¹⁸ Although the digital image could be mistaken as a single-exposure image, the 1996 composite photograph has a different relationship to time. It was made from four months of cumulative data, in order to assure that every part of the Earth's surface eventually was visible below the cloud cover. This surface detail has a spatial resolution, or level of detail, of one square kilometer per pixel. In this photograph, North and South America, not Africa, are in central focus. Swirls of dynamic clouds avoid obscuring the western half of the United States, but are not omitted altogether, because a cloudless country might suggest that blatant alteration of the mathematical probability of the appearance of the surface data did take place.

The New World is a photograph of the Americas, as they would have appeared in "average" appearance, over four months – with undisclosed aesthetic modifications of this data. The resulting whole-Earth image corresponds to an abstract, hypothetical, imagined time. The planet never existed in a time-space continuum as it appears in a whole-Earth digital-composite photograph.

With respect to representing time, *The New World*, like all composite whole-Earth images, provides an abstraction from temporality's lived experience. At first glance, this digital image functions much like the single-exposure images *Earthrise* and *Big Blue Marble*. Reflected light that left the Earth's surface

⁴¹⁸ ARC's data is derived from the "NOAA TIROS satellite AVHRR data and colorized by a proprietary methodology patented by ARC. It has continued to be enhanced by MODIS and Landsat derivatives." Ibid.

approximately a half-second earlier is collected as an instantaneous photograph. The image's *that-has-been* is an additional half-second deferred, and this condition makes reference to the physical act of light's travel over a duration of time. However, in the digital composite image *The New World*, this representation of time is rendered yet more complex. Rather than resulting from the travel of reflected light during *one* fraction-of-a-second camera exposure from a single vantage point, the image is the product of a *four-month-long duration* of taking billions of fraction-of-a-second photographs of the Earth's surface from the point of view of more than two dozen satellites. Computer synthesis of this data also required a significant and variable amount of time to adapt satellite data for the representation of a spherical Earth. The process of making a whole-Earth image also implies an unseen temporal duration.

In *The New World*, a singular, fraction-of-a-second photograph is *not* selected as "the" image of a five-hundred-meter "pixel" that represents that portion of the Earth's surface. Instead, this bit of visual data is translated into binary code, blended and averaged with *other* collected data that represent this part of the planet to calculate the "usual" appearance of this five-hundred-meter "pixel" of the Earth. In other words, what we see in *The New World* is a digital synthesis of an hypothetical, imagined image of how the Earth might appear from outer space over a *durée* of elapsed time. Thus, whole-Earth photographs offer an imaginary view of elapsed, multi-layered, multiplicitous times. By making such a view of time possible, these digital composites, in turn, introduce a synthetic

temporality that enables viewers to inhabit multiple times, simultaneously, by compressing them into a lasting image.

III. Photographic Precedents to Digital Composite Practices

But is this layered, simulated representation of temporality a product of the digital age? Do whole-Earth composites provide us with the opportunity to define a unique and unprecedented phenomenon of a distinctly “digital” approach to a “virtual,” hypothetical expression time that utilizes a convincing language of “realism” to provide such imaginative abstractions? To consider this question, this section will take a look at possible analog precedents to whole-Earth images, in order to determine if these composite photographs’ expressions of time are unique to the “digital” technology with which they were created.

A look at various practices of combining photographic images in the analog, or pre-digital, age suggests that the temporal expressions of whole-Earth photographs are descendants of montage and multiple-exposure composite practices. In a photographic *montage*, multiple photographs are combined by means of cutting and pasting.⁴¹⁹ Images may or may not overlap. For instance, Talbot’s *Experimental Photo-Glyphic Engravings of City Views* (c. 1858) was

⁴¹⁹ This dissertation bases its definitions of the terms “montage,” “collage” and “composite” on standard dictionary entries. A “montage” is defined as a “picture made by superimposing several different pictures.” A “collage” is defined as a composition of various objects, including “newspaper, cloth, cardboard, etc.” A “composite” image is defined generically as an image composed of “separate parts or components; combined or compounded.” *Funk and Wagnalls New Comprehensive Dictionary of the English Language: Encyclopedic Edition*. (New York: J. G. Ferguson Publishing Company, 1980), 257, 268, 824. Whole-Earth photographs are comprised of billions of multiple-exposed photographs, which are patched together adjacent to other multiple-exposure images. They are “montaged composites.”

made by affixing three different cut-out photographic images to a common background surface to form a new image. For the photoglyphic engraving in **Fig. 54**, Talbot selected portions of stereographic photographs taken by anonymous photographers of city streets and river views in and around Paris. Each photograph, itself a part-object (or a fragment of a larger whole), is reshaped by Talbot, and recomposed to create a dynamic urban scene of semi-circular shapes, sweeping diagonals, intersecting verticals, with street views positioned in sideways and upside-down relationship to each other. One image is repeated twice, and positioned in mirror-image relationship to its doppelgänger – perhaps in self-conscious reference to the medium’s tendency to laterally reverse similar Seine city views (as in Friedrich von Martens’s previously discussed panoramic *View of Paris* from 1845). These photo-glyphic experiments marked Talbot’s progress toward developing and patenting a process which would be a precursor to photogravure, which he called “photo-glyphic reproduction” – Greek for “carving with light.”⁴²⁰ Fragments of different photographs depicting city streets – each image indexing a different time and space – are taped together and united as

⁴²⁰ Larry Schaaf, “Etchings of Light,” in *Sun Pictures XII: Talbot and Photogravure* (New York: Hans Kraus Gallery, 2003), n.p. Talbot patented the process in 1852 and 1858, and it was sufficiently sound to be adapted for publications as early as 1858. This process did not succeed commercially during his lifetime, but it was a direct ancestor to the photogravure process. The process involved using dichromated gelatin as an etching resist on a plain copper or steel-faced plate. This essay by Larry Schaaf presents additional technical details, and comprises the most recent scholarship on this body of Talbot’s work: Ibid. Other significant scholarship leading up to that essay includes: Charles Henry Talbot, “Some Account of Fox Talbot’s Process of Photographic Engraving,” *Penrose’s Pictorial Annual*, Vol. 8 (1902-1903).; A.J. Bull and H. Mill Cartwright, “Fox Talbot’s Pioneer Work in Photo-Engraving,” in *The Photographic Journal*, Vol. 77 (May 1937): 307-313.; Eugene Ostroff, “Etching, Engraving and Photography: History of Photomechanical Reproduction,” *The Journal of Photographic Science*, Vol. 17, No. 1 (1969): 101-115.

a cohesive photographic image representing multiple, energized visual elements which possess a distinct spatial and temporal specificity, yet contribute to the creation and expression of a new imaginative temporality. In this body of Talbot's photographic work, temporalities collide in an expression of the sensation of living in an age of intermingling, discordant times and spaces.⁴²¹

As an ancestor technology to today's mechanical photographic reproduction processes, Talbot's photoglyphic engravings unfixed notions of photographic originality and singularity, and contributed to modernity's ubiquitous mass-circulation of visual data. As previously discussed, Benjamin examined the temporal complications posed by mechanical reproduction. He argued that a subject's original presence is reconstituted and reinterpreted across various times and spaces.⁴²² The ease with which photographic reproductions travel over vast spaces and lend subjects a reconstituted existence in simultaneous

⁴²¹ Robert Delaunay specifically was responding to vernacular photography in his "Eiffel Tower" series, as Buckberrough argues. Delaunay collected photographic postcards of the monument, and wanted to express the multiple simultaneous views of the tower that he saw in his postcard collection. For more about the influence of photography upon Delaunay's expressions of spatial and temporal simultaneity in his "Eiffel Tower," "Windows" and "City" series, see: Buckberrough, "The Simultaneous Content of Robert Delaunay's Window."; Sherry Buckberrough, *Robert Delaunay: The Discovery of Simultaneity*, (Ann Arbor: U.M.I. Research Press, 1982). Léger's layered evocations of simultaneity are discussed in: Green, *Léger and the Avant-Garde*. The artist articulated his views about modern life's dynamism and evocation of simultaneity in this essay: Fernand Léger, "The Origins of Painting and Its Representational Value," in *Cubism*, ed. Edward F. Fry (New York: 1966), 121; Linda Henderson offers a study of the influence of urban life and simultaneity upon Cubist painting and the work of Marcel Duchamp and Frantisek Kupka: Linda Dalrymple Henderson, "X-Rays and the Quest for Invisible Reality in the Art of Kupka, Duchamp and the Cubists," *Art Journal*, Vol. 47, No. 4 (1988): 323-40. She discusses the degree to which these artistic explorations and others by figures such as Kasimir Malevich and Piet Mondrian might have been influenced by publicized articles about contemporary scientific/technological advances in: Linda Dalrymple Henderson, *The Fourth Dimension and Non-Euclidean Geometry in Modern Art* (Princeton: Princeton University Press, 1983).

⁴²² Benjamin, "The Work of Art in the Age of Mechanical Reproduction."

times manipulate formerly fixed notions of absence and presence, space and time. As such, photographic reproductions engage in modernity's radical destabilization of these terms.

Gustave Le Gray's composite seascapes, such as *Large Wave, Mediterranean Sea* (1857) (**Fig. 55**), resulted from the combining of two negatives just above the horizon line.⁴²³ A thin white line marks the meeting point of the negatives.⁴²⁴ Le Gray resorted to montage techniques as a consequence of his dissatisfaction with the tendency of single-exposure landscape photographs

⁴²³ Gustave Le Gray is known for his technical innovations, including waxed-paper and collodion-glass negatives. Le Gray's work received scholarly attention relatively recently. The first monograph on Le Gray was published in 1987: Eugenia Parry Janis, *The Photography of Gustave Le Gray* (Chicago: The Art Institute of Chicago and the University of Chicago Press, 1987). In 2002, the Bibliothèque Nationale de France, Paris, exhibited a large number of his photographs. This show traveled to the J. Paul Getty Museum in Los Angeles, and was the largest exhibition of his works in America to date. This catalog accompanied the show, and encapsulates the most recent and complete research on Le Gray's life and work: Deborah Ann Gribbon, Sylvie Aubenas, and Gordon Baldwin, *Gustave Le Gray: 1820-1884* (Los Angeles: J. Paul Getty Trust Publications, 2002). This book also contains an essay by Sylvie Aubenas which casts Le Gray's montage efforts as endeavors to combine science and art – which he did not see as mutually exclusive. One of these authors also published a condensed version of the exhibition catalog: Sylvie Aubenas, *Gustave Le Gray* (New York and London: Phaidon Press, 2003). Le Gray's seascapes are the sole focus of Ken Jacobson, *The Lovely Sea-View, Which All London is Now Wondering At: A Study of the Marine Photographs Published by Gustave Le Gray, 1856-1858* (Petches Bridge : Ken & Jenny Jacobson, 2001).

⁴²⁴ Le Gray re-used the negative of the sky that appears in *Large Wave, Mediterranean Sea* (1857) in *Seascape with a Ship Leaving Port*, from the same year. According to the J. Paul Getty Trust: "This use of combination printing was not criticized when he exhibited his seascapes, although it is unlikely that he hung finished images utilizing the same negative for the sky in each adjacent to one other, so perhaps it went undetected." J. Paul Getty Trust, "Gustave Le Gray: Photographer, July 9-September 29, 2002," On-Line Catalog of Previous Exhibitions. Accessed June 4, 2008. Available at: http://www.getty.edu/art/exhibitions/le_gray/. Le Gray's most widely circulated image, *Brig on the Water* (1856) commonly is cited as an earlier example of this method of montage. However, The Clark Art Institute and The Metropolitan Museum of Art have since determined that *Brig on the Water* was made by a single exposure, and thus was not the result of combination printing montage techniques: The Metropolitan Museum of Art, New York. "Gustave Le Gray: Brig on the Water (1976.645.1)," in *Timeline of Art History*. Updated: October 2006. Accessed June 4, 2008. Available at: http://www.metmuseum.org/toah/hd/gray/hod_1976.645.1.; The Sterling and Francine Clark Art Institute, Williamstown, MA. "Gustave Le Gray (1998.32.3)." Accessed June 4, 2008. Available at: http://www.clarkart.edu/museum_programs/collections/photographs/content.cfm?ID=65&marker=3&start=3

made on wet collodion-on-glass negatives to either over-expose the sky while providing the ideal exposure for the ground, or under-expose the ground while providing the ideal sky exposure.⁴²⁵ He overcame this technical limitation by combining two negatives – sometimes exposed several years apart – to make one combination montaged print.⁴²⁶ This process enabled Le Gray to represent water-surface details, such as the rising wave caught in the moment before its crashing, under a dark, dramatically illuminated sky – which also appears in other prints by Le Gray.

However, despite Le Gray's efforts to darken the ground in this image – especially on the left edge – the equitable distribution of light across the water of *Large Wave, Mediterranean Sea* does not coincide with the illumination expected of the cloud-covered light source represented in its sky. Eugenia Parry Janis notes that Le Gray's seascape montages appear “combined from two separate visual experiences.”⁴²⁷ Indeed, they are the product of the duration of two plate exposures, each capturing the temporally specific luminal qualities of that

⁴²⁵ Hippolyte Bayard was the first to suggest combination printing to construct an image. This technique also was used by Edouard Denis Baldus. Le Gray wrote a section of a book describing the techniques discussed above: Gustave Le Gray and John H. Croucher, *Plain Directions for Obtaining Photographic Pictures* (1851), (Philadelphia: A. Hart, 1853). This book by Le Gray outlines his approaches to other photographic processes, and displays his keen technical knowledge of his photographic craft: Gustave Le Gray, *A Practical Treatise on Photography, Upon Paper and Glass*. (London: T. & R. Willats, 1850). Le Gray experimented with photographic processes, and wrote another treatise outlining the use of waxed paper for negatives. He also is known to have declared with great foresight that “[t]he future of photography is altogether in paper...Every one will agree with me that it is always more agreeable and convenient to have to take paper instead of glass, which is both heavy and fragile.” Le Gray and Croucher, *Plain Directions for Obtaining Photographic Pictures*, 89-90.

⁴²⁶ Le Gray also experimented with combining paper and glass negatives to make a single composite image.

⁴²⁷ Janis, *The Photography of Gustave Le Gray*, 82.

subject's appearance in a specific season, at a particular time of day, and under certain meteorological phenomena. Nevertheless, accuracy was secondary to the task of making a representation of a more dramatic, dynamic, hyper-real version of "reality" – a peculiarly "modern" expression of heightened stimuli. Le Gray's two combined negatives may represent two specific relationships to differing moments in the temporal continuum, but as they collide, they merge, creating a new, invigorated, simultaneous, composite reality.

Composite photography, at the hands of Le Gray, was a tool in the service of creating a perfect scene which surpassed the scope of the camera's vision. Le Gray – originally trained as a painter under Paul Delaroche – also often manipulated his combination prints by retouching clouds, and darkened the edges of his prints to draw attention to the center of the image, and sometimes even removing figures – if he felt these modifications would improve the overall composition.⁴²⁸

Using processes of selection and manipulation to create a more compelling composite image was not a new approach to image-making. As discussed previously in this dissertation, British landscape painter Constable incorporated selected segments of cloud-study sketches into his six-footer paintings in order to infuse these large, labored paintings with a sense of spontaneity. In his composite

⁴²⁸ In photographic discourse, the painter Paul Delaroche often is quoted as remarking, upon seeing an early display of daguerreotypes, that "from today, painting is dead!" No evidence exists to confirm that Delaroche actually said this. He was, in fact, an *advocate* of the earliest daguerreotype, and medium of photography, in general. Delaroche also taught photographer Roger Fenton.

paintings, which feature a blending of an indistinct number of varying temporalities, Constable also conveys competing, simultaneous, yet idealistically energized, temporalities, which form a new, more vibrant, idealized reality. Montaged photographic and painting practices express this experience of temporality as a harmonized cacophony, with differing times and spaces that blend and intermingle, yet maintain their individual discordances. The result: an imaginary, idealized, multi-layered time that exceeds the expressive power of unaltered representations of time.⁴²⁹

Montage continued to develop as a form of expression in the mid-nineteenth century at the hands of Oscar Rejlander and his student, Henry Peach Robinson.⁴³⁰ To make the 31-inch-by-16-inch composite photograph *The Two Ways of Life* (1857) (**Figs. 56-57**), Rejlander planned the composition of the entire

⁴²⁹ Additional relationships to temporality are implied by the length of time needed by Le Gray to select the desired negatives, to combine them, and to dodge, burn and retouch his prints.

⁴³⁰ Patricia Leighton argues that Rejlander and Robinson made the “first manipulated photography.” Patricia Leighton, “Critical Attitudes toward Overtly Manipulated Photography in the 20th Century,” *Art Journal*, Vol. 37, No. 2 (1977-78): 133. As this dissertation so far has argued, Talbot’s composite montaged photographic manipulations pre-date Rejlander’s practices. Oscar Rejlander began to be explored in art-historical scholarship in the 1970s and 1980s. This exhibition catalog features the earliest compilations of this work: Edgar Yoxall Jones, *Father of Art Photography, O. G. Rejlander, 1813-1875* (Greenwich: New York Graphic Society, 1973). Building on the scholarship of Jones, Stephanie Spencer published a text based on her 1981 doctoral dissertation providing a closer look at the impact of Rejlander’s work: Stephanie Spencer, *O.G. Rejlander: Photography as Art* (Ann Arbor: U.M.I. Research Press, 1985). Peter C. Bunnell provides primary-source material in this compilation of Rejlander’s newspaper essays about art photography: Peter C. Bunnell, *The Sources of Modern Photography: The Photography of O. G. Rejlander* (New York: Arno Press, 1979). An unpublished M.A. thesis by Noriko Gamblin addresses the reception of Rejlander’s work: Noriko Gamblin, “Art and Audience in Victorian England: Rejlander, Robinson, and the Photographic Artist,” University of Delaware, Thesis, Master of Arts, Art History, 1989.

image, and produced it by photographing individual clusters of figures.⁴³¹

Rejlander then carefully masked out the undesired portion of each negative with black varnish, and made every exposure individually. Atomized components of carefully orchestrated but distinct temporal and spatial relationships are coalesced into a collective, constructive, composite representation. His is an expression of differing temporal relationships that function to create a cohesive, harmonious whole.

This composite photograph was made by Rejlander in six weeks and from thirty negatives, each of which possessed a different and unique relationship to a duration of exposure time. Rejlander, a former painter, claimed that his intentional selection of such a tedious, labor-intensive production technique was a means to emphasize the artistry involved in making composite photographs, and to de-emphasize photography's mechanical nature.

As this brief overview of exemplary samples of analog montage has argued, various techniques of juxtaposing photographs to create a new form of "montaged time" that consists of the simultaneous presence of various representations of time is not a unique expression born from the emergence of digital manipulation techniques. Although the ubiquity of computer-generated montage has made this technique perhaps more familiar to us today, the

⁴³¹ For the artist's explanation of the intended symbolism of this didactic work, see: Oscar G. Reijlander, "On Photographic Composition: With a Description of 'Two Ways of Life,'" *Journal of the Photographic Society of London*, Vol. 4 (April 21, 1858).; Reprinted in: Bunnell, *The Sources of Modern Photography*, n.p. Other discussions of the reception of the work appear in: A.H. Wall, "Rejlander's Photographic Art Studies: Their Teachings and Suggestions," *The Photographic News* (August 27, 1886): n.p.; Reprinted in: Bunnell, *The Sources of Modern Photography*, n.p.

discordant, multiplicitous temporalities of montage practices had their beginnings with the birth of photography itself.⁴³²

Moreover, the employment of multiple-exposure techniques in order to combine at least two photographic images on a singular image predated the digital age. According to Gail Buckland, the first instance of composite photography was a double-exposed image made within a few years of the invention of the medium.⁴³³ On an unspecified day in 1839, Johann Karl Enslin separately exposed negative images of an oak leaf and a drawing of the face of Jesus Christ onto the same light-sensitive surface, and shared this image with Talbot – to whom the composite photograph continued to be attributed until the past decade (**Fig. 58**).⁴³⁴

John Herschel, a friend and colleague of Talbot's, also created a double-exposed photograph, *Leaf with Superimposed Character* (**Fig. 59**), dated February

⁴³² Geoffrey Batchen, "Electricity Made Visible," Wendy Hui Kyong Chun and Thomas W. Keenan, eds., *New Media, Old Media: A History and Theory Reader* (New York: Routledge, 2005), 31.

⁴³³ Gail Buckland's 1980 book *First Photographs* classifies this double-exposed image as the first "photomontage," and she attributes it to William Henry Fox Talbot: Gail Buckland, *First Photographs: People, Places and Phenomena as Captured for the First Time by the Camera* (New York: MacMillan Publishing Co., Inc., 1980), 147. For more about the reattribution of this image, see: H. J. P. Arnold, "A Problem Resolved," *British Journal of Photography* (May 18, 1989, 25–27, 25; and May 1989): 20–21.

⁴³⁴ Enslin remains an understudied figure, as Pam Roberts explains: "German Johann Karl Enslin began experimenting with photography in 1839, at the age of 80, after reading the reports of W. H. F. Talbot's experiments in England. This photogenic drawing [*Jesus Christ/Oak Leaf*] from the same year was sent to Talbot for his opinion and remained in his collection, being attributed to him until some few years ago. The line drawing of Christ's head used must have been from a photographic negative as it is a positive in this image. Enslin's collection of experimental photography, held in a museum in Lubeck, was largely destroyed by fire during World War II." Pam Roberts, *Photohistorica: Landmarks in Photography* (New York: Artisan, 2000), 180. The spelling of Enslin's middle name varies. Larry Schaaf uses "Karl," but Roberts spells it "Carl." The body of this dissertation assumes Schaaf's style.

26, 1839.⁴³⁵ Assuming accurate dating, if Enslin's image was not made prior to late February 26, Herschel's image instead could be the first composite photograph. It is possible that Enslin and Herschel had knowledge of each others' experiments through their connections to Talbot.⁴³⁶ In Herschel's photograph, negative images of a leaf and a letter of hand-rendered script of a laterally reversed capital "J" were exposed separately onto the light-sensitive surface. In both Enslin's *Jesus Christ/Oak Leaf* and Herschel's *Leaf with Superimposed Character*, photographs of botanical specimens share equal prominence with human-drawn forms of representation. These images engage a dialogue with Talbot's belief that photography itself was "impressed by Nature's hand," which was assisted by human knowledge of chemistry and physics.⁴³⁷ Enslin and Herschel superimpose images representing the hand of nature with equal presence

⁴³⁵ Larry Schaaf describes John Herschel as "the very embodiment of science." Schaaf writes: "By the time Herschel would be buried next to Sir Isaac Newton in Westminster Abbey in 1871, the comparison between the two men would already be fixed in the public mind." Schaaf, *Out of the Shadows*, 2. Herschel has been credited with radically changing mathematics. He also published more than 150 scientific papers and several books. Following in the tradition of his father (also named John Herschel), he made significant contributions to stellar astronomy. While Talbot and Herschel both went to Cambridge, and "[t]he friends they made [at Cambridge] would emerge as some of the most accomplished scientists and most powerful politicians of Victorian England," they did not meet during their school years. Herschel was friends with Charles Babbage (who also was a friend of Talbot's) while at Cambridge. *Ibid.*, 3-4.

⁴³⁶ Enslin's collection of correspondence with Talbot (and possibly even Herschel) is unavailable and unquantifiable because his experimental photography and records were destroyed during World War II.: Roberts, *Photohistorica*, 180. Herschel's representation of a letter of script, Geoffrey Batchen discusses, suggests an interest in translation, which Herschel shared with Talbot – as well as with contemporaries Charles Wheatstone and Charles Babbage, the inventor of the earliest form of computer: Batchen, "Electricity Made Visible," 34.

⁴³⁷ Talbot, *The Pencil of Nature*, n.p.

with representations made by the *human* hand.⁴³⁸ Distinctions between nature and culture collapse.

While viewers process the competing stimuli of the juxtaposed subjects in simultaneous time, other relationships to temporality are implied. Both composite images make reference to the duration of the hand-drawing process, the time of each photographic exposure, the duration of the act of collecting the leaf, the time of year of the leaf's collection, and the end of the "life" of that oak leaf, which has been detached from its nurturing connection to the tree. Enslen's photograph also evokes the "narrative time" of Jesus Christ's life cycle, His death, and the Christian promise of the redemptive temporal infinity. Death is evoked at least twice: by the fate of Christ, and the apparent detachment of the oak leaf from its nurturing tree.⁴³⁹

Analog composite techniques involving more constituent photographs were especially prevalent in analog composite portraiture, which was introduced by eugenicist Francis Galton in the late nineteenth century to create "representative faces" that may suggest the genetic traits of various groups of the social order by exposing multiple subjects for an equal amount of time on the same photographic plate.⁴⁴⁰ In the late 1880s, this practice became a popular technique for group portraiture. John L. Lovell's *Composite of Class of '87 Harvard*, 1887 (**Fig. 60**), for instance, is a round-shaped facial portrait of a dark-

⁴³⁸ Ibid.

⁴³⁹ Barthes, *Camera Lucida*.

⁴⁴⁰ Francis Galton described his composite techniques in: Francis Galton, *Inquiries into Human Faculty and Its Development* (New York: Macmillan, 1883).

haired man. Details of his facial features and body form are obscured in a ghostly haze. The image's title indicates that this photograph of what appears to be *one* man actually represents Harvard University's *entire*, all-male graduating class of 1887.⁴⁴¹ Portraits such as this was regarded as an amusing "technical gimmick" that had particular mass appeal in "an age fascinated by the diversity of human appearance and achievement" and in defining "a cultural bedrock of basic human types."⁴⁴² To create this imaginary photograph representing, typologically, Boston's elite, well-bred Brahmin class, Lovell carefully aligned and exposed an unspecified number of portrait negatives on a single sheet of photographic paper.⁴⁴³ Each individual portrait that comprised the composite image resulted from a fraction-of-a-second exposure, with a specific relationship to an isolated fragment of time from the temporal continuum. However, as these singular images were combined during the printing process, they created a portrait of a human being who never existed, and thus suggested the existence of an instantaneous-exposure-time duration that likewise never existed. Instead, the photograph implies the temporal dimension of an imaginary, abstract "composite time." Moreover, analog composite portraits such as *Composite of Class of '87*

⁴⁴¹ Women were educated by Harvard University faculty through the "Harvard Annex." John L. Lovell also created a separate composite photograph of the women who studied at the Annex in 1887. The Annex was renamed Radcliffe College two years later, and was chartered in 1894.

⁴⁴² Keith Davis, *An American Century of Photography: From Dry-Plate to Digital*, Second Edition (New York: Harry N. Abrams, 1999), 24.

⁴⁴³ *Ibid.* An informal count of the number of undergraduates who received their Bachelor of Arts degrees in 1887 totals 65. It is not discernable whether, for instance, graduate students or other majors were included in John L. Lovell's multiple-exposed composite photograph.

Harvard also embody the temporal implications of the labor-intensive darkroom printing process by which the multiple portrait negatives were aligned and exposed separately on a single sheet of albumen paper. When we view *Composite of Class of '87 Harvard*, we see layer over layer of individual fraction-of-a-second exposure times which lose their temporal specificity to produce a singular image that may be comprised of many distinct exposures. But the resulting image paradoxically enjoys no exposure-time-based temporal particularity in and of itself. Instead, the image represents the “average” appearance of Harvard University’s well-bred Boston Brahmin brotherhood, a typographic likeness that has resonance in viewers’ minds, in the realm of the temporal. They are “real,” without being “actual,” and make a seemingly unquantifiable phenomenon visually tangible. Analog images such as *Composite of Class of '87 Harvard* provide precedents for the abstractions of N.A.S.A.’s whole-Earth photographs and other digital composites. Such images are at odds with what Peter Galassi argues is photography’s unique ability to represent specificity, or a subject’s “thisness” – which he suggests is rooted in the medium’s status as heir to the “spirit of realism” of the Renaissance.⁴⁴⁴ However, Jonathan Crary argues that modern observers have been conditioned to expect these departures from “the real,” “the actual,” and the absolutely indexical:

⁴⁴⁴ Galassi, *Before Photography*, 19.

From the mid [nineteenth] century on, an extensive amount of work in science, philosophy, psychology, and art was coming to terms in various ways with the understanding that vision, or any of the senses, could no longer claim an essential objectivity or certainty.⁴⁴⁵

Similarly, on November 18, 1993, *Time* magazine featured a special issue about the increasingly multicultural status of America in the late *twentieth* century (**Fig. 61**). The cover of the magazine featured a frontal facial photograph by Kin Wah Lam of a woman surrounded by a background of about eighty small, semi-transparent portraits. The headline “The New Face of America: How Immigrants Are Shaping the World’s First Multicultural Society” overlapped the base of the woman’s neck, and this text appeared to the left of the portrait: “Take a good look at this woman. She was created by a computer from a mix of several races.”⁴⁴⁶ Specifically, the cover model “Eve” was created from combining photographs of seven women and seven men of a range of ethnic and racial backgrounds using Morph software.⁴⁴⁷ As in the analog *Composite of Class of ’87 Harvard*, several images with different respective exposure times are merged to make an abstract image with a creative relationship to time in this *Time* magazine digitally altered cover image.

Aesthetic continuities between analog and digital practices suggest that composite photography, as a genre, possesses a complex, layered relationship to

⁴⁴⁵ Jonathan Crary, “Unbinding Vision,” *October*, Vol. 68 (1994): 21.

⁴⁴⁶ “The New Face of America,” *Time*, Vol. 142, No. 21 (Nov. 18, 1993). The individual portrait photographs were taken by Ted Thai. This composite cover image was made by Kin Wah Lam.

⁴⁴⁷ Evelyn M. Hammonds, “New Technologies of Race” in *Processed Lives Gender and Technology in Everyday Life* eds. Jennifer Terry and Melodie Calvert (London: Routledge, 1997), 116.

simultaneous, multiple, creative times. While composite expressions of temporality are not therefore determined by their basis in analog or digital practice, technology plays a role in shaping perceptions of time that underlie these images' reception. *The New World* and other whole-Earth composites are the products of a culture affected by advances in technology, and specifically, by the tool used to create these images, the computer.

Coincidentally, the emergence of the first computers and the invention of the medium of photography were near-simultaneous events. Acknowledged father of computing, Charles Babbage, introduced his Analytical Machine in the 1840s and 1850s.⁴⁴⁸ Talbot, one of photography's founders, was close friends with Babbage.⁴⁴⁹ These two figures, according to Batchen, shared information with

⁴⁴⁸ Howard Bessner points out that Charles Babbage also wrote of the benefits of *division of labor*, which led to the introduction of the production line in an age of industry and modernity. Babbage wrote: "The master manufacturer, by dividing the work to be executed into different processes, each requiring different degrees of skill or of force, can purchase exactly that precise quantity of both which is necessary for each process; whereas, if the whole work were executed by one work[er], that person must possess sufficient skill to perform the most difficult, and sufficient strength to execute the most laborious, of the operations into which the art is divided." Charles Babbage, from *On the Economy of Machinery and Manufacturers*, (1832), as quoted in Harry Braverman, ed. *Labor and Monopoly Capital: The Degradation of Work in the Twentieth Century* (New York: Monthly Review Press, 1974), 79-80. Critics of the division of labor argue that specialized, atomized activities lead to routinization and alienation. Harry Braverman, *Labor and Monopoly Capital: The Degradation of Work in the Twentieth Century* (New York: Monthly Review Press, 1974).; Karl Marx, *The Art of Loving* (New York: Harper & Row, 1956), 85-86.; Philip Kraft, "The Industrialization of Computer Programming: From Programming to 'Software Production,'" in Andrew Zimbalist, ed., *Case Studies on the Labor Process* (New York: Monthly Review Press, 1979), 1-17.

⁴⁴⁹ In 1844, Robert Chambers published an anonymous treatise that pre-dated Charles Darwin's ideas about evolution by about fifteen years, but provided less detail. According to historian Peter Watson, Chambers circulated at fashionable salons and societies in London, and his ideas were a part of an intellectual climate that also included those of William Henry Fox Talbot, John Herschel and Charles Babbage. Evolutionary theories extended the human purview of time to an unprecedented, vast scale. Peter Watson, *Ideas: A History of Thought and Invention, From Fire to Freud* (New York: Harper Perennial, 2005), 637-638.

each other about their inventions, indicating, perhaps, that a common discursive climate brought about the invention of both photography and the computer.⁴⁵⁰ The complex intellectual culture that nurtured and enabled these innovations, Batchen suggests, valued the cerebral play involved in various manipulations of the binaries of nature/culture, absence/presence, and encoding/decoding.⁴⁵¹ These preoccupations exercise the mental capacity for abstract conceptualization. As Augusta Ada Byron (the daughter of Lord Byron who also was known as Lady Lovelace) suggests: “The effects of the study [of mathematics include an]...immense development of *imagination*: so much so, that I feel no doubt if I continue my studies I shall in due time be a *Poet*. This effect may *seem* strange but it is not strange, to me.”⁴⁵² Ada Byron also wrote to Babbage and expressed her enthusiasm for the cerebral kinship of numerical play and artistic expression evoked by his Analytical Machine.⁴⁵³

It would come as no coincidence that photography – a medium that embodies a union of Nature’s agency with humankind’s photo-chemistry and optics, enables the two-dimensional presence of absent subjects, and is comprised

⁴⁵⁰ Batchen, “Electricity Made Visible,” 28. Batchen’s scholarship examining the philosophical and intellectual circles of early-to-mid-nineteenth-century England suggests the merit of further study of similar circles in France, Germany, America and other countries.

⁴⁵¹ Ibid, 31-40.

⁴⁵² Ibid, 32.; Batchen cites: Augusta Ada Byron/Lady Lovelace, “Letter to Lady Byron” (January 11, 1841), reproduced in Betty Alexandra Toole, *Ada: The Enchantress of Numbers: Prophet of the Computer Age* (Sausalito, Calif.: Critical Connection, 1998), 96.

⁴⁵³ Batchen, “Electricity Made Visible,” 42, fn23. Batchen cites: Augusta Ada Byron/Lady Lovelace, “Letter to Charles Babbage,” Jim Holt, “Ada Perplex,” *The New Yorker*, March 5, 2001, 92.

of constituent bits (whether “grains” or “pixels”) that testify to the differential presence of light – would find its genesis in the age of Byron, Babbage and Talbot. Digital photography’s storage as binary code is merely an extension of the interdependence of mathematics and expression that Ada Byron describes.

In a more general sense, the temporal anxieties prevalent in the decades surrounding the invention of photography were, in part, kindled by the introduction of the computer and the medium of photography. The next wave of temporal anxiety (1870s-1940s) was dominated by advances in analog communications and transportation. But the computer emerged again as an agent for shaping time-and-space perceptions starting in the 1970s.⁴⁵⁴ This relatively recent flurry of digital technological advances has accelerated the pace of life dramatically, forever altering our experiences and conceptions of space and time up to today.

Specifically, in the quotation at the start of this chapter, Mirzoeff suggests that digital photography has collapsed processing times and has made the circulation of images more immediate. Indeed, this compression of time pervades darkroom-free, digitally distributed whole-Earth digital composite practices. *Big Blue Marble: Next Generation* (**Fig. 53**) resulted from millions of photographs collected by MODIS sensors aboard the Terra and Aqua satellites – which have been used for data collection since the year 2000 – from *one week* of data in March of 2000. This image gives central focus to North America, and reveals a

⁴⁵⁴ Jerley, *Wondrous Contrivances*.

greater degree of surface detail than *The New World*. The Earth's terrain varies from green to brown. Swirls of clouds congregate over Canada, the North Pole, and over the western coast of South America. The rest of the globe is relatively free from obstructive cloud cover. The royal blue oceans of *Big Blue Marble: Next Generation* are noticeably brighter in intensity than the water masses of the original *Big Blue Marble* and of *The New World*.

Big Blue Marble: Next Generation is the result of significant technological improvements over *The New World* composite photograph from 1996 (which was based on Geostationary-Orbiting Environmental Satellite data), according to N.A.S.A. Senior Geoscientist William L. Stefanov. Coupled with improved geolocation data, computer hardware, server connectivity, and image processing made it become possible to produce and serve frequently updated, global mosaics at approximately one kilometer per pixel or five kilometers per pixel resolution.⁴⁵⁵ Advances in data processing also improved image clarity, and gave “highly reflective land surfaces, such as salt flats, a more realistic appearance.”⁴⁵⁶

In *Big Blue Marble: Next Generation*, technological improvements reduced data-collecting time for images representing every part of the Earth's

⁴⁵⁵ Stefanov, “Interview by the Author and E-Mail Consultation,” n.p.

⁴⁵⁶ Reto Stöckli, “Blue Marble: Next Generation”, N.A.S.A. <http://earthobservatory.nasa.gov/Newsroom/BlueMarble/> (accessed March 13, 2007). Computer technicians are working to correct what they see as problems with *Big Blue Marble: Next Generation* images. Stöckli argues that “the creator of the *Blue Marble* [software] uses a uniform blue color for deep ocean regions, and this value has not been completely blended with observations of shallow water in coastal areas.” Stöckli also claims that the images also fail to distinguish between snow covering and clouds. He also points out that during periods of heavy rainfall in tropical regions, it is often difficult to get data about the Earth's surface appearance because of persistent cloud cover. Stöckli, “Blue Marble: Next Generation.”

surface to *one week*, a significant decrease from the *four months* of data-collecting needed to make *The New World* in 1996. The imprint of additional time was rendered unnecessary, in favor of producing an image *as quickly as possible*, given newer, “time-saving” technology.⁴⁵⁷

As discussed in Chapter Two, the challenge of decreasing exposure and processing times is hardly unique to the digital age, but has existed as long as the medium of photography itself.⁴⁵⁸ The medium of photography, whether analog or digital, has a history of aspiring to collapse time sensitivity thresholds through advances in photo-chemistry, lens design and camera mechanics. This trend of “defeating” or “saving” time in photography’s exposures, processing, printing and circulation processes continued into the twentieth century and persists today. As such, photography has from its genesis subscribed wholeheartedly to the positivist goals of technological modernity. Its aim has been to technologically “annihilate” the time of taking, making and sharing photographs, while producing images that themselves express a challenge to time’s very coherence.

In the book *Liquid Modernity*, sociologist Zygmunt Bauman also redefines modernity as a time obsessed with “acceleration and the resulting ability to

⁴⁵⁷ This phenomenon has limitations, computer-technology historian Alex Steffen suggests: “The way we code software also has profound limitations.” Alex Steffen, “What Happens When Technology Zooms Off the Charts?: Singularity and Its Meanings,” *Whole Earth Catalog* (Spring 2003): 9. Steffen speculates, based on the state of data storage in 2003, that data processing speeds will reach a peak of efficiency in the years 2010-2020.

⁴⁵⁸ Although the reduction of exposure times was a particular preoccupation in the nineteenth century, a collapse of processing time analogous to the impact of digital processing was made possible in 1947 with the introduction of the Polaroid Land Camera.

manipulate time.”⁴⁶⁰ Philosopher and sociologist Jacques Ellul likewise notes modernity’s near-religious fervor for ever-more-efficient technology, and its increasing emphasis on speed has had specific social and psychological consequences.⁴⁶¹ *Big Blue Marble: Next Generation* provides an expression of time’s insistent, anxiety-provoking passage in an age of modernity and unrelenting technological advance. As time is rendered sculptural and is distended, montaged-together, compressed and repackaged to form a new idealized, instantaneous version of imaginary time, temporality’s very laws, contradictions and operations are subject to interrogation. Dorthe Gert Simonsen argues that modernity’s positivist technological advances, and its increasing valuation of speed, inevitably has led to a convoluting or “annihilation” of our understanding of time:

[A]cceleration has continuously compressed time and space throughout modernity, reaching a final annihilation of temporal and spatial coordinates in the present society of instantaneous electronic communications... Rather than continuously compressing and finally annihilating time and space, speed has produced diverse and interacting, occasionally conflicting, times and spaces.⁴⁶²

⁴⁶⁰ Simonsen, "Accelerating Modernity," 98.

⁴⁶¹ Jacques Ellul, *The Technological Society*. Transl. John Wilkinson (New York: Knopf, 1964).

⁴⁶² Simonsen, "Accelerating Modernity," 99. Simonsen compares the obsession with speed during the Information Age with the similar drive for speed at the time of the invention of the airplane: “Phrases such as ‘conquering,’ ‘shrinking,’ and ‘annihilation’ of space and time have been used in popular discourse to capture the experience of more than a century of accelerating technology. From this perspective ‘time-space compression,’ which has been among the tropes most often repeated in the rhetoric of globalization and the Information Age, begins to sound like an echo of the former period.” Ibid, 102.

Composite whole-Earth photographs such as *Big Blue Marble: Next Generation* and the more recent version by the same title made in 2003 (**Fig. 62**) are examples of experimentation with temporality's contingency. The time abstractions in digital composite whole-Earth images – and of their analog predecessors – are products of an anxious culture coming to grips with the effects of modernity's quickening pace of life. That is to say, photography is both a product and a catalyst of modernity.

Chapter Six: Concluding Thoughts

A few centuries ago our ancestors had the luck
 to make the voyages of great discovery.
 We, the grandchildren of Columbus,
 are creating the epoch of the most glorious inventions.
 They have made our globe very small
 but have expanded our space
 and intensified our time.
 My life is accompanied by unprecedented sensations.
 Barely five years old I had the rubber leads
 of Edison's phonograph stuck in my ears.

– *Untitled Poem*, El Lissitzky⁴⁶³

Many commentators have remarked that photography has a unique relationship to time. Yet the topic has yet to receive in-depth examination, and many scholars have been content to discuss the medium's expression of temporality in broad, generalized terms, or within the context of the "fraction-of-a-moment" conception of photographic time discussed in Chapters Two and Three. However, through a detailed and specific examination of the temporal dimensions of a variety of ubiquitous-yet-unstudied photographic practices, this dissertation has argued that the medium possesses an endless range of ways to express the phenomenon of time.

Chapter Two began with a look at Edgerton's stroboscopic photographs, which have been regarded as archetypes of our conceptions of the medium's

⁴⁶³ El Lissitzky (Lazar Markovich Lissitzky) is quoted in: John Berger, *The Sense of Sight* (New York: Pantheon, 1985), 167.

conventional, fraction-of-a-second relationship to time. These images also represent a technological milestone and an apex in the medium's journey to master the temporal fragment. A detailed look at Edgerton's *Milk Drop, Coronet* and his four-image series *Death of a Light Bulb* revealed this work to express much more than scientific/technical advances, or an "unreal realism" involving everyday objects. Instead, Edgerton's photographs, this dissertation argued, reveal the layered temporal nature of *narrative time* – a concept that received more extensive examination in Chapter Three. His images evoke multiple possible collective narratives, each possessing a creative relationship to time, and often also conjuring personal associations. In other words, an in-depth look at exemplary samples of Edgerton's images suggests that these fraction-of-a-second-exposure photographs express time in many more ways than as a brief view of a *that-has been*. Such a view has yet to be added to our histories.

Moreover, a close examination of Edgerton's *Death of a Light Bulb / .30 Caliber Bullet* argues that the drive to place photographs in a temporal order supersedes the veracity of the photographs themselves. Specifically, viewers are quick to temporally contextualize the photographs as illustrations of the linear event Edgerton suggests – *the death of a light bulb* – rather than see the series as a representation of the "deaths" of four different bulbs. Indeed, the urge to place photographs within a meaningful temporal framework – in order, perhaps, to make sense of time – curiously overpowers the documentary authority of these photographs and poses a challenge to the perceived "truth" value of the medium.

This inquiry into the potency of *narrative time* continued in Chapter Three, which offered a case study of a commonplace, exemplary, fraction-of-a-second-duration-exposure American family portrait, *Leighton Family* (1899). This ubiquitous photographic practice allows for the investigation of the strangeness of the isolated, *that-has-been* view of full-field, fraction-of-a-second exposure, with respect to the ongoing temporal continuum. Even a photograph such as the *Leighton Family* – which complies with conventional expectations of “photographic time” – forces a radical collision of the past and the lived-time “present,” revealing the medium’s unique capacity to express the complex experience of time. As scholars such as Kern and Schall have pointed out, anxiety about time’s passage was particularly prevalent in the years preceding the start of the twentieth century, and echoed then-contemporary narrative experiments in literature.⁴⁶⁴

Additional temporal complexities emerge as multiple viewers of the *Leighton Family* readily impose varying, mutable, fractured, creative, and interpretive *narrative times* upon the portrait, in order to create a personal and subjective sense of order for the image. These vernacular histories are partial, mutable, innately personal, and rife with omissions and the addition of absent

⁴⁶⁴ Kern, *The Culture of Time and Space*. Jan Schall also compares this period’s anxiety to that which ensued in 1999: “Fixated on potential Y2K problems, and dazzled by rough numbers, we conveniently overlooked the fact that our timekeeping is based on a counting system that begins with ‘one’ rather than ‘zero.’ We ignored the stunning accuracy of our sophisticated time reckoning devices and followed our imaginations, blowing whistles, exploding fireworks, tossing confetti, spraying champagne, and kissing – one year early. The relativity of time...[is] so blatantly evidenced by this millennial confusion...” Ibid, 13.

items and/or events. As Olin points out, Barthes made similar “mistakes” in his descriptions of several images in *Camera Lucida*.⁴⁶⁵ These errors, whether intentional or not, illuminate discussions of the creative, amalgamated narratives that lend photographs a new, personalized relationship to time. Barthes suggests that these narratives are worthy of study in our photography histories. This dissertation provides further expansion of Barthes’s ideas. Moreover, it suggests the merit of continued inquiry into the phenomenon of *narrative time* not only as a manifestation of temporality, but also as a means of more thoroughly exploring the function and persisting personal relevance of vernacular portraiture practices.

Narrative time, it has been argued, also engages the innovative experiments of modern literature, which also fractured and reordered linear time to convey its convoluted nature and experience at a viewer’s will at subsequent multiple coordinates in space and time. This term from literary studies similarly provides the vocabulary for addressing the possibilities of an imaginative, subjective, simultaneous, multiple-tense photographic time whose possibilities have been suggested by Benjamin and Barthes. These scholars’ ideas were further examined in the concluding section of Chapter Three. In an oral history for portrait of himself as a boy, Samuel Leighton recalls the Liberty Bell – an object that curiously finds no presence in the photograph. This case study implicitly argues that our subjective *narrative times* surpass the documentary power of photographs to testify to the appearance or presence of subjects. That is to say,

⁴⁶⁵ Olin, “Touching Photographs,” 105-114.; Barthes, *Camera Lucida*, 53, 87-88.

our drive to temporalize such photographs challenges our attachments to the images' veracity. This, in turn, suggests that perhaps different photographic practices possess a nuanced and varying relationship not only to time, but also, to *truth*.

In addition, the imposition of a subjective, creative, often non-chronological, narrative upon a photograph by a viewer also convolutes distinctions between *time* and *temporality*, implying that time's basis in human "reality" lies in its *embodiment* as the temporal. This phenomenon, Crary has argued, is a defining characteristic of visual habitude in an age of modernity.

Having examined the temporal complexities of photographic practices with a normative, fraction-of-a-second exposure time, Chapter Four offers yet another means by which the medium expresses time's complex experience. Asynchronous photographs – produced by a camera with a modified focal plane, shutter, and/or film advance system – defy the usual expectation that a photograph captures the appearance of a subject in a fixed, rectangular field of space at an atomized instant of time. They offer a perplexing collision of the *durée* and the millisecond, while representing racing subjects with a confounding contradiction of absolute realism and abstraction. Such images suggest that the photograph's status as a truthful document is perhaps conditional.

This chapter's analysis of the ubiquitous yet understudied racing Photo Finish and other device-altered photographic practices examines the medium's capacity to represent time and space as asynchronized, accumulated, distended

and/or compressed. In the Photo Finish and its related antecedent practices including the panorama, the time/space matrix is creatively reimagined and expressed.

Device-altered photographs such as the Photo Finish also provide the illusion of mastery over time's relentless passage by capturing its constituent atomized bits with a sensitivity that exceeds unaided vision. As logical scientific armatures of the reason and positivist advance lauded by capitalist and industrial modernity, images such as the Photo Finish were hailed man-made creations with the means to bypass the human "failings" of subjectivity and restore a stabilizing force of objectivity and logic in an age in which rapid technological advance compressed, complicated, and reconfigured perceptions of space and time. Yet while the Photo Finish's failsafe realism reassures such positivist urges, its abstract nature thwarts such efforts to truly master time.

Chapter Five introduced another unstudied photographic practice that allowed for the close examination of an added range of temporal expressions, N.A.S.A.'s whole-Earth digital composite images. Whole-Earth digital photographs feature a complex synthesis of atomized, differentially deferred times, extended duration, collapsed space and simultaneity of vision. Time is distended, layered, mathematically abstracted, montaged-together, compressed and repackaged to form a new idealized, imaginary time. In whole-Earth digital composite photographs, the very coherence of time is questioned. These temporal abstractions are products of an anxious culture coming to grips with a quickening

pace of life, which was enabled by the evolving, ever-*becoming* technology used to create and compose such photographic images.

Whole-Earth composite montages also appear frequently in our textbooks. However, they represent a digital tapestry of multiple, layered, simultaneous times, and reveal the Earth as it *never appeared*. These images are *real* without being *actual*, *symbols* rather than *evidences*. As such, they reveal the contradictions of photographic realism, and suggest the tandem nature of both temporal and veristic complexity.

As the product, embodiment and faithful servant of a complex and variegated modernity, photography is equally variously temporally stratified. It provides a distinct means for expressing of what it means to live in a time of modernity – with all of its exhilaration, scientific and technological advance, and the resulting anxieties it stirs over the unfixed nature of temporality and reality. It is an ideal medium with which to express the temporal sensation of living in a relative world with no absolutes, operating without fixed frames of reference, where objects are dependent upon observing subjects to give them interpretive form and meaning.

Consequences of This Study

This dissertation has argued in favor of a nuanced look at photographic time that surpasses our conventional perception of defining its parameters as an exposure-time-oriented “instant.” By examining in detail the narrativizing urges

such fraction-of-a-second exposures evoke in viewers, this project draws attention to the role of the viewer in determining temporal meanings. Observers are quick to expand upon a photographed duration in time and inhabit it, adding their subjective narrative interpretations to speak for the image. Thus, the extremely limited exposure-time duration that appears as a two-dimensional representation before us – and that “exclude[s] us” and “evict[s] us from the ongoing process,” Clive Scott suggests – is reclaimed in a time and space that belongs to the viewer.⁴⁶⁶ When this repossession occurs, the photograph’s individually specific exposure-time continuum *in* a time is subsumed by a creative, projected continuum *of* time. Similarly, device-altered practices such as the Photo Finish and panorama reconfigure the time/space relationship and render it sculptural. In these photographs, time is reclaimed and its possibilities and truths are imaginatively manipulated. Whole-Earth digital-montage/composite practices and their antecedent image-making processes offer similarly imaginative representations of multiple, synthesized, simultaneous times. In sum, this dissertation suggests that photographic time is highly subjective and unstable.

This dissertation, then, raises these questions: *How do we write a coherent history for such a moveable, diverse phenomenon? What might the expanded history advocated by this study look like?*

⁴⁶⁶ Clive Scott, *Street Photography: From Atget to Cartier-Bresson* (London and New York: I.B. Tauris, 2007), 43.

Our existing histories of the medium tell a story of the prevalence of the fraction-of-a-second exposure. This history begins with the very first published comments about photographic time, which appear just after the announcement of the invention of the medium in the early nineteenth-century. In reaction to Daguerre's photograph of the *Boulevard du Temple, Paris* from 1839, Samuel Morse wrote:⁴⁶⁷

Objects moving are not impressed. The Boulevard, so constantly filled with a moving throng of pedestrians and carriages, was perfectly solitary, except an individual who was having his boots brushed. His feet were compelled, of course, to be stationary for some time, one being on the box of the boot-black, and the other on the ground. Consequently, his boots and legs are well defined, but he is without body or head, because these were in motion.⁴⁶⁸

Other viewers such as journalist H. Gaucheraud were quick to point out that the unreal realism of Daguerre's street scene was due to the camera's extended recording of time's passage:

⁴⁶⁷ Daguerre's photographic experiments were made public by the French government on Aug. 19, 1839. An instruction manual in French, English, Italian, Spanish and Swedish, immediately was printed and distributed: Louis Jacques Mandé Daguerre, *History and Process of Photogenic Drawing by Means of the Daguerreotype* (London, 1839), 7. For an English version of this manual, please see: Louis Jacques Mandé Daguerre, *On a New Process of Polishing Plates Destined to Receive Photographic Images Permitting Identical Results to Be Obtained So Long as the External Circumstances Remain the Same* (London, 1843). The distribution of these manuals assured the spread of the daguerreotype process, and further irritated William Henry Fox Talbot and Hippolyte Bayard – who were among a cluster of individual inventors who claimed to have invented a photographic process before 1839. For more about the competing claims of the simultaneous inventors of photography – and the problems with anointing one man as *the* inventor of the medium, please see: Batchen, *Burning With Desire*, 24-53, 223-231.

⁴⁶⁸ Samuel F.B. Morse, "The Daguerrotipe," *The New York Observer*, April 20, 1839, 62. The spelling of the title of Morse's article has not been changed.

[A]ll that was walking or moving does not appear in the picture; of the two horses of a hackney coach on the stand, one unfortunately moved its head during the exposure so the animal appears without a head in the picture.⁴⁶⁹

Morse and Gaucheraud felt compelled to explain photography's peculiar departures from the appearance of "lived time" and motion in an animate world, and the medium's uncanny ability to express time in a new manner – as a finite slice of past duration. This early discourse lays out a technological challenge for the medium: the mastery of exposure times through improving the sensitivity of photo-chemistry and lenses, and the controlling of light exposures through rapid-moving shutters and spark/strobe illumination, for instance. As discussed in greater detail in Chapter Two, these concerns preoccupied various innovators from the invention of the medium into the early twentieth century.

But perhaps more significantly, these early comments also offer a succinct expression of expectations of photography's relationship to time: that of the fraction-of-a-second exposure that isolates recognizable slivers from the ongoing temporal continuum and presents them as a two-dimensional, lasting image. Such a view of our world, these authors imply, enables a hypersensitive intensification of our unaided vision that can encapsulate the vital energy of the modern age, just as Baudelaire suggested in 1863.⁴⁷⁰

⁴⁶⁹ H. Gaucheraud is quoted in: Helmut and Alison Gernsheim, *L.J.M. Daguerre: The History of the Diorama and the Daguerreotype* (New York: Dover Publications, 1968), 85. The original article appeared in: H. Gaucheraud. *Gazette de France*, Jan. 6, 1839. This is the Gernsheim's translation.

⁴⁷⁰ Baudelaire, "The Painter of Modern Life," 402.

Consequently, our existing histories tend to stress a technological, positivist succession of advances that allowed for the capturing of the fraction-of-a-second, in the service of defining the medium's contribution to views of the momentary. These stories are premised on a normative expectation that photography produces lasting images of the appearance of subjects in a full field of space, within a thin slice of time. Chapters Three and Four of this dissertation have suggested that the medium offers many additional views of time beyond that of the fractional second. Rather than refute the importance of the conventional view of photographic time, this project seeks through a series of historicized case studies to expand upon it. In other words, this dissertation advocates object studies that similarly expand our purview of the medium's expressions of time beyond that of the fraction-of-a-second exposure.

That said, while *narrative time*, *asynchronous time* and *composite time* are manners in which photography may articulate time, the medium's range of expressions of the modern time experience of temporality are potentially endless. This dissertation thus invites the contribution of further perspectives to further explore the multifarious possibilities of photographic time.

Specific additional case studies that could be added to this study in the future might include a detailed study of images with extended exposure times, photographs that allow for the further interrogation of the veracity of the unseen (such as spirit photography, X-rays, Ruth Drown's curative radionic photographs, etc.), and perhaps a closer look at the possibilities of *narrative time* beyond the

fin-de-siècle portrait case studies presented in this study. For instance, authors such as Eudora Welty, James Joyce and Marcel Proust kept collections of photographs that perhaps functioned as catalysts or inspirations for characters and settings in their fictional novels. In other words, this study aspires to be the start – rather than the finish – of additional inquiry into the complex nature and many possibilities of photographic time.

In addition, this dissertation has suggested that photography's relationship to "the real" is every bit as complex as its relationship to temporality. This topic – which has become more hotly debated with the emergence of digital-manipulation software in the 1980s – is worthy of additional in-depth study that exceeds the purview of this project. Each of the photographic practices discussed in this dissertation have uniquely tested the documentary truth value of the medium through the evocation of subjective narratives, the co-existence of absolute veracity with abstraction, and by presenting layered digital temporal complexity that supersedes the particular in service of the symbolic. This discussion is only the beginning of a much more layered, comprehensive inquiry into the nuanced nature of photographic realism, which is perhaps as varied as the range of multifarious practices of photography. Moreover, expectations of photographic realism also rely upon unique implicit reception-based understandings between viewers and the genres of images themselves. In other words, photography's relationship to truth is equally as complex as its expression of time.

In closing, this dissertation suggests that a purely *technological* history of the medium is an incomplete one. It is not enough to consider only the *making* of such images without exploring the way they *express* time, and the way these representations are *received*. Indeed, photography has been invested with restless anxiety about time's impermanence and changing experience in the midst of an age of such rapid change. Therefore, this project has argued that the additional consideration of the urge to *reclaim* and assert time's multifarious experience through projected narratives, device-altered practices and digitally synthesized montage/composite photographs allows for an expanded conversation about the medium as a site for exploring the effect of the perception of contingency anxiety and temporal convolution in the age of modernity.

In order to better articulate photography's role in shaping modern vision, the changing nature of modern vision itself needs to be explored in tandem with the images it influences. Consequently, this dissertation has integrated an expanded interdisciplinary study of the social/cultural, intellectual, scientific and philosophical views of time into its studies of exemplary photographs, while not seeking to repeat the connections made in the recent work of historians such as Kern and Canales.⁴⁷¹ This dissertation suggests an approach to history-writing that is methodologically expansive – yet insistently photography-focused – in

⁴⁷¹ Kern, *The Culture of Time and Space*.; Canales, *A Tenth of a Second*. These authors both explore the changing scientific/cultural view of time in an age of modernity, with an emphasis on the period from the 1880s-1920s.

order to prove that the expression of time in photography is as complex as perceptions of the experience of time itself.

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