THE FLICKERING BODY

A Dissertation
Presented to
The Academic Faculty

By

Alexander Dupuis
B.A., Brown University, 2010
M.A., Dartmouth College, 2012
M.A., Brown University, 2017

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dissertation requirements for the degree of Doctor of Philosophy.

Date ——————   ————————————————————

                                Todd Winkler, Advisor

Recommended to the Graduate Council

Date ——————   ————————————————————

                                Ed Osborn, Reader

Date ——————   ————————————————————

                                Shawn Greenlee, Reader

Approved by the Graduate Council

Date ——————   ————————————————————

                                Andrew G. Campbell, Dean of the Graduate School

Curriculum Vitae

EDUCATION

Ph.D. Computer Music & Multimedia (2020), Brown University, RI
Dissertation: *The Flickering Body*

M.A. Digital Musics (2012), Dartmouth College, NH
Thesis: *Development of Cross-Modal Feedback Processes for Audiovisual Composition*

B.A. Music (2010), Brown University, RI

PUBLICATIONS

2016   Dupuis, A. & Hayter, K. "*APPARITION COIL*: pareidolia in performance," in *Proceedings of the 15th Biennial Arts and Technology Symposium*

2014   Dupuis, A. & Dominguez, C. "Digitally Extending the Optical Soundtrack," in *Proceedings of the 2014 International Computer Music Conference*

2014   Dupuis, A. "Harmonic shuffling: Waveform and image resynthesis in *That Which Pulls*," in *Proceedings of the 14th Biennial Arts and Technology Symposium*

CONFERENCE PRESENTATIONS

2018   *Loup-garou*, Sonic Fluidities, University of California San Diego, USA, March 2-3

2018   *three paths*, 16th Biennial Arts and Technology Symposium, Connecticut College, USA, February 15-17

2017   *that which is about us*, International Computer Music Conference, Shanghai Conservatory of Music, China, October 15-20

2016   *#000000*, Seeing Sound (w/ Kristin Hayter), Bath Spa University, UK, April 9-10

2016   *APPARITION COIL* (w/ Kristin Hayter), 15th Biennial Arts and Technology Symposium, Connecticut College, USA, February 25-27

2014   *That Which Pulls*, International Computer Music Conference / Sound and Music Computing Conference, Athens, Greece, September 14-20

2014   *That Which Pulls*, 14th Biennial Arts and Technology Symposium, Connecticut College, USA, February 27-March 1

2012   *Stelaextraction*, International Conference on New Interfaces for Musical Expression, University of Michigan, USA, May 21-23

2011   *Omaggio a Berberian*, International Society for Music Information Retrieval Conference, Miami, USA, October 24-28

2011   *All Hail the Dawn*, International Conference on New Interfaces for Musical Expression, University of Oslo, Norway, May 30-June 6

2010   *Ramus*, International Computer Music Conference, Stony Brook University, USA, June 1-5

TEACHING EXPERIENCE
Brown University
Introduction to Generative Animation (Spring 2020)
Electroacoustic Improv Ensemble (Fall 2017)
Independent Study: Real-time Graphics (Spring 2019, Spring 2018, Fall 2017)
Independent Study: Studio production (Spring 2019, Fall 2018)
Computers and Music Teaching Assistant (Fall 2019, Fall 2015, Fall 2008)
Electronic Music Aesthetics Teaching Assistant (Spring 2017)
Real-time Systems Teaching Assistant (Fall 2016)
Recording Studio Teaching Assistant (Spring 2016)

Dartmouth College
Programming for Interactive A/V Arts Teaching Assistant (Winter 2013)
Animation / Film Teaching Aide (Fall 2010 - Spring 2012)

WORKSHOPS GIVEN
2019   "Intro to digital video feedback," Northampton, MA
2016   "2D Video Feedback in OpenGL," RISD, RI
2016   "Digital drawn-on-film animation," 2016 AV Synthesis Workshop, Dartmouth College, NH
2015   "Liquid pixel show: fantastical flow simulations through feedback," 2015 AV Synthesis Workshop, Dartmouth College, NH
2014   "Digital raster scanning as audiovisual synthesis," 2014 AV Synthesis Workshop, Dartmouth College, NH

ARTIST RESIDENCIES
2015   I-Park General Residency, CT

COMMISSIONS
2016   *APPARITION COIL* (w/ Kristin Hayter), 15th Biennial Arts and Technology Symposium

SERVICE
2016   Brown Music Department Diversity and Inclusion Action Plan committee
2012   Music-Video Reviewer, International Computer Music Association

RECORDINGS
2018   *13 Years Later* (w/ Blevin Blectum)   100% Synthetic DVD
2014   *All Hail the Dawn*   Computer Music Journal DVD

AFFILIATIONS
2014-15   Society of Motion Picture & Television Engineers
2014   International Computer Music Association

PERFORMANCES: SOLO WORKS

2019 — *Loup-garou*, Portals: Dissertation concert, Providence, RI

2019 — *Red Dot*, Portals: Dissertation concert, Providence, RI

2019 — *Dawn Chorus*, Portals: Dissertation concert, Providence, RI

2019 — *Loup-garou*, Electric Eclectics Festival, Meaford, Ontario

2019 — *Fish and Seafood*, h0t club launch event, New York, NY

2019 — *Dawn Chorus*, Computer Music & Video Concert, Northampton, MA

2019 — *Loup-garou*, Chat Club vol. 1, Providence, RI

2018 — *Yes We Can-certo*, Bach to the Future VI, Providence, RI

2018 — *Dawn Chorus*, 100% Synthetic Release event, Providence, RI

2018 — *Dawn Chorus*, Loopfest, Providence, RI

2018 — *three paths*, 16th Biennial Arts and Technology Symposium, New London, CT

2017 — *three paths*, Verdant Vibes Winter Warmer, Providence, RI

2017 — *that which is about us*, International Computer Music Conference, Shanghai, China

2017 — *Loup-garou*, Loopfest, Providence, RI

2017 — *three paths*, PVDfest, Providence, RI

2016 — *Bach Ross: The Joy of Fugue*, Bach to the Future IV, Providence, RI

2016 — *extra space points*, Loopfest, Providence, RI

2015 — *G'd(w)^n's castle*, Magic Lantern, Providence, RI

2014 — *All Hail the Dawn*, Anthology 6, Providence, RI

2014 — *that which is about us*, sonic.focus.3, Providence, RI

2014 — *Omaggio a Berberian*, New York City Electroacoustic Music Festival, New York, NY

2012 — *Ocelli*, Electric Eclectics 8, Meaford, Ontario

2012 — *All Hail the Dawn*, Electric Eclectics 8, Meaford, Ontario

2012 — *Stelaextraction*, New Interfaces for Musical Expression, Ann Arbor, MI

2012 — *Diving Bell*, Festival of New Musics, Hanover, NH

2012 — *Conway 4tet*, Transient Series, Brooklyn, NY

2012 — *All Hail the Dawn*, Transient Series, Brooklyn, NY

2011 — *Omaggio a Berberian*, International Society for Music Information Retrieval Conference, Miami, Florida

2011 — *All Hail the Dawn*, Pixilerations v.8, Providence, RI

2011 — *All Hail the Dawn*, New Interfaces for Musical Expression, Oslo, Norway

2011 — *Void_One*, Festival of New Musics, Hanover, NH

2011 — *Cannibal Mechanical Caracara*, Spheris series, Hanover, NH

2010 — *Tree of Aeons*, Spheris series, Hanover, NH

2010 — *Tree of Aeons*, Pixilerations v.7, Providence, RI

2009 — *Richard Crowley's Cloud Pump*, Pixilerations v.6, Providence, RI

2009 — *Tea Tree No. 6*, Cloud Maps, Providence, RI

2009 — *Richard Crowley's Cloud Pump*, Cloud Maps, Providence, RI

SCREENINGS

2019 — *three paths*, MUTA Festival Internacional de Apropiación Audiovisual, Lima, Peru

2019 — *13 Years Later*, Melbourne International Animation Festival, Melbourne, Australia

2018 — *13 Years Later*, 100% Synthetic Release event, Providence, RI

2018 — *three paths*, Moscow International Experimental Film Festival, Moscow, Russia

2018 — *three paths*, Curtocircuíto, Santiago de Compostela, Spain

2018 — *three paths*, Supernova Digital Animation Festival, Denver, CO

2018 — *First Contact*, Supernova Digital Animation Festival, Denver, CO

2018 — *13 Years Later*, Supernova Digital Animation Festival, Denver, CO

2018 — *three paths*, CYFEST, Kaliningrad, Russia

2018 — *First Contact*, New Music Gathering, Boston, MA

2018 — *three paths*, International Short Film Festival Oberhausen, Oberhausen, Germany

2018 — *three paths*, CYFEST, St Petersburg, Russia

2017 — *three paths*, CYFEST, Brooklyn, NY

2017 — *4JM*, London International Animation Festival, London, UK

2017 — *Prosperity Playlist*, Atlanterium, Atlanta, GA

2017 — *4JM*, Melbourne International Animation Festival, Melbourne, Australia

2017 — *We can make each other happy*, Explosions from the Other Canon, Providence, RI

2016 — *that which is about us*, Fest Anca, Zilina, Slovakia

2016 — *That Which Pulls*, Cloaked in Code, Toronto, Canada

2016 — *that which is about us*, danube video art festival, Grein, Austria

2015 — *that which is about us*, Animafest Zagreb, Zagreb, Croatia

2015 — *that which is about us*, nanoGalactic, Denton, TX

2015 — *That Which Pulls*, Magic Lantern, Brooklyn, NYC

2014 — *That Which Pulls*, Magic Lantern, Providence, RI

2014 — *That Which Pulls*, International Computer Music Conference, Athens, Greece

2014 — *That Which Pulls*, Experimental Film Festival Portland, Portland, OR

2014 — *No-Input Pixels*, Punto y Raya, Reykjavík, Iceland

2012 — *Void_Two*, Selections from Student Experimental Film Festival Binghamton, Tokyo, Japan

2012 — *Disco_Void*, Pixilerations v.9, Providence, RI

2011 — *Yes We Can-certo, Mvt III*, Student Experimental Film Festival Binghamton, Binghamton, NY

2011 — *Void_Two*, Student Experimental Film Festival Binghamton, Binghamton, NY

EXHIBITIONS

2019 — (solo show) *Writing the Arctic*, Cohen Gallery, Providence, RI

2019 — *Digital Graffiti*, Alys Beach, FL (curated by Brett Phares)

2015 — *Eyetunes*, le Bel Ordinaire, Billère, France (curated by Bertrand Grimault)

2014 — *Spaced Out: Migration to the Interior*, Red Bull Gallery, New York, NY (curated by Faith Holland)

2014 — *14th Biennial Arts and Technology Symposium*, New London, CT (curated by Nadav Assor)

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CHAPTER 1
INTRODUCTION AND MOTIVATION

1.1 Introduction

Looking back at the multimedia performances which I have experienced and found most personally affecting, I find a number of pieces which are linked by two commonalities. The first such commonality is one of medium - this group of influential pieces consists entirely of audiovisual performances which in some way center the live human body. The second correlation, which took a bit of time to discover and articulate, is one of experience - each of these pieces had, in some way, brought about an uncanny sensation that specifically resulted from the bodily presence inherent in each work. In fact, these uncanny moments are very often the parts of performance that I find to be the most meaningful and enjoyable. This dissertation is an articulation of my interest in this confluence of uncanny experience, audiovisual performance, and the human body, and will describe the ways in which my theories on uncanny media art have manifested in several of my own artistic works.

First, however, I would like to start with a couple of anecdotes from performances which helped spark this interest in strangely mediated bodies. The first performance which really captured my interest in this regard also marked my introduction to the *flicker* - the cinematic technique which consists of rapidly strobing frames. It occurred in 2007 at a new media festival in Providence, Rhode Island, where Kevin Patton was onstage performing his audiovisual work *Creaking the Sky*. The piece features Patton and his glove controllers producing an assortment of gesturally responsive sound, but it was the accompanying video that grabbed my attention. And I do mean *grabbed*, in as literal a way as can be said for a projection beam on a screen - the flashing forms seemed to

almost pulverize my body, leading to an involuntarily tensing of the muscles and freezing me to the auditorium chair. The results were disturbing and, yet, also thrilling. I had never before experienced the state of apparent hypnosis, the hallucinatory and almost paralyzing effects that occurred in that moment - it was a revelation of video's potential to not simply communicate illusory forms and shapes, but to interact with the body of the spectator in ways both perceptual and physiological.

The other example took place eight years later during a performance of Akiko Hatakeyama's *SOAK*. The performance is itself a ritual of mythological mystique, an elemental transmutation in which patterns of salt, spread out on a tabletop and filmed from above, are electronically translated and transformed into a chorus of gong and chime-like sounds. An onstage CRT television set displayed this overhead camera feed, and as Hatakeyama spread the salt across the surface of the table the appearance of her arm on the television set deeply unnerved me. Like the salt, the arm that appeared on that screen had undergone its own transmutation, morphologically alike to its physical counterpart but so radically different in aura that it seemed to exist in an entirely different reality. The image onscreen showed an arm not of this physical world but of the world of television, transcending its mundane existence to become art. Had I simply seen this image broadcast onto a television in my living room I would not have given it a second thought, but through witnessing the irreconcilability of the juxtaposed real and onscreen forms I felt as though I was given experiential knowledge of a fundamental difference between the physical world and the alleged representation of video.

These two events represent formative artistic moments in which I was shaken out of the passive and habitual modes of seeing which are common when viewing moving images. Underlying both revelations was this sensation of the *uncanny*, and it was in fact the feeling of contact with the uncanny that helped to provoke the heightened awareness within these experiences. Moreover, the foregrounding of the human body in these experience (including the bodies of both spectators and performers) was not coincidental but very

much linked with this sensation of the uncanny - it seemed that these moments were specifically made possible by an underlying tension that exists between human bodies and moving images. Over the last ten years I have endeavored to create performances that elicit similar sensations through the juxtaposition of onscreen spaces and onstage performers - the flickering bodies alluded to in the title. Just as other experimental artists have sought to cultivate ways of hearing and seeing that are repressed by habit and society, uncanny multimedia performance offers a means of reorienting oneself within a world overpopulated with screens.

The creative work of this dissertation consists of several pieces that attempt to engage with uncanny experience through audiovisual performance. The three performances - *Dawn Chorus*, *Loup-garou*, and *Red Dot* - work with a number of topics that I explore more generally in other pieces including audiovisual relationships, generative systems, and connections between mythology and new media. All of these works feature performers occupying the worlds of onstage projections, trying to simultaneously bridge and complicate the distance between the live body and the onscreen space. This written portion of the dissertation details these individual pieces as well as the shared interest in the uncanny that binds them together.

The Motivation chapter covers the relationship between moving images and the uncanny in greater detail and outlines my reasons for focusing on uncanny experience as a goal of [audio]visual performance. The History chapter discusses creative works by other artists that have particularly influenced the pieces in this dissertation, including a selection of flicker films, Takashi Ito's short film *THE MOON*, and several expanded cinema performances. These works all foreground intersections of film and the body as ways of eliciting awareness of the medium, and are examples which I believe evoke the uncanny through multimedia performance in powerful ways.

The final chapters document the creative pieces behind this dissertation: *Dawn Chorus*, *Loup-garou*, and *Red Dot*. Each piece has a respective chapter which follows this

overarching dissertation structure in miniature, with a discussion of the motivations and background relevant to each piece as well as a description of the work's form, content, and technical implementation where appropriate.

1.2 Motivation

The concept of the *uncanny* has taken a place of prominence in numerous discourses over the last fifty years, crossing almost effortlessly between subjects such as psychoanalysis, aesthetics, film, architecture, and philosophy.[1] The term haunts the writings of thinkers such as Heidegger, Derrida, and Freud, with Freud's 1919 paper on the topic acting as the axis about which a whole industry of uncanny-related analysis revolves.[2] The ubiquity of the term accelerated towards the end of the twentieth century to the point that it was dubbed by Martin Jay to be the master trope of the 90s,[3] and its close associations with simulation and artificial intelligence have kept the term at the forefront of public consciousness.

The canonization of the concept within these various discourses necessitates defining the term as it pertains to this dissertation. Freud provides one particularly quotable definition in his paper *Das Unheimliche*[4] which originates from the German philosopher F.W.J. Schelling, saying that the uncanny (or *unheimlich*) is everything "that ought to have remained secret and hidden but has come to light."[5] The term is further defined by Freud as "that class of the frightening which leads back to what is known of old and

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1. Anneleen Masschelein, *The unconcept: The Freudian uncanny in late-twentieth-century theory* (Albany: SUNY Press, 2011).
2. Ibid.
3. Martin Jay, "The uncanny nineties," *Salmagundi*, no. 108 (1995): 20–29.
4. Sigmund Freud, *The uncanny* (Penguin, 2003).
5. The use of the "hidden" proves significant: as Freud takes the reader on an etymological adventure through the roots of unheimlich and its negation heimlich, he reveals that the latter refers not only to the safety and comfort of the home but also to a notion of concealment, the hiddenness of things located within the home itself. This apparent contradiction, in which both heimlich and unheimlich appear to refer to hidden things, is not a cause for concern in the wider discourse on the uncanny but actually a point of celebration: writers on the uncanny appear to love little more than reveling in the meta idea that the term never fully reveals its meaning.

long familiar."[6] For Freud, the uncanny is not simply a feeling of fear but a disturbing revelation.

The aspects of the uncanny dealing with familiarity and hidden knowledge are, I think, both insightful and relevant to this thesis, but I would like to add two more facets to define the term as it relates to this work. The first is the assertion that *uncertainty* is a prerequisite for the uncanny experience, a notion which was put forth in 1906 by the German psychoanalyst Ernst Jentsch in his own paper on the psychology of the uncanny.[7] Freud responded to Jentsch by pointing out that uncertain experiences are not universally uncanny,[8] but the relevant point is actually the inverse relationship: that all uncanny experience is founded on an uncertainty. The moment a viewer becomes sure of their evaluation of a situation, the potential for uncanny sensation disappears and is replaced by another emotion, whether fear, awe, boredom, etc.

The second clarification is that the uncanny experience is not only perceived as an encounter with something previously *hidden* but also something *unnatural*, possibly even *supernatural*. Nicholas Royle describes this meeting of uncertainty and the unnatural rather elegantly, saying that the uncanny is "a flickering sense (but not conviction) of something supernatural," and "involves feelings of uncertainty, in particular regarding the reality of who one is and what is being experienced."[9] The uncanny moment contains the possibility, however unlikely, that the established rules of existence have been altered or violated in some cosmic sense. The unease of an encounter with déjà vu or a doppelgänger does not necessarily come from feeling that something *should* not be real, but, more fundamentally, that it *cannot* be real.

In this expanded definition, then, the uncanny experience describes a state of uncertainty, one that occurs when confronted with something which seems distinctly unnatural

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6. Freud, *The uncanny*.
7. Ernst Jentsch, "On the Psychology of the Uncanny," *Angelaki: Journal of the Theoretical Humanities* 2, no. 1 (1997): 7–16.
8. Freud, *The uncanny*.
9. Nicholas Royle, *The Uncanny* (Manchester: Manchester University Press, 2003).

and which represents something "known of old and long familiar." The uncanny can be frightening, but it also represents a potential for insight through critical inquiry which originates from the uncertainty and curiosity of the viewer.

The causes of the uncanny are, as we might imagine, far too numerous and varied to be exhaustively listed (though this certainly did not stop Freud from trying). The fundamental subjectivity of the experience is a significant obstacle here: something which is uncanny to one person will not necessarily appear so to anyone else. Nonetheless, there are certain situations that are likely - or at least more likely - to elicit such a reaction (if this were *not* the case, the theoretical underpinning of this dissertation would be in a bit of trouble). The harbinger of the uncanny which is most relevant to this dissertation is the *automaton*, a being which is not human but nonetheless *appears* as one. Jentsch and Freud[10] point to the automaton as a reliable object for eliciting uncanny experience, with Jentsch referencing both the ubiquity of the automaton as a literary device and also the uncanny effects of lifelike facsimiles such as wax dolls.[11] The automaton's superficial but incomplete humanity places it squarely within the qualifiers for uncanny experience - a being which is at once familiar and yet strange, whose behavior or appearance is indescribably off to such a degree that the reader or viewer remains in doubt as to its reality.

The automaton looms considerably larger in the present day than it did in the days of Jentsch and Freud, inhabiting animated feature films and chatbots as well as ever more sophisticated humanoid robots. It is now common to discuss recent implementations of human-like technologies in terms of their relationship to the *uncanny valley*, a concept that hypothesizes a nonlinear relationship between the apparent realism of a human facsimile and a viewer's emotional response.[12] The 'valley' theory posits that, for a graph where the perceived realism is mapped to the x-axis and the viewer's emotional response or affinity

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10. Freud, *The uncanny*.
11. Jentsch, "On the Psychology of the Uncanny."
12. Masahiro Mori, "The uncanny valley," *Energy* 7, no. 4 (1970): 33–35.

is mapped to the y, the line of emotional response will take a significant negative turn near the point where an automaton approaches perfect replication of human likeness and activity. Put another way, viewers often react negatively when something is *close* to being human without being absolutely indistinguishable from the genuine article.

This theory of the uncanny valley suggests that advances in the realism of automata will likely correlate with an increasingly uncanny reception of these beings. Viewed within the logic of the uncanny experience this correlation is perfectly rational: the closer that an automaton comes to approximating human behavior, the more *uncertainty* a viewer will likely experience in evaluating whether or not someone or something is really human. When a figure is deemed to be clearly unrealistic the viewer will cease to be uncertain about its humanity and be more likely to accept its artifice, and at the other extreme a figure exhibiting sufficiently perfect realism will for all intents appear to be human and thus not unnatural in the slightest. Within the zone between clear artificiality and perfect realism the viewer confronts the distinct possibility that something unnatural is at work.

Although the concept of the uncanny valley was initially developed as part of robotics research,[13] the term is especially associated in popular culture with animations and cinematic transformations of the human body.[14] The history of cinema is littered with meetings between the uncanny, the technological, and the human form, as audiences grapple with and acculturate to new developments in motion picture technology. Early advances in film technology would often coincide with periods of uncanny viewer response as audiences, confronted with radically new illusions of imagery and sound, would ponder the mechanisms that made these illusions possible.[15] Though the experiences might well have been pleasurable, the novelty and unnaturalness of early cinematic experiences often provoked viewers into a state of *medium awareness*.[16] Frances Alice Kamm describes this

13. Mori, "The uncanny valley."

14. Frances Alice Kamm, "'A Mirror Image of Ourself'? The Technological Uncanny and the Representation of the Body in Early and Digital Cinema" (PhD diss., University of Kent, 2015).

15. Tom Gunning, "An aesthetic of astonishment: Early film and the (in) credulous spectator," *Art and text* 34, no. 1 (1989): 31–45.

16. Robert Spadoni, *Uncanny bodies: The coming of sound film and the origins of the horror genre*

confluence of film technology and uneasy audience reactions as the *technological uncanny*, alleging that this experience leads to "fundamentally questioning the nature of the cinematic medium," and is specifically elicited by on-screen representation of the human body.[17]

The uncanny reaction to new technologies often disappears after some period of time as that which was new and strange becomes familiar and commonplace.[18] Film and video are no longer uncanny in and of themselves, but new techniques and technologies in video and animation still have the potential to reacquaint the audience with the underlying artifice of video and film. One notable contemporary disruption took place in 2012, when Peter Jackson decided to shoot and screen *The Hobbit* series at double the normal frame rate for theatrical releases. The term *frame rate* refers to the number of images which are shown per second in a particular format, with film playback typically running at twenty-four frames per second - a standardized rate adopted decades prior in tandem with the development of synchronized sound playback.[19] Peter Jackson wanted to show the *Hobbit* films at forty-eight frames per second, a number which was not strictly unprecedented but which had not been implemented at such a scale for theatrical pictures. By doubling the rate at which the individual frames of the movies were filmed and displayed to the audience, Jackson aspired to create a more 'realistic' viewing experience, one which would cut down considerably on blur from fast motion and camera movement.[20] The language used by Jackson to promote the change fits perfectly within the rationale for a progressive 'realism' in mainstream motion pictures: the visible artifacts of the filming process would be reduced, and the materials would thus seem more transparent, as though the viewer was "really there."

(Berkeley: University of California Press, 2007).

17. Kamm, "'A Mirror Image of Ourself'?"

18. Ibid.

19. Bruce Mamer, *Film Production Technique: Creating the Accomplished Image*, 5th edition (Boston: Cengage Learning, 2008).

20. Demosthenes, "HFR 3D: Peter Jackson explains what and why," TheOneRing.net, November 19, 2012, accessed February 18, 2020, `https://www.theonering.net/torwp/2012/11/19/65492-hfr-3d-peter-jackson-explains-what-and-why/`.

Reaction to the format was mixed at best. While some audience members praised the use of high frame rate (HFR), specifically its depiction of landscapes and scenery, many described the effects as disorienting, reminiscent of bad television, 'too real'.[21] Specific criticisms by dissatisfied viewers often focused on unnatural reactions to the characters, whose appearances and movements often seemed 'animated' or 'video-game like'.[22] One reviewer contrasted the experience of watching *The Hobbit* at the doubled speed versus the conventional film playback rate, declaring that the doubling of speed was so unsettling that it suppressed any expressions of joy or humor from the audience.[23] Disturbed audience members, shocked at a novel experience of representation in moving images, found themselves contemplating the nature of film's production in order to solve their feelings of unease. The reaction highlights the ways in which moving image formats become so commonplace that their very peculiarities and artifacts are conflated with a viewer's ideal reality: a format such as HFR film can only be *too real* in contrast to something *sufficiently* real, some format whose artifice has been accepted as a satisfactory representation of reality.[24]

Another prominent example of the intersection between cinematic hyperreality and the uncanny valley occurs in the discourse surrounding photorealistic character animation. The widespread adoption of motion capture technologies informs much of the discussion around the perceived successes and failures of these animations, and studios are strategic in the ways that they publicize (or obscure) the use of motion capture in their films. While 2001's *Final Fantasy: The Spirits Within* minimized any discussion of motion capture in order to make its case as a purely *digital* creation, most studios have sought to publicize the technology in a way that reassures audiences that human performance

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21. Carolyn Michelle et al., "The Hobbit hyperreality paradox: Polarization among audiences for a 3D high frame rate film," *Convergence* 23, no. 3 (June 1, 2017): 229–250.

22. Ibid.

23. Vincent Laforet, "The Hobbit: An Unexpected Masterclass in Why 48 FPS Fails," Gizmodo, December 19, 2012, accessed February 18, 2020, `https://gizmodo.com/the-hobbit-an-unexpected-masterclass-in-why-48-fps-fai-5969817`.

24. Julie Turnock, "Removing the pane of glass: The Hobbit, 3D high frame rate filmmaking, and the rhetoric of digital convergence," *Film Criticism* 37, no. 3 (2013): 30.

is a vital part of the production.[25] In this latter approach motion capture is framed as a transparent translation of an acting performance, affirming to viewers that the technique fits squarely within the lineage of traditional acting and that a certain underlying *humanity* is preserved.

Peter Jackson's Middle Earth films kicked off the millennium with a resounding success in this regard, with Andy Serkis' performance of Gollum garnering widespread acclaim when *The Fellowship of the Ring* debuted in 2001. Serkis frames his role as that of the 'cyber-thespian' who differs only from the traditional actor in the application of digital makeup, reifying the importance of human talents in a field of rapid technological development.[26] James Cameron's 2009 film *Avatar* built on this motion-capture success in its depiction of the Na'vi, a race of 9-foot tall blue beings, and the picture would go on to become the highest-grossing international film at its time of release. Much like Serkis, Cameron justified the success of the film's graphics in terms of the technology's transparent rendering of human acting, preferring to use the term *performance* capture instead of motion capture and emphasizing that Avatar was "not an animated film"[27] despite its overwhelming reliance on computer-generated characters and scenery.[28]

The positive reception to the characters of Gollum and the Na'vi might seem to signal a successful scaling of the uncanny valley, and to be fair these films do indeed represent remarkable achievements in photorealistic digital effects. However, it is crucial to note that the animated characters of these films are *humanoids*, not humans, and a survey of contemporary animated films aspiring to photorealistic humans reveals a much more divided reception. Films like *Final Fantasy: The Spirits Within* (2001), *The Polar Express*

25. Kamm, "'A Mirror Image of Ourself'?"

26. Adam Dawtrey, "Andy Serkis plans UK motion-capture studio," The Guardian, April 23, 2010, accessed February 18, 2020, `https://www.theguardian.com/film/2010/apr/23/andy-serkis-motion-capture-studio`.

27. Media Magik Entertainment, "Avatar Exclusive -Behind The Scenes (The Art of Performance Capture)," December 16, 2009, accessed February 18, 2020, `https://www.youtube.com/watch?v=P2_vB7zx_SQ`.

28. These stances by Cameron and Serkis have understandably rankled the animation teams responsible for so much of the success of these characters.

(2004), and *Beowulf* (2007) were prominent contemporaries of *The Lord of the Rings* and *Avatar* that aspired to photorealistic renderings of human characters, with the latter two films featuring not only motion captured acting but also the likenesses of its established stars like Tom Hanks and Anthony Hopkins. Whether in spite or because of these celebrity avatars, the characters in all of these films the characters were criticized in terms of both their unreality and hyperreality, with these descriptions increasingly referencing the uncanny valley as the term gained wider popularity in the mid-2000s.[29]

The disparity in reception between Gollum and the heroes of *Beowulf* could perhaps be chalked up to a difference in animation quality, but the general trend points to the unique attention that we pay towards the mediated human form. Even within the last few years the intersection of humans and photorealistic animation in major motion pictures remains fraught with the uncanny, including the use of a literally reanimated Peter Cushing in 2016's *Rogue One*, and the unmitigated critical and commercial disdain for the surrealist manipulations in 2019's *Cats*.[30] Cushing's "performance" of his classic Star Wars character Grand Moff Tarkin was particularly fraught with ethical issues given that Cushing's real-life death had occurred over twenty years prior to the film - rather than write a new character or recast the part, the filmmakers opted to insert a 3D animation of the actor, its movements generated by a motion capture performance by Guy Henry in which he inhabited the character of Cushing's Grand Moff. The reappearance of Cushing fits squarely within the lineage of reanimated entertainers which is headlined by Tupac's hologram performance, and the contextual knowledge of Cushing's death played into the uncanny reception the character received from many fans. Little wonder, then, that some writers invoke the vampire as a metaphor for motion capture: the technology's capacity to allow one human to control another is fraught with all manner of supernatural subtext.[31]

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29. Kamm, "'A Mirror Image of Ourself'?"
30. The past few years have given rise to a narrative that the CGI of newer mainstream movies has actually deteriorated in quality: whether true or not, there seems to be a reasonable case that any decline in quality could be attributable to an increase in occupational instability and an acceleration of deadlines within the industry.
31. Kamm, "'A Mirror Image of Ourself'?"

Motion-capture's abstraction of the human form positions the technology within a lineage of motion picture techniques that serve to mechanize the body. We can see examples of this kind of human quantification going back over a hundred years to the motion experiments of Eadweard Muybridge and Étienne-Jules Marey, who recognized early on the capacity of the moving image to reveal otherwise hidden information about bodies in motion. The topic of hidden physiological information is even more relevant today, with anxieties over facial recognition and deepfakes reflecting a general apprehension towards the nefarious possibilities that arise from digitally abstracted bodies. The example of Peter Cushing points towards a future in which onscreen human appearance is not only malleable but modular.

The fact that these examples occur in mainstream cinema is significant precisely because of the obsession with realism and transparent technology within mainstream films. These are films with every incentive to *avoid* inducing uncanny sensations in their audiences, and yet their aspirations towards an increasingly realistic artifice seem, as often as not, to disturb and provoke viewers. For filmmakers and media artists wishing to deliberately induce the uncanny, these films suggest that a *hyperreal* cinema, particularly one which centers the human body, might well elicit such a revelation.

1.3 Why evoke the uncanny?

The above section details some of the ways in which moving pictures might elicit uncanny experience: now we must turn to the question of *why* I and others might want to explore the uncanny in [audio]visual performance. Speaking for myself, perhaps the most basic reason traces back to the simple fact that I often *enjoy* the eerie disturbances that these experiences provoke and the sense of heightened awareness that accompanies them. Despite the seemingly inherent negativity of the term, the uncanny is not a universally unpleasant feeling - there is a reason that, as Jentsch notes, the automaton has such a

prominent place in literature.[32] If the fundamental condition of the uncanny is something at one *familiar and yet strange*, it represents the defiance of expectation to which art aspires.

I would also say that my affinity for uncanny experience is especially tied to its manifestation in screen-based media, and that in trying to construct eerie screen performances I am driven not just by the pursuit of pleasure but also a desire to re-experience video as an artifice, as a reality whose understanding of space and time and bodies is distinct from that of the non-screen world. It is an attempt to return to a state of being before our acculturation to screens, when people were more aware on an experiential level that the moving image represented an entirely different logic of space and time. It is a distinct reaction to the *lack* of the uncanny that I feel in a cyberspace full of strange and manipulated bodies covered in filters and Facetuning. Much of the fear of deepfake face-replacements comes specifically from the fact that without context these videos would likely *not* seem uncanny, that these videos could successfully present themselves as indices of recorded light from the physical world.

My interest in invoking a sense of medium awareness reflects the influence of certain Structuralist filmmakers on my audiovisual performance practice. Structural film is, according to Peter Gidal, defined primarily by its attempt to be non-illusionist, and its correlated aim is to activate the attention of the viewer towards the underlying mechanisms of film production.[33] Malcolm Le Grice, another prominent filmmaker lumped under the banner of Structural film, supports these aims in his own writings on filmmaking, citing his commitment to "an affirmation of the projection event as the primary reality," and emphasizing "the Real TIME/SPACE event at projection".[34] Gidal's assertion that narrative film is a "repression of real space" underscores the ways that Structural film aspires to the uncanny moment - in its desire to do away with illusory time and space

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32. Jentsch, "On the Psychology of the Uncanny."
33. Peter Gidal, *Structural film anthology* (London: British Film Institute, 1976).
34. Malcolm Le Grice, "Real time/space," *Art and Artists Magazine*, 1972, 38–43.

it seeks to defamiliarize screen space and reveal underlying cinematic mechanisms which have been repressed and hidden.[35]

Despite the anti-illusionist bent of this field, the Structural film works which have resonated most profoundly with me actually appear to *create* illusory cinematic spaces through juxtaposition of human performers with projections. Works like Le Grice's *Horror Film 1* and Guy Sherwin's *Man with Mirror*, which are discussed in the next chapter, place physical performers within the projection beam in such a way that the performer's "Real TIME/SPACE" is conflated with the cinematic space-time of the film. For me, the apparent creation of illusion is a successful aspect of these works - the audience's recognition of the illusory experience is precisely the moment when their attention becomes activated. If uncanniness in the cinema is often associated with hyperreal human bodies, these performances seem to have struck upon the uncanny hyperreality of the genuine article itself.

My own performances outlined in this dissertation are, in part, explorations of the premise that juxtaposing live bodies with moving images can foster an experiential knowledge of the differences between real and cinematic space-time. Though these pieces are carried out digitally rather than on film, the basic illusion of cinematic realism still very much functions in digital video. Indeed, the fact that cinematic realism persists in a medium as malleable as digital imagery underscores the need for a continued evaluation of the illusory powers and mechanisms of moving pictures. In attempting to find the uncanny within these videos and images, I am trying to orient myself within intertwining space-times both "real" and on-screen.

1.4   The projection as thin place

The continued referral to the illusory nature of onscreen space-time has led me to think of these screens as a kind of supernatural space: if these screens do not represent 'real'

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35. Gidal, *Structural film anthology*.

time and space, they must therefore be *un*real. In this conception the expanded cinema works which I list above act as portals, liminal spaces which briefly manage to span the discontinuity between our physical world and the one in the projection. By extending the analogy of the portal into the realms of mythology and religion, the idea of the *thin place* has emerged as a particularly apt parallel for explaining the overlap between projection and body which occurs in these works. When these performances are placed in this mythological lineage, they represent the latest in a long effort to find literal places where real and supernatural space align.

The term *thin places* has strong associations with Celtic mythology, where it is used to refer to concrete locations where the boundary between the physical world and the supernatural Otherworld is thin to the point of permeability.[36] Over time the term's meaning has expanded to include places that not only promote a feeling of spirituality, but which even more generally engender a shift in perspective, "a [jolting] out of the old ways of seeing."[37] The notion of locationally specific connections between physical and supernatural planes is a common idea across cultures and is analyzed more generally by religious scholar Mircea Eliade in his 1957 book *The Sacred and the Profane*.[38] Eliade uses the more general term *hierophanies* when discussing manifestations of the sacred, a notion that encompasses fixed locations such as thin places as well as sacred objects which might enable portable connection to the supernatural. These supernatural otherworlds connect with the earthly world in a discontinuous manner through these hierophanies, and these connections act as locations of importance which contrast with the infinitude of earthly (that is to say, profane) space. In Eliade's estimation the profane space of the earth contains nothing of existential significance to the religious individual, whereas encounter

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36. Patricia Monaghan, *The Encyclopedia of Celtic Mythology and Folklore* (New York: Infobase Publishing, 2014).

37. Eric Weiner, "Thin Places, Where We Are Jolted Out of Old Ways of Seeing the World," The New York Times, March 9, 2012, accessed January 16, 2020, `https://www.nytimes.com/2012/03/11/travel/thin-places-where-we-are-jolted-out-of-old-ways-of-seeing-the-world.html`.

38. Mircea Eliade, *The sacred and the profane: The nature of religion* (Boston: Houghton Mifflin Harcourt, 1959).

with a hierophany allows such a person to quite literally center themselves; "Revelation of a sacred space makes it possible to obtain a fixed point and hence to acquire orientation in the chaos of homogeneity, to 'found the world' and to live in a real sense."[39]

While the sacred aspect of thin spaces and hierophanies might seem to be at odds with a profane media arts practice, Eliade's description of the sacred as "a reality of a wholly different order from 'natural' realities," parallels quite closely the "Real TIME/SPACE" which filmmakers like Le Grice aspire to connect with in their own work. Film and digital video both represent spaces which exist but which are, in a sense, supernatural, reminiscent of but distinct from the physical world in space, time, and logic. In this sense the projection beam itself becomes a cinematic hierophany or thin place, tapping into a longstanding urge to relate to a supernatural world by literally centering oneself within a place where the boundaries are thinnest.

1.5   Conclusion

The literature on the concept of the uncanny contains two assertions which I think are particularly relevant to the multimedia performances which interest me - the first being that moving images are inherently uncanny media, and the second that the juxtaposition of moving images and human bodies makes uncanny experience especially likely (particularly when such juxtaposition invokes the idea of the automaton). I believe that analysis of these uncanny mergers between bodies, films, and videos can reveal mechanisms for eliciting uncanny experience, and that many experimental films and multimedia performances attempt to create such uncanny situations in order to activate the critical awareness of audience members. In this way, physically juxtaposing live performers and projections can create something of a thin place between the physical world, and the immaterial worlds of film and video.

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39. Eliade, *The sacred and the profane*.

CHAPTER 2

RELEVANT WORKS

This chapter examines a set of pieces which have been especially influential on my work with projection in live performance, focusing in particular on three topics: flicker films, Takashi Ito's short film *The Moon*, and several examples of expanded cinema in which the body of the performer serves as the screen. The important commonality between these three areas is the centering of the human body during the performance event, with flicker films engaging primarily with the physiological response of the spectator and the works of the latter two sections creating insightful interactions between live performers and projected light. In all of these works the specter of the uncanny raises its head, and with it the possibility of audience activation with respect to the mechanisms behind the work.

2.1   Flicker films

The flicker film is a class of film and video which uses strobing light as its primary content, often (though not always) attempting to engage with certain perceptual and physiological responses in the viewer. Kevin Patton's *Clearing the Sky*, mentioned in the introduction to this dissertation, was not a flicker film per se, but did represent my first experience with the flicker as a moving image technique. The few strobing effects that I can recall prior to that moment tended to be utilized for purposes of inducing horror and fright, as in the hallways of a haunted house, and so the uncanny aspects of the flicker were subsumed under a narrative of horror. Isolating the flicker effect from actors and narrative allows its essential uncanniness to come to the fore through its hallucinatory effects, as well as the response of the body of the viewer.

The flicker film's defining feature is rapid oscillations of light. This is brought about

through the sequencing of frames which typically are composed of uniform colors, with these colors tending to shift considerably in value from their temporal neighbors in order to produce the contrasting effect that the flicker requires. If such a film were played sufficiently slowly the viewer would see frames consecutively change their colors, but when the frame changes speed up the individual "images" begin to blend and interact with one another. When this happens, the film can induce hallucinatory effects in the viewer, resulting in the appearance of phantom shapes and forms.[1] The most austere of these films thereby foreground the ways in which the work's content is created by the perceptual processes of the viewer: though the audience knows intellectually that the film frames are "blank" their patterns of light elicit entirely new shapes for each individual who watches them.

The correlation between flickers and hallucinations has been documented well before the invention of film and even electric light. Several accounts from the early nineteenth century mention the appearance of patterns induced by rapidly interrupting a bright light, including moving a hand before a gaslamp and running alongside railings which obscure the sun.[2] In the 1920s the scientist Hans Berger was conducting early EEG experiments and began to study the effects of bright flashes of light on measurable brain activity, specifically noting a correlation between flickers of 8-12 Hz and the simultaneous alpha wave rhythms of the viewers who were being monitored.[3] The introduction of more highly-powered strobe lights into this laboratory testing led to hallucinations within the experiments, and with these hallucinations came a concurrent acknowledgement of the seemingly mystical power of the flicker. Neurophysiologist W.G. Walter described some of the resulting imagery as "whirling spirals, whirlpools, explosions," and said that, "... we had stumbled on one of those natural paradoxes which are the surest sign of a hidden

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1. Carsten Allefeld et al., "Flicker-light induced visual phenomena: Frequency dependence and specificity of whole percepts and percept features," *Consciousness and cognition* 20, no. 4 (2011): 1344–1362.

2. Bastiaan Coen Ter Meulen, Denes Tavy, and B. C. Jacobs, "From Stroboscope to Dream Machine: A History of Flicker-Induced Hallucinations," *European Neurology* 62, no. 5 (2009): 316–320.

3. E. D. Adrian and B. H. C. Matthews, "The Berger Rhythm: Potential Changes from the Occipital Lobes in Man," *Brain* 57, no. 4 (December 1, 1934): 355–385.

truth."[4] That he titles his chapter on this subject "Revelation by Flicker" underscores the fundamentally uncanny experience the flicker can elicit, which can lead to participants feeling that they are on the threshold of some knowledge which is just beyond their grasp.

The apparent mind-altering powers of the flicker took hold with a number of counter-culture figures around the turn of the 1960s. The Dreamachine, created by Brion Gysin and Ian Sommerville in 1959, was a device invented for the specific purpose of inducing flicker-based hallucinations.[5] It consisted of a cardboard cylinder with regular patterns of holes cut around the diameter, and would be placed over a lightbulb on the center of a 78 rpm turntable. Through the combination of the holes and the speed of the turntable, a person sitting close to the cylinder with eyes closed could experience flashes of light within the same frequency range that Berger had documented. Figures such as William S. Burroughs and Allen Ginsberg documented their experiences with the machine, and some members of the Beatnik community made note of its potential as a 'drugless high' (not that it stopped them from combining its use with chemical enhancements).[6]

The 1960s also marked the birth of the first generally acknowledged flicker films, beginning with Peter Kubelka's *Arnulf Rainer* in 1960.[7] Kubelka's film is stripped down to four components which represent his conception of film's irreducible parts: white and black frames representing light and shadow, and bursts of white noise in contrast with silence. While the film contains moments of strobing, Kubelka was primarily interested in the arrangement of the film's components rather than the perceptual aspects of flickers: as Malcolm Le Grice notes, *Arnulf Rainer*'s structure is rather musical in its attention to *phrases*, and the changing durations of the white and black frames disrupts any flickering effects which might take hold.[8] Nonetheless the moments of flicker are present, and the

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4. W. J. Freeman, "W.G. Walter: The Living Brain," in *Brain Theory*, ed. Günther Palm and Ad Aertsen (Berlin, Heidelberg: Springer, 1986), 237–238.

5. Paul Cecil, *Flickers of the Dreamachine*, Google-Books-ID: TVUCAAAACAAJ (Codex, 1996).

6. Meulen, Tavy, and Jacobs, "From Stroboscope to Dream Machine."

7. Jay Beck and Tony Grajeda, *Lowering the Boom: Critical Studies in Film Sound* (Champaign: University of Illinois Press, 2008).

8. Malcolm Le Grice, *Abstract Film and Beyond* (Cambridge: MIT Press, 1977).

stark visual language of simple white and black frames anticipates the aesthetic of the more perceptually oriented flicker films to follow.
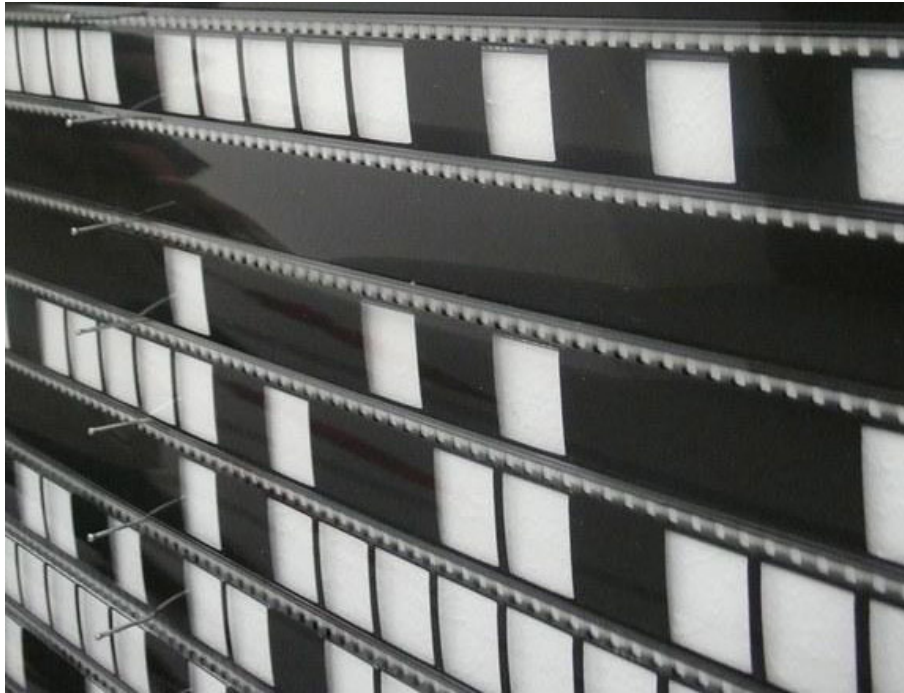
Figure 2.1: Frames from *Arnulf Rainer*, 1960

Tony Conrad's short film *The Flicker* debuted six years later and fully embraced the perceptual phenomena of film flickers. As in *Arnulf Rainer*, the film's visual contents consist of white and black frames arranged in various patterns, but in the case of *The Flicker* the frequency of the patterns and their overall arrangement were developed out of experiential tests conducted on the part of Conrad and Mario Montez.[9] Slow changes in the strobe patterns are intended to not only incite hallucinations in the viewer, but also provoke them into an "awareness of gradually changing modes of perception."[10] This reflexive aspect of *The Flicker*, in which audience members would often question not only their autonomic reactions but also the interacting film mechanisms, led to P. Adams Sitney including flickers as one of his four characteristics of Structural film production.[11]

9. Tony Conrad, "Is this Penny Ante or a High Stakes Game? An Interventionist approach to Experimental Filmmaking," *Millennium Film Journal* No. 43/44 (Paracinema / Performance 2005): 103–105.

10. Le Grice, *Abstract Film and Beyond*.

11. P. Adams Sitney, "Structural Film," in *Film Culture Reader* (New York: Cooper Square Press, 1969),

The repeated associations of flicker phenomena with enlightenment and hallucination indicate the flicker's potential as a reliable elicitor of the uncanny. Experimental filmmaker Ken Jacobs gives something of a pragmatic spin on the enlightening potential of flickers as a means of disrupting our 2D, flattened view of cinema (and by extension the world), saying such perceptual illusions "can teach us modesty as regards knowledge of The Truth of Things. Religion is bullshit, philosophy falls short. Simple luck in being born with a constitution that can take a steady diet of bewilderment gets us through."[12] Unlike the uncanny effects of many technological advancements, which tend to fade as people acculturate to the technology and its artifacts, flickers seem to be an indefinitely repeatable physiological and perceptual phenomenon and thus perhaps serve as a perpetual source of uncanny experience.

I would like to close the flicker section by describing one flicker experience which I found to be profoundly unsettling and intriguing. It came from *OX* by Asha Tamirisa, a film which I have seen several times but which was screened to particularly startling effect at a show in 2014. The work is composed of frames which alternate between darkness and brightly saturated color, beginning with a vibrant blue and seemingly working in purples and oranges and greens as the strobing progresses.[13] The film's sequences of color and flicker rate bring about wild changes in hallucinated patterns and perception of time, particularly when shown on a large screen. However, the most striking thing about this theatrical experience was my vivid and unshakeable hallucination of a man who had appeared beside me midway through the viewing, an event which I only realized to be a vision after the picture had ended. This moment was not simply uncanny in an abstract sense of encountering hidden knowledge but an encounter with a fully supernatural human, a real-life meeting with a flickering body.

326–349.

12. François Bovier and Adeena Mey, "Paracinema, Flicker and 3D. Interview with Ken Jacobs," Décadrages, January 3, 2013, accessed March 22, 2020, `https://www.decadrages.ch/paracinema-flicker-and-3d-interview-ken-jacobs-francois-bovier-and-adeena-mey`.

13. Given the flicker's propensity for inducing hallucinations of color as well as shape, the "real" colors of flicker frames do not always correspond with the perceptual result.

2.2 Takashi Ito and *The Moon*

The films of Takashi Ito are a delight for fans of surreal and impossible cinematic spaces. Ito's works fully commit to exploring the games of time and space which are possible through the logic of film, and they do so with a meticulous attention to craft and production value that in no way blunts the intensity of their content. Although the films are deeply illusory, their effects also serve to draw attention to several fundamental unrealities in the film medium, and as such they call the viewer's attention to the differences between real and cinematic space-time.

Two areas which he explores with particular insight are the difference between recorded time and screening time, as well as the conflation that can occur between onscreen and physical space. Ito investigates this latter point through rephotography of still images, films, and projections, and carefully manipulates the camera's framing to alternately hide and reveal his artifice to the viewer. One example where this seamless rephotography is applied to great kinetic and perceptual effect in Ito's 1981 film *Spacy*. The film takes place in a largely empty gymnasium which is populated by a number of stands, each of which holds a large rectangular photograph. The camera slowly moves in a parabolic arc towards one of the photographs, which is revealed to be an image of the same gymnasium space replete with photo stands, taken from the same height as the shots which comprise the film itself. As the camera approaches the photo its frame aligns with the picture on the stand such that the photograph perfectly covers the lens' view. Once this alignment occurs the camera appears to move *through* the photograph into the space it depicted, the motion and lighting appearing so seamless it is as if the camera has passed through a portal rather than a photo. This fundamental underlying trick of *Spacy* is repeated at an accelerating rate, and though the premise is immediately discernible to the viewer the apparently discontinuous passage through space and time loses none of its bewildering effects. The effect is of a repeated uncanny in which the illusion of filmic representation

is repeatedly shown to the audience in a rapid series of revelations.

During the mid-1980s Ito also explored the aesthetic possibilities of rephotographing film projections, a process which coincided with a careful use of long exposures to establish wildly different space-times. Films such as *Thunder*, *Grim*, and *Ghost* make use of these altered space-times to disconcerting effect, as one might imagine from reading their titles. These films tend to lean towards a more overtly horror aesthetic which is accentuated by Ito's stop-motion techniques, with numerous discontinuous flashes of stroboscopic light and images which seem to be suspended in midair.

One especially haunting moment comes in *Grim*, a film which uses the sterile stillness of a nondescript industrial office as a haunting backdrop for space-time exploration. In this particular moment of *Grim* the camera is focused on a doorway at the end of a hall, advancing slowly forward. Lights flash on and off in the corners of the room while images of this same door are, through some trickery, projected into the blank space of the hallway where they seem to float in midair, presenting to the viewer the illusion of a door within a door. The two doors appear to belong to two different sorts of reality: there is the primary door, the "real" space which we believe is the one documented in the film, and the projected door which belongs to a secondary reality, that is to say it is clearly a representation which is reproduced within the world of the film. For Ito, however, there is no fundamental difference between the reality of photograph in contrast to a photograph of a photograph, and he upends the composition of the hallway by suddenly and seamlessly advancing the camera so that we are suddenly aligned with the whole of the projected door - the world which was clearly a projected representation within the film has now morphed into a space which me might believe to be "real". Before one can properly adjust to this shift in reality, the audience is jerked back to what appears to be the original hallway once more. Through the use of rephotography and the framing of the shot we are briefly made aware again of the illusion of a primary reality within film.

The issue of framing brings up the importance of camera motion in Ito's films with

Figure 2.2: Superimposed doors within Ito's *Grim*

respect to the ways that he uses panning to activate the awareness of the audience. Although Ito's works would not be properly labeled as Structural films, a great number of his techniques call attention to the illusory mechanisms and production of cinema, with his camera movements making an especially strong contribution in this regard. The use of camera motion for activating awareness does in fact show up in some Structural cinema works, with Michael Snow being a particularly intrepid explorer in works like <>.[14] Within Ito's pieces like *Thunder* and *Grim* the illusion of smooth camera motion is crucial in emphasizing the altered space-time that emerges from Ito's stop-motion techniques. Without this motion, the compressed time of these shots would likely be perceived as something of a time-lapse, and the familiarity of the time-lapse format would more likely create a passive viewing situation. By moving the camera in a way that conflates compressed time and real-time speed of movement, the implicit presence and

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14. P. Sitney's assertion that fixed camera position is one of the four characteristics of Structural film would seem to contradict this fact, at least within his own conception of the term - but then again he lists several examples by Snow alone which succeed precisely because of their camera motion and/or use of zoom.

orientation of the camera are continually emphasized to the viewer.

Figure 2.3: Still from Ito's *The Moon*, 1994

The piece of Ito's which is most relevant to this dissertation is 1994's *The Moon*. Much like the expanded cinema performances in the following section, *The Moon* centers the human body within mapped film projections as a way of creating uncanny liminal experiences. The fact that this piece is a film and not a performance also allows Ito to incorporate his techniques of space-time manipulation, and the fixed format in no way diminishes Ito's ability to play with and call attention to the audience's assumptions about the reality of onscreen space.

The film itself proceeds in the slow yet discontinuous manner of a dream, steeped in richly associative imagery. Literally less flashy than films such as *Thunder* and *Ghost*, the cool blue world of *The Moon* turns away from horror imagery towards a more eerie quiet. The settings of the film continually transform through tricks of camera framing and projection mapping: a film of a landscape is reframed to reveal its presence on a wall, while the titular moon is not located in the sky, but is rather hiding menacingly behind

a closet door. Just when the viewer might think they have grasped these revelations, the light of the landscapes begins to fracture and split along panes of glass, as though the very world is rupturing. Ito's work is a continual revelation of film's *Inception*-like status as dreams-within-dreams - as Sylvia Schedelbauer writes of Ito's films, "The cinematic process is as much the subject matter as the subversion and collapse of the laws of time, space, and perspective."[15]

The Moon is, however, not just focused on spatial manipulation but also the presence of the human body within film. The primary subject inhabiting these onscreen spaces is a small boy, Ito's son, who seems to cross between several of the mediated levels within the film. This represents something of a change from *Thunder*, *Grim*, and *Ghost*, which all featured humans that stayed within a certain level of mediation: that is to say they either appeared to be purely within the "real" space filmed by the camera, or their depictions were clearly projected onto the walls of the "real" spaces. This changes in *The Moon* as the boy's images move between multiple layers of mediation. In one shot, we appear to be watching a film of the boy on a bicycle until the onscreen world warps, revealing its status as a rephotographing of the bicycle film. The most unsettling image of the picture features the smiling face of Ito's son projected onto a dark form which we take to be the "real" boy, his limbs twitching slightly in the compressed speed of stop-motion. The alignment of the projected face onto the otherwise dark form of the boy creates several levels of discomfort: though the face is in roughly the right position on the body it is never quite aligned, its geometry stretched awkwardly over some ambiguous portion of the boy's head, and in a strange evocation of Janus it is not necessarily even clear which way the "real" boy is facing. The shadow form shudders subtly in its altered space-time, and the projected face never stops beaming at the camera.

As a coda to this particular discussion we might consider the symbolic role of the moon itself in this work. Within the film itself the moon disappears and reappears at sudden

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15. Sylvia Schedelbauer, "Poetics of an Urban Darkness: Takashi Ito's Spectral Cinema," *OTHERZINE*, no. 20 (February 15, 2011).

moments, appearing to paradoxically loom over the proceedings while inhabiting a closet, a disjunction in space-time. Given the rich mythological history of the moon it seems assured that this use of imagery will find some connection across cultures, albeit in different ways. Agnieszka Kiejziewicz points out that Ito's moon is very likely a reference to the cosmic eye which appears in *Phantom* by Toshio Matsumoto, who was Ito's mentor during university, and also speculates that Ito might be tapping into mythological Japanese associations with the moon as something unstable, a destroyer of order.[16] This reading is certainly legible in the context of Western associations of the moon with instability and quite literally "lunacy". But I also think that Ito's connection might run deeper, given his sometimes oblique methods of calling attention to the production and mechanisms of filmic illusions, and I believe that the moon is acting in this piece as the ultimate cosmic symbol of *reflection*. The sun is of course the primary symbol of a light *source*, and the moon thus corresponds with the projection surfaces which act as the main area of exploration in the film, with the walls and the boy himself all becoming transformed through the reflection of light. Just as with the moon, the projection surface becomes a source of cosmic instability in the universe of the film.

2.3   The body as screen

The last category of works which I would like to discuss brings the physical body into the cinematic event by placing it in front of the screen. Where Ito's bodily projections are ultimately documented in film and make use of the underlying temporal discontinuities of the medium, the following pieces foreground the very different discontinuity between what Le Grice would call the "real TIME/SPACE" of the audience and performer in contrast with the illusory space-time that occurs onscreen. These works by Malcolm Le Grice, Sally Golding, and Guy Sherwin all engage with projected illusions in a way that activates audience awareness of film's mechanisms, and in the process these pieces also

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16. Agnieszka Kiejziewicz, "Enter the metaphysical cosmos: the visualizations of the universe in Japanese experimental cinema," *Maska*, no. 29 (2016).

reveal poignant and horrific ways that the body is transformed within screen space.

2.3.1   Malcolm Le Grice's *Horror Film 1*

Figure 2.4: Performance of Le Grice's *Horror Film 1*

The title of Le Grice's *Horror Film 1* (1971) epitomizes the concern with horror themes and imagery which runs through many of the films described in this section, from Ito's ghostly figures to the explicitly horrific imagery in Sally Golding's following piece. Le Grice's stature as something of a[n unwilling] figurehead of Structural film raises some interesting questions about the overlap between Structural film and horror, film practices which might seem diametrically opposed to one another when it comes to the question of film as an illusory medium (to say nothing of their respective reputations for high art austerity vs. lowbrow pulp). Nonetheless, I see two areas of significant interconnection between these practices: the first, which is outlined further in the *Loup-garou* chapter, concerns the fact that horror film, particularly in its early stages, deliberately elicits uncanny audience awareness of the artifice of film as a means of inducing unease. Second, I think that for a number of these experimental filmmakers there is a connection in the

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understanding that film is, at some level, a disturbing and perhaps even *undead* medium, that at some deep level all film is horror film. This is exemplified by placing the body of the performer within the projection beam, as happens in the performances of this section: if we take the premise of Lev Manovich that all cinema is animation, then then the body in the projection is also subsequently animated (a word which when etymologically expanded means *instilled with life*).[17] But, since the body is already alive the more proper term would be that it is *re*-animated, doubly living, and thus a prime point for contact with the uncanny.

With these connections in mind we can turn back towards discussing Le Grice's performance: *Horror Film 1* (1972) is an expanded cinema shadow-play comprised of multiple projections, a soundtrack, and a live performer (typically Le Grice himself), in which the body of the performer interrupts the projection beam and completes the onscreen imagery through the negative space of their shadow. The three projectors are set up in parallel, placed several feet apart from one another and oriented to face the same screen. All the projectors are aligned so that the centers of their frames match one another, with the frames of the two projectors on the right and left sized at about half the width and height of the center projection. When played back without spatial interruption, the audience sees one smaller frame consisting of the overlapping right and left projections which is contained within the larger frame of the center projector. The projectors play film loops of saturated color which shift hues every second or two, alternating between full light and darkness.[18] Much like the typical flicker film the individual projections contain no content save that of solid colors, though the rate of change in *Horror Film 1* is not within the range for producing flickering phenomena.

Le Grice's performance interrupts this otherwise abstract color-play when he crosses into the beams of the projectors. The performance opens with Le Grice standing at the

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17. Lev Manovich, "What is digital cinema," *Telepolis - das Magazin der Netzkultur*, 1996,
18. The center projection seems to have originally used a single slide instead of a loop, as Le Grice mentions in "Real time/space", but later documentation shows that the central projection loops as well.

front of the stage facing the screen, appearing to nearly touch the wall. A soundtrack of slow and heavy breathing marks the time, amplified and distorted.[19] The exact spatial overlap between Le Grice's body and the frame varies from one performance situation to the next but his bare torso is always illuminated - in early performances he was totally nude, and newer performances now feature the inclusion of pants (as Le Grice explains these earlier performances, everybody "couldn't wait to get their clothes off" in the 60s and 70s[20]). In both cases the bare torso serves as both screen and as a signal to the audience that this is undertaking is a ritual - the performance has stepped out of societal norms and therefore beckons towards an alternative space of perception and engagement.[21] In this initial position at the start of the screen, Le Grice interrupts the colored loops of the films, creating a singular shadows whose edges flicker with color. The color play expands as Le Grice slowly backs away from the screen over the course of the performance, with the slight differences in projection position and angle causing the colorful shadows to diverge into multiple bodies which flicker in and out of view. All the while Le Grice slowly raises and lowers his arms, eventually encompassing the edges of the smaller central frames in his grasp as his shadows grow sufficiently large.[22] By the end he stands directly before the central projection, his hands nearly blotting it out as the two outer shadows have disappeared entirely, and the projectors are turned off to end the performance.

Despite the title of the piece the effect of the performance is likely not one of horror

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19. The soundtrack touches on one of my own personal apprehensions about screenings of silent art films, during which I tend to fixate unhealthily on the possible noise produced by my breathing and its connection with the general social unacceptability of bodily noises in public spaces. I have no reason to believe that Le Grice was attempting to invoke this particular experience, but I do think that the presence of breathing in an otherwise silent piece is not only a reference to the menace of the horror movie monster, but also might serve to remind viewers of their own bodies in the theater, alongside the split forms of Le Grice.

20. Lucas M. Ihlein and Louise Curham, "Reaching through to the object: reenacting Malcolm Le Grice's Horror Film 1," *Performance Matters* 1 (No. 1-2: Archiving Performance 2015): 24–40.

21. Ibid.

22. The arms-raised poses have drawn comparisons to Da Vinci's Vitruvian Man as noted in Ihlein and Curham, though viewers from a certain era might note commonalities between Le Grice's rectangular arm alignments and the so-called "cactus pose" which was required for the first Kinect to recognize human users. Retroactively applying this millenial reading, it's almost as though he is continually asking the technology to acknowledge his presence in the frame. This pose also makes an appearance later in this text, since it is included as homage / quotation in the performance of *Loup-garou*.

or fright, but there is nevertheless the feeling that something unnatural is at play in the shifting and multiplying shadows. The shadows themselves are reminiscent of many omens from horror films, particularly the striking contrasts of German Expressionism and the iconic shadows of *Nosferatu.* The shadow, in its capacity to both double and defamiliarize the body, is also of course a harbinger of the uncanny, and Paul Coates expressly connects the triangle of horror, shadows, and the uncanny in the opening to his book on German Expressionism: "The world becomes uncanny when it is perceived as no longer simple substance, but also as shadow, a sign of the existence of a world beyond itself, which it is nevertheless unable fully to disclose."[23]

It seems to me that Le Grice wishes to use this uncanny moment to draw a clear delineation between two worlds which can become conflated: on the one hand there is the "real TIME/SPACE," which contains "the projection event as the primary reality," but by that same token the audience must also recognize that the projection, however abstract, communicates with a different logic of space and time.[24] The shadows here are a product of multiple projection apparatuses which are placed in full view of the audience, with the taboo act of interrupting the projection calling attention to the invisible spatial logic of its light beam.

The production of the event is fraught with illusory effects brought about through the confusion of the reappearing shadows, and in fact these illusions are a significant delight for many in the viewing of the work.[25] The shifting shadows entrance the viewer and complicate the body within the frame, and in many cases the saturated onscreen outlines are so seductive as to entirely distract the viewer from the live "real" performer. However, I think that these illusions are a necessary part of the work, since they open the possibility of repeated uncanny experience to remind the viewer of both the illusions of cinema and the physical apparatus which brings about the performance. Le Grice, and the other

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23. Paul Coates, *The Gorgon's Gaze: German Cinema, Expressionism, and the Image of Horror* (Cambridge: Cambridge University Press, April 26, 1991).
24. Le Grice, "Real time/space."
25. Ihlein and Curham, "Reaching through to the object."

filmmakers in this section, are completely transparent about their methods in a way that few illusionists are, and by that token the effects are all the more elegant and profound for their repeated success. The tricks are out in the open for the audience's rumination, and yet the revelations may yet occur again and again.

2.3.2 Sally Golding's *Face of An Other*

Sally Golding's *Face of An Other* (2009) is a more contemporary expanded cinema piece which is quite overt in its use of horror references. Audiences to the performance witness a stock-still Golding standing within the throws of two projectors, her body overlaid with horror imagery while the air rings with sounds of screams and canned laughter. The images are mapped out in anatomical correspondence with her body, with her face alternately masked by "movie monsters, a beauty therapist and a series of evolutionary great apes," while her chest is "exposed to a skeletal rib cage and medical imagery of breasts and lungs."[26] While Golding remains deathly still, the projectors enact a paradoxical situation in which her body is animated (that is to say again *instilled with life*) by the light of corpses.

Her face is a location of particular confusion, with her own eyes closed and the eyes of the filmed bodies staring back out. Just as with the boy from Ito's *The Moon*, there is a predilection for the uncanny when projection mapping one face onto another - something ever so slightly off in the alignment of geometry and lighting. The minute motions of Golding inadvertently swaying back and forth pull the projections and facial features in and out of alignment, thereby resetting the basis for uncanny experience. One moment the difference between physical and projected faces are startlingly apparent, the next the eyes and mouths fuse into an entirely new visage.

Face of An Other is unusual amongst the works in this chapter in its dedicated approach to *sound* as a potential vector for uncanny experience. The soundtrack by Joel

26. Steve Polta and Sally Golding, "Polta/Golding: Perpetual Motion," *Perpetual Motion*, 2016,

Figure 2.5: Performance of Golding's *Face of An Other*

Stern and Golding contains, among other things, two classes of sound effects: the first being "death and horror" sounds which are recognizable for their use in the horror genre, the second being the less obviously apt sounds of studio audience laughter.[27] The first class of sound effects are unlikely to be perceived in a particularly frightening or even uncanny manner (though Golding speculates they might become "ominous" through the soundtrack's "disturbing abstract pulp construction").[28] It is rather the audience laughter which, though it might simply be heard as ironic, nonetheless has the potential to tap into an uncanny effect. Stern pulls from Slavoj Žižek's writings on canned laughter where he mentions its most "unsettling" aspect: "My most intimate feelings can be radically externalized. I can literally laugh and cry through *another.*"[29] The audience is then intended to recognize these sounds as analogous with Golding's facial projections - two

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27. Joel Stern, "Tracing the influence of non-narrative film and expanded cinema sound on experimental music" (PhD diss., Queensland University of Technology, 2013).

28. Polta and Golding, "Polta/Golding."

29. Slavoj Žižek, "Will You Laugh for Me, Please?," In These Times, July 18, 2003, accessed March 25, 2020, `http://inthesetimes.com/article/88/will_laugh_for_me_please`.

examples of mechanized media giving expression to the still bodies of the spectators and the performer.

The extreme stillness of Golding's performance is representative of the relative lack of bodily motion in this chapter's expanded cinema works. While Sherwin and Le Grice do make some roughly choreographed motions during their pieces, all of these works depend on specific alignments between projections and performers that greatly restrict the range of motion: we see this in the image of Le Grice moving slowly in a single straight line, in Sherwin and Golding remaining rooted to the spot, and even in the similarly discomforting stillness of Ito's son in *The Moon*. This seems at least in part a matter of practicality given the non-interactive nature of film's image contents, a reality that demands a specific choreography in which the performers are responsible for any alignment between bodies and projections. For pieces wishing to explore the uncanny, however, this lack of motion is also very much a positive trait. The limitations imposed by these motions are likely to give rise to a small class of repetitive and purposeful actions, qualities which are likely to communicate the performance as a ritual and therefore necessitating audience involvement. The lack of motion also helps to blur the line between physical and projected space: as the still bodies appear less obviously alive, it is the mechanical projection which can provide them again with life and motion.

2.3.3   Guy Sherwin's *Man with Mirror*

Man with Mirror (1976) is a piece which, as its name might imply, contains its fair share of spatial trickery and projection-beam displacement. But beyond simply being a manipulation of light in space it is also a rather poignant statement on film and the passage of time, and this temporal insight traces back to the inception of the work in 1976, when the film component was created. The film for *Man with Mirror* is single-channel Super-8 and consists of a then-twenty-something Sherwin standing in front of a camera in a field. He holds a rectangular mirror of some several feet square which is painted white

on one side, and over the course of the film he rotates both the mirror and his body in a loose choreography. Sherwin seems to go through every possible combination of body and mirror rotations, with the mirror side sometimes doubling his image and other times briefly revealing the camera, or the ground, or the nearby trees. Sometimes the white painted side of the mirror swallows the whole frame, save for two pairs of fingers holding onto its sides. This film is projected at roughly life-size in the performance space, where the real-life Guy Sherwin completes the performance by standing within the projection throw and recreating the actions of his filmed self, complete with an identical half-painted mirror.

Figure 2.6: Performance of Sherwin's *Man with Mirror*

The workings of the piece are thus fairly simple, and yet startlingly effective as uncanny illusion. Sherwin's live movements roughly follow the actions of his filmed self but do not exactly correspond, and within these moments of misalignment the lines between present and past Sherwin briefly blur. At times even the white side of the mirror itself seems to grow and shrink as the two Sherwins move it back and forth in contrary motion. This is

the kind of illusion that Le Grice advocates for, in which the apparent magic of the event is not diminished one bit even when the tools are laid bare before the audience.[30]

But as noted before this is not simply a performance about space and confusion between arbitrary bodies: the singular identity of the filmed and live performers leads to specific insights which would not otherwise occur, and the juxtaposition of Sherwin and his past self inevitably changes the experience of the work as time passes. Where once the performance might have seemed to feature two indistinguishable men, the changing body of Sherwin is clearly foregrounded during those performances happening thirty or forty-plus years later. As the audience's perception pops in and out of the illusory nature of the work they are forced to confront and re-confront the illusions of time and space present in photographic and moving images: the fundamental unreality of film's illusory here and now.

2.4   Conclusion

Looking at these works through the lens of uncanny discourse has helped to clarify relationships between the technical aspects of their production and my own experiences as an audience. That is to say that I think there is a correlation between many of the common techniques in these pieces, and the uncanny effects which I experienced - these pieces make use of mechanisms which are well-suited to creating such eerie or unnerving experiences. This realization has led me to better focus on those mechanisms that show up in these works, including an automaton-like stillness in performance and an attention to perception encouraged by flickering film. For anyone who finds themselves drawn to uncanny experience in performance, I think that writings on the uncanny can point towards performance situations which are likely to bring about such a sensation.

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30. Le Grice, "Real time/space."

CHAPTER 3

DAWN CHORUS
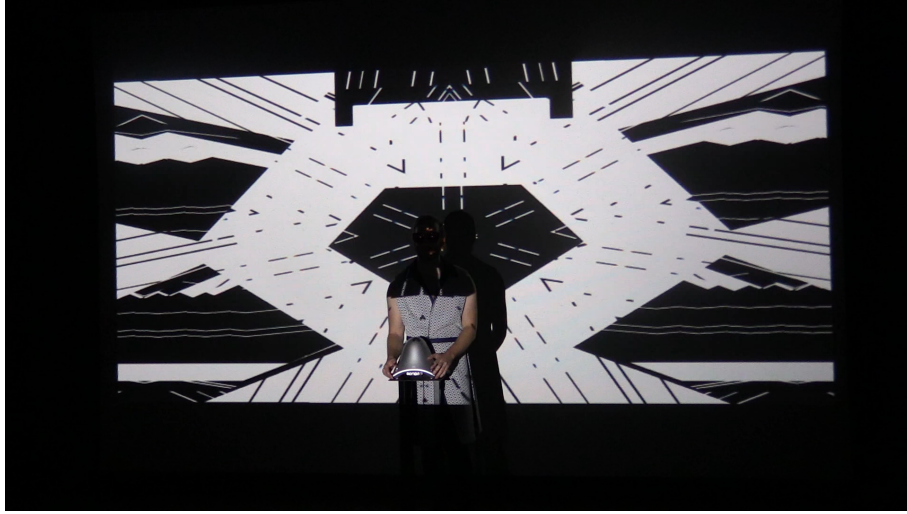
Figure 3.1: Performance still from *Dawn Chorus*

Dawn Chorus is an audiovisual performance in which sound and light mutually influence one another in a cross-modal feedback loop. I play a small light-sensitive synthesizer that sits within the throw of a live projection, with a computer converting the instrument's messy square-wave signals into videos of black-and-white geometries. When these animations are projected back onto the instrument, an environment of entangled causality is created in which light and sound are inextricably bound to one another. The piece's name derives from the phenomenon in which birds and even fish may sing en masse at the break of day, an event whose synchronization between sound and light prompts similar questions of audiovisual causality: do the birds sing specifically in response to the sun? Or, if we let our imaginations run back to the dawn of time, is it in fact the shadows of the night that flee before the song?

3.1 Background and motivations

Dawn Chorus is a successor to an earlier work of mine called *All Hail the Dawn*, a piece which I first began work on in 2011. It was during a rehearsal for *All Hail* that I first experienced a particular kind of uncanny predicated on an overlap between projections and performers, though it would be several years before I thought seriously about the implications and possibilities of the event. The moment in question occurred during a review of a videotaped run-through, watching the end of the piece when the black and white animations are supposed to flicker and die away.[1] The animations all progressed as planned, and yet while watching I felt an eerie sensation: it seemed to me that in the dwindling light, my body had, for a moment, ceased to act as a projection surface and became a part of the projection. It somehow took on the *quality* of a video signal - what was once a body in continuous space acquired a discrete resolution and frame rate and became discontinuous, indistinguishable from the time and space of the projection. The irony is that I had been watching myself on video the whole time, rather than looking at a live, fleshy body, and at the time it was relatively easy for me to dismiss this experience as a trick of the medium of video and move on to other concerns with the piece. It was only years later, having reexperienced these uncanny feelings while watching others perform live within and around projections and videos, that I began to reconsider the potential of the projection beam as a cinematic thin place.

When I first began developing this earlier piece, *All Hail the Dawn*, I was primarily motivated (at least consciously) by the potential of the audiovisual feedback loop as a means of synchronizing light and sound - the visuals influencing the sound and the sound altering the visuals in turn. This framing placed the piece within a visual music lineage that is often concerned with developing effective audiovisual mappings, and I imagined that by mapping projections and music together in an infinite feedback loop, the two

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1. Videotaping of course being the only way, short of enlisting a second performer, that I can get an approximate sense of the interaction of body and projection during most of these pieces.

would inextricably merge together.

However, framing the operation of the piece purely in terms of sonic and visual interaction neglects the crucial role of the performer and their physical presence within the feedback loop, both in terms of function and performance and also in terms of how the audience relates to the piece. The light-sensitive synthesizer and projections do indeed affect one another directly, but it is the action of the performer that elucidates the piece's spatial logic which manifests in the feedback loop: moving the instrument reveals the ways that its various orientations and locations within the projection throw help to produce the different audiovisual behaviors. Although my initial stated motivations dealt with the audiovisual mappings common to visual music, when I returned to the piece years later it seemed more appropriate to collectively frame its components as a generative system.

My interest in generative art is founded in part on the joys of witnessing emergent behavior, as well as the ways that generative art encourages a shift away from authorship towards exploration and discovery. Describing this action as exploration makes particular sense when considering that generative art systems are often framed as *environments*, rather than solitary art objects - as Ross Ashby put it when discussing Cybernetics, systems are "not things, but ways of behaving."[2] Hans Haacke's assertion that real-time technology allows for the creation of systems that "merge with the environment",[3] is particularly apt for the system in *Dawn Chorus*, in which the projections combine with the performer and the instrument to create a space of emergent interaction, a physical environment whose connections manifest in light and sound.

The environmental focus of systems and generative art places particular importance on the relationships between a system's components or variables. Christina Chau says that when defining a generative system "each individual variable within the system must also genuinely contribute to that system's function,"[4] emphasizing the interconnectedness

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2. William Ross Ashby, *An Introduction to Cybernetics* (New York: Springer US, 1956).

3. Edward A. Shanken, "Art in the Information Age: Technology and Conceptual Art," *Leonardo* 35, no. 4 (2002): 433–438.

4. Christina Chau, "Kinetic Systems: Jack Burnham and Hans Haacke," *Contemporaneity: Historical*

of a system's parts. This idea of an interconnected system resides at the core of the feedback loop in *All Hail* and *Dawn Chorus*, in which the sound and light both materially influence one another. This approach was a reaction to my own frustration attempting to develop audiovisual pieces whose light and sound relationships were unidirectional, with the sound influencing the visuals, or vice-versa, but never with both in a mutual dialogue. I had the feeling that these unidirectional processes created an unequal power dynamic which would rob the reacting medium of any internal coherence and vitality. Looping the sound and video into one another was not guaranteed to create very *pleasing* results, but it would at least ensure that neither light nor sound could act without affecting the other - they were both, as they say, in it together.

The projection throw establishes a physical space for interaction with the instrument, and the resulting importance of the instrument's location also serves to essentialize the body of the performer as a variable in the system. This creation of a feedback loop which depends on performer-generated movement helped me to address a personal crisis regarding my role as an artist who performs with live video: since much of my animation and video work can be generated solely on a computer, my status onstage can be often inconsequential to the performance. When performing with animations generated entirely on the computer, I could be sitting on a laptop directly onstage, off to the side, or behind the audience, and in every case the projected video would be produced in a manner entirely independent of my physical proximity to the screen. Putting myself onstage in that sort of situation not only plays into anxieties about the perceived dullness of laptop performance, but also emphasizes the visual and spatial disconnection between myself and the projection and potentially creates confusion over where audience attention should be directed.

The feedback system for *All Hail* and *Dawn Chorus* addresses this issue through the tight relationship between projection and instrument, which requires the performer
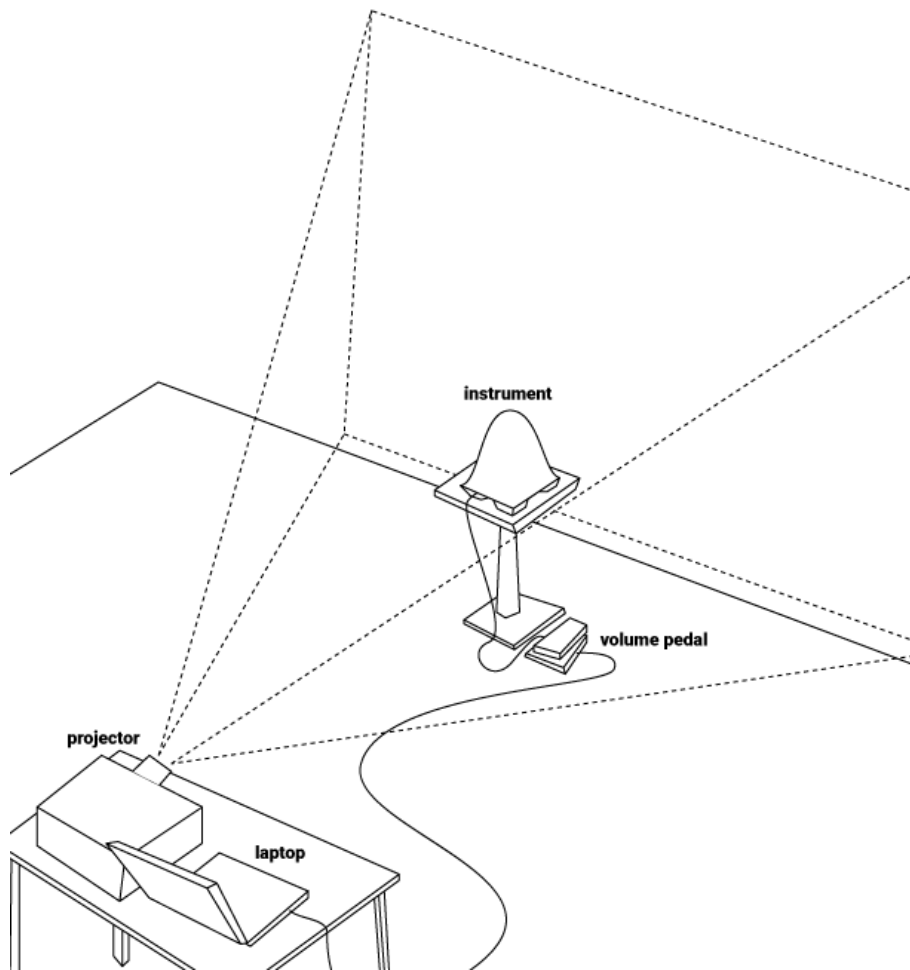
Figure 3.2: *Dawn Chorus* staging and hardware

to participate in the spatial logic of the piece's audiovisual system. Operating within the projection beam itself also removes the problem of split attention that I sometimes experience when watching pieces with projections and onstage performers. I was once told as a sort of truism that "an onstage human is always more interesting than something on a screen," and, while I have found the opposite to be true for myself, I think that there is indeed often a conflict for attention when screens and bodies come together in front of an audience, whether on the concert stage or at an office meeting. Many of us would like to believe there is something more essentially interesting about a physically present human in all of their complexity, and that we *should* be drawn to the presence of our fellow people over the illusions of a medium that in a very literal sense has no

substance. Putting myself within the projection throw eliminates this particular choice for the audience - there is no longer a need to choose between the onstage body and the onscreen content as they merge into the same environment, with my body quite literally centered within the visual field.

The development of *Dawn Chorus* as a performance is an ongoing process of exploring the generative possibilities of this performance system, and adjusting the software and hardware components in order to hone in on the areas that seem particularly interesting. This development has been especially concerned with enabling those systemic behaviors which seem to create uncanny thin spaces between myself and the animations, particularly in the low flickering lights which I have found can elicit confusion between onscreen and physical space.

3.2   The feedback system

The generative system of *Dawn Chorus* is, broadly speaking, a feedback loop between a light-sensitive synthesizer, performed by myself, and audio-reactive animations projected back onto said synthesizer. The signal from the synthesizer passes through a volume pedal on its way to the computer, where various audio features are extracted and mapped to image and sound processes. Once these animations and sounds are projected into the space, they create a physical environment for feedback interactions, some of which I find to be pleasantly unexpected. I will briefly list some of the ways that the various design decisions have led to discoveries in the evolution of this piece.

The instrument predates the creation of the piece itself and is really the catalyst behind the work - I doubt I would have ever explored the idea of a physical, audiovisual feedback loop without having a light-sensitive instrument lying around. It's a bit awkward to keep calling it by the name of "the instrument," but I never found a name that stuck, and given the emphasis on the *system* in this piece it might be a bit out of line to place too much emphasis on one component. In any event the instrument is not remotely sophisticated
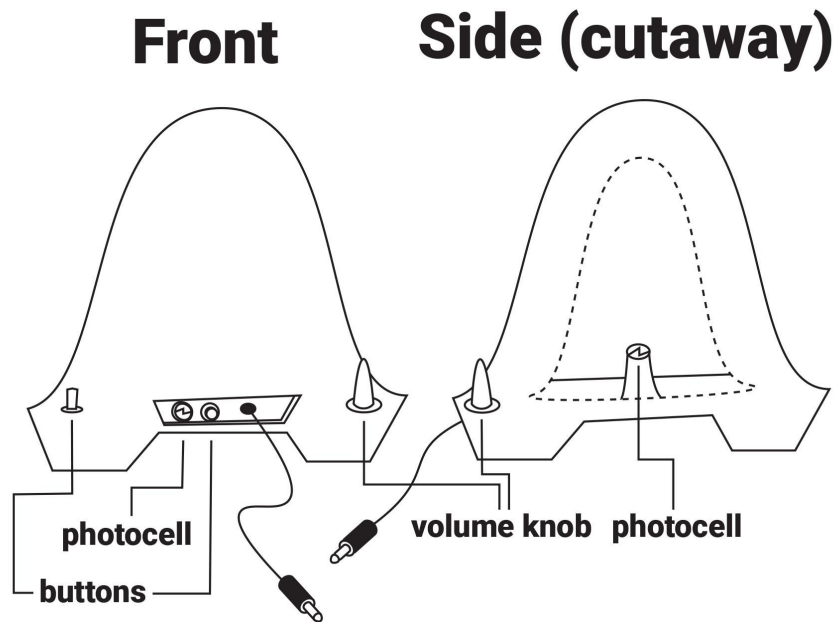
Figure 3.3: The *Dawn Chorus* instrument

and very much a beginner's DIY project. It was in fact the first instrument I built, constructed as an introductory assignment in a course taught by Butch Rovan. It uses a variant on a circuit design of his in which two photocells influence the periodicity of a couple of oscillators, with those oscillators looping into one another to create a little feedback circuit with some delightfully gnarly interactions. For the DIY musician, creating a photocell oscillator circuit is really nothing to write home about; these kinds of light-to-sound instruments are simple to make and prominently feature in introductory instrument building materials (like Nicolas Collins' excellent beginner's resource *Handmade Electronic Music*).[5] The instrument was and is, on its own, quite unremarkable in the lineage of weird synthesizers.

But, the beauty of the generative system lies not in the complexity of its components but in their emergent interactions, which might well result in complicated behaviors. The instrument's simplicity and crudeness have in many ways been beneficial in this regard

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5. Nicolas Collins, *Handmade Electronic Music: The Art of Hardware Hacking* (Abingdon: Taylor & Francis, 2006).

while working on *Dawn Chorus*, as several of my ignorant electrical and design decisions have had an unexpected and (largely) fortuitous impact on the behavior of the audiovisual environment.[6] Perhaps the most important design decision involved the placement of the photocells within the enclosure, a choice which was initially driven by convenience but which also helped to realize the gestural potential of the instrument. I housed the circuit in an old computer subwoofer, a foot-high and slightly battered silver/grey object of vaguely extraterrestrial aesthetics, and in lieu of drilling into the plastic I opted to place the photocells in preexisting holes, one facing the front (or at least, what became the front) and the other facing down through the subwoofer port. This separation between the photocells was intended to provide for a wider range of expression, since the motion of the instrument could be used to shift exposure from one photocell to the other.

The exposure of each of these photocells is a function of the instrument's orientation towards a given light source. Within the feedback environment of the projection throw this results in an emergent correlation between the orientation of the instrument and certain replicable audiovisual behaviors: the same orientation of the instrument in the same location will lead to a largely replicable set of sonic and visual patterns.[7] Within each performance I can twist and turn the instrument to seek out these locations and play with them, and though the field of interactions changes slightly from one performance situation to the next, the repeatability of the behaviors within a given setup provides a balance

6. One of the stranger outcomes from my electronics work was the discovery that I had, completely without realizing, added what was effectively a microphone into the instrument's circuit. The "microphone" is in fact a speaker which was purely intended to provide the instrument with its own means of amplification: given that I was already housing the instrument in a subwoofer, I figured it would be fun to connect the circuit to the sub's existing speaker so it might make some noise without an amplifier (with any resulting haptic feedback acting as a bonus). Little did I realize that my suspect wiring would result in a bidirectional signal flow in which the speaker did not simply project sound outward, but also acted as a microphone and sent sound back into the circuit. The ramifications are sometimes lovely and sometimes unfortunate: on the one hand, during quieter moments I can essentially make use of this microphone signal as a kind of contact mic which picks up interactions on the surface of the instrument. On the other hand, sometimes the sound system is loud enough to establish a feedback loop through this speaker/mic, and I have had a couple of experiences in which performances with loud amplification turned much more unruly than I anticipated.

7. For those of you curious what "replicable" constitutes, I would say that in many cases the instrument produces similar pitches or spectra in a given orientation, and the corresponding audio analysis renders corresponding patterns and motion onscreen.

between exploration, learning, and performing which I find enjoyable. I also rather like the way that the system effectively transforms the instrument into an emergent controller, in which the behavior of the system itself can in some sense communicate higher-level abstractions like "orientation" without explicitly requiring a device which measures and sends these values.

In addition to the instrument's orientation and location, other points of interaction between the performer and the system include a volume knob on the instrument, as well as a commercially produced volume pedal. The dual volume knob and pedal might seem like overkill, but the volume knob has a considerably nonlinear effect on the behavior of the circuit, while in contrast the volume pedal generally manipulates the amplitude without drastically altering the spectrum. The volume knob produces something like a square wave roar when fully opened, but the moment it is turned down high-pitched squeals and shrieks erupt, their frequency only diminishing again as the knob turns even lower. Within the context of the feedback loop this change in frequency content impacts the behavior of the system, and so the volume pedal was added as a linear amplitude control, freeing the volume knob to be used less for amplitude manipulation and more for its expressive frequency-altering effects.

The software for *Dawn Chorus* completes the cross-modal loop between light and sound, as it provides the visualization which complements the instrument's sonification. Written in Max/MSP/Jitter, the software for *Dawn Chorus* begins by using the instrument's audio signal for processing and analysis. The processing imparts a number of cosmetic alterations to the sound, sometimes doubling the instrument with more synthesizers or chopping up the input into rhythmic components, and it is this processed signal which is subsequently sent to the visualization portion of the patch to generate the animations.

The primary audio-to-video mapping comes from converting a spectral analysis of the sound into a black and white texture. The amplitude of each FFT bin is compared to a

threshold and, depending on whether it exceeds this number or not, rendered as a black or white pixel. These one-dimensional textures are kaleidoscoped, run through feedback, and modulated with video synthesizers to generate solar abstractions that define the piece's imagery. During the portions of the piece where the spectral textures are mapped to specific regions of the screen, the mapping between spectrum and image has the effect of establishing a link between frequency and the projection space, a relationship which leads to repetitive behaviors when the instrument produces frequencies corresponding with its location within the projection field.

While developing the software over the last couple of years I have largely focused on stabilizing certain behaviors which I enjoyed but found finicky to deal with, particularly those behaviors whose low, sputtering light seemed most suitable for creating a thin place in the projection. In early iterations of the performance, the spectral mapping which translates audio into video produced relatively stable behaviors when the sounds had many high frequencies and the projection was mostly lit. The two tend to go hand in hand in the circle of the piece's infinite causality, since strong light will raise the frequencies produced by the instrument, and spectral analysis disproportionately represents the higher frequencies - therefore, on average a higher-pitched sound can lead to more light, and more light likely leads to an even higher-pitched sound, and on and on it goes. The converse was also true in earlier iterations of the software - an absence of light would lower the frequencies produced by the instrument, and if those frequencies dropped low enough the screen would remain dark, with the instrument only sputtering out the occasional sub-audio click.

I have done work in the patch to stabilize the feedback during these moments of low lighting and low sounds, and the results have not only expanded the uncanny potential of the system but also opened up a new world of generative behaviors that were previously inaccessible. Chief among the alterations has been the inclusion of several compression stages, one just for the audio and the other for the audio-to-video translation, both which

help to ensure that the signal does not tend towards production of totally dark or totally light animations. Where once a drop in frequency or volume risked stalling the entire piece, now these gestures are incorporated into the structure of the performance, and their instability results at times in monstrous or menacing moments.

3.3 Form and performance

The form of *Dawn Chorus* is realized through sequenced parametric changes within the software, which operate alongside a set of specific actions for the performer which act as guideposts for improvised playing with the instrument. These changes serve to dynamically alter the range of possible audiovisual behaviors within the overall system, and while part of my own interest in the piece is the variation that comes about in different performances through improvisation and the physical space of interaction, these behaviors are sufficiently distinct to produce an overall arc that remains consistent from one realization to the next. The solar/sonic link suggested by the title is enacted in the progression of these behaviors, which alter the forms of the animations and sounds in a manner reflecting the passing of a day under a mythical and capricious sun.
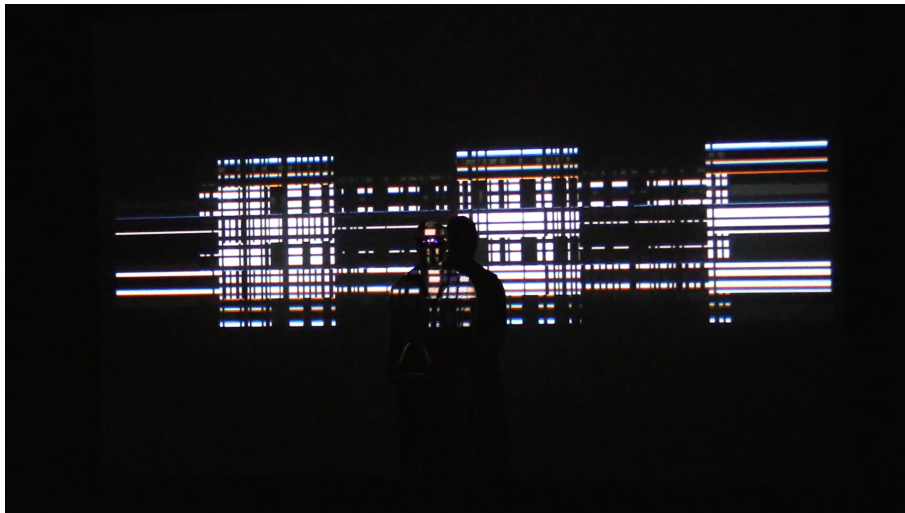
Figure 3.4: The *Dawn Chorus* intro

The piece begins in a predawn darkness, with the projections confined to a narrow

horizontal band which is centered on the performer's head. The instrument is quiet and the animations are tiny points of light moving in grid-like patterns, gradually expanding out from the center. The expansion in the area of the light is paralleled by the gradually increasing volume of the audio, a relationship which is partially due to the instrument's automatic responses to changing light levels. At a certain point, this slow crescendo will tend to break into low "growls," sounds which due to the piece's spectral processing can take on an almost voice-like quality. Just as more light tends to lead to higher frequencies made by the instrument, the inverse is also true - lower frequency sounds often *reduce* the amount of light projected, and so these bassy growls break up the image into sputtering flickers which dance around the performer. It was something of a happy coincidence that this monstrous speech coincided with light behaviors that were most likely to appear uncanny, and in a narrative sense I have come to think of these interjections as a manifestation of some hidden antagonist attempting to displace the light of the sun, sowing chaos in the world.
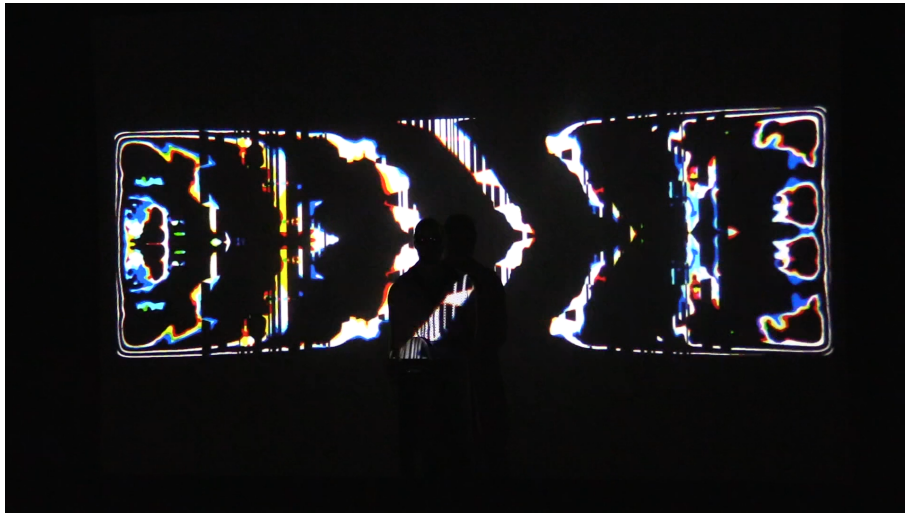
Figure 3.5: The *Dawn Chorus* growl

The growl is ultimately chased away as the dawn breaks - the methodical vertical expansion of the projection is timed for the moment when the animations directly cross over the front photocell of the instrument. This direct contact between light and photocell

results in a marked change to the sound, which rises to a high warble, and this increased pitch drives the animations to kaleidoscope about the center, forming a halo of rays about the performer. Here, in the full glow of the dawn, the instrument can properly act out its role as the chorus and salute the day, shifting through resonant modes of various audiovisual behaviors as it is raised up to the light.
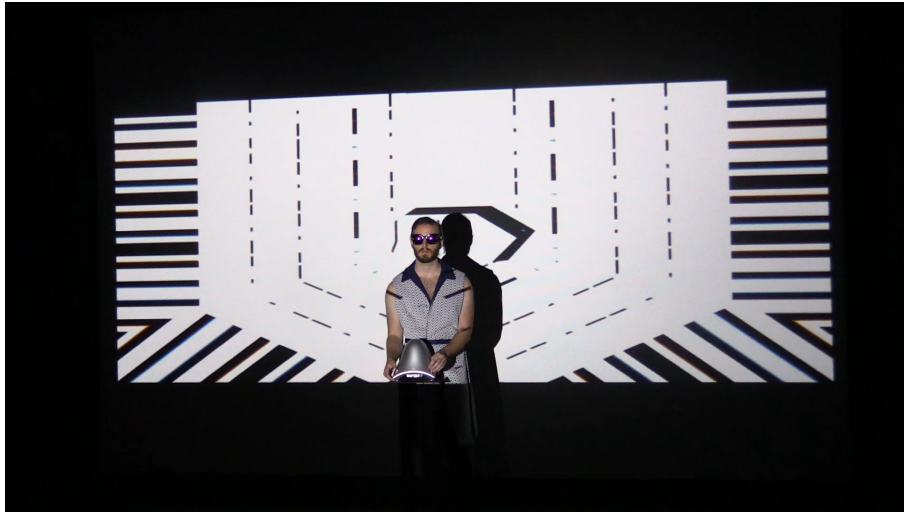
Figure 3.6: The projection makes contact with the instrument

This day is, however, suddenly interrupted when, at a designated moment,[8] the hand of the performer descends over the eye of the instrument to suddenly cast the world into near-darkness. Symbolically, this event reads as an eclipse, and if the projection is the sun, that must then make the performer the moon. Just as in Takeshi Ito's *The Moon* the moon is analogous to the projection surface, in *Dawn Chorus* the performer is part of the reflecting body which displays the light. The analogy can be drawn even further to encompass the performative actions of the piece, as the performer's influence over the instrument might be compared to the pull of the moon's gravity or superstitions of the lunar sway over the mind.

The threat to order represented by the eclipse has, at times in the past, been met

8. The performance cues are sometimes communicated solely through the sequenced changes in audiovisual processing, but there are also a few cues which are overlaid on the performer's view of the video feed.

Figure 3.7: The *Dawn Chorus* eclipse

with a flurry of sonic responses intended to drive off any agents of chaos which might have effected this horror - shouts, screams, or loud bells which help end the struggle and bring the sun back.[9] So it is that the eclipse of *Dawn Chorus* ultimately passes in fits and starts, as the low-pitched growls of the cosmic struggle are displaced by bursts of noise as the light breaks through. When the day finally does return it brings with it a rhythmic pulse culled from synthetic kicks and 808 claps. Order finally restored, the piece descends into a more peaceful darkness as the cycle is complete, and the daylight can disappear on its own terms.

3.4   Conclusion

The multi-year development of *Dawn Chorus* reflects my own increasingly conscious interest in uncanny aspects of expanded multimedia performance. While I initially framed the motivations of this piece solely in terms of exploring audiovisual relationships, many ingredients for uncanny performance were present from the outset such as flickers, projections on the body, and a robotic rigidity in the performative actions. It was only through subsequent analysis of the performance that I began to recognize and articulate

9. Rachel Alexander, *Myths, Symbols and Legends of Solar System Bodies* (New York: Springer, 2014).
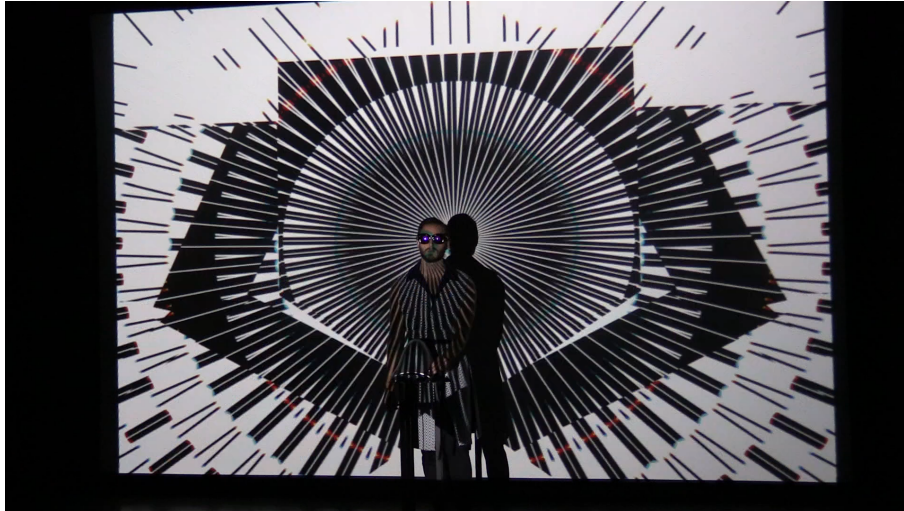
Figure 3.8: The *Dawn Chorus* outro

my attraction to these techniques, and to prioritize processes which might better establish a liminal space between the audiovisual materials and my presence as a live performer. Identifying this interest in uncanny performance has helped to guide the evolution and priorities of this piece.

CHAPTER 4

LOUP-GAROU

Figure 4.1: Performance still from *Loup-garou*

In 1964 Robert Ashley created a piece called *The Wolfman* which features one of the first deliberate applications of feedback in a musical performance. While other experimental feedback works like Reich's *Pendulum Music* and Tudor's *Microphone* focus on feedback as an expression of sound system components and spatial reverberation,[1] Ashley's piece centers the body of the performer within this process, guiding and shaping the roaring feedback by using the vocal cavity as a filtering device.[2] The performer does not simply *sound* like a wolfman, they embody the forces of power and transformation which cause the werewolf to wreak its violence. Ashley's titling provides a mythological framework for relating humanity with powerful technological forces we can barely control.

Loup-garou is a multimedia performance which transports *The Wolfman*'s premise into an audiovisual setting, with the body of the performer shaping and shaped by feedback

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1. Cathy van Eck, *Between air and electricity: microphones and loudspeakers as musical instruments* (New York: Bloomsbury Publishing USA, 2017).

2. Larry Austin, Douglas Kahn, and Nilendra Gurusinghe, *Source: Music of the Avant-garde, 1966–1973* (Berkeley: University of California Press, July 6, 2011).

processes which are visual as well as sonic. The piece's video feedback system, which encompasses the stage through a projector and camera, helps to not only further explore the transformative potential of recursion through another medium, but also connects the performance with the cinematic lineage of the werewolf, as well as the sneakily Structuralist approaches found in many horror films. Rather than focus on a narrative of uncontrollable violence, *Loup-garou* takes its mythological underpinnings from histories in which shapeshifting is a means of supernatural journeying. Processes that begin as transformations of the performer's body eventually shift into worlds of abstraction, moving through zones of cellular and astral imagery. The mythology of the supernatural journey serves to engage with the history of travel metaphors in video feedback, and also points towards a less violent conception for how feedback of sonic and visual varieties might function in performance.

4.1   Motivation

The title of Ashley's *The Wolfman* has always been a bit tantalizing to me - while the term *wolfman* is itself rich in associations, the piece and its score do not contain any narrative that clearly defines the symbolic intent of the title. There is no story or prose, no text to imply who or what this wolfman might be, just a solitary performer whose intimate sounds are magnified to horrific proportions. The piece could have been given any number of abstract or technoscientific names, and indeed Alvin Lucier argues that the title of the piece is really a distraction from what he views as fundamentally an exploration of amplification.[3] However, I disagree on this point - not only because I think the centrality of the body in *The Wolfman* adds a significant dimension beyond the amplification of a sound system, but also because I think that the title invites meaningful consideration of the performance situation and processes involved. The choice to invoke a monstrous supernatural form seems to me to be a way of contextualizing the use of

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3. Alvin Lucier, *Music 109: Notes on Experimental Music* (Middletown: Wesleyan University Press, November 16, 2012).

feedback which was relatively novel at the time of the work's creation. It provides a point of reference to a listening public that was, at the time, largely unprepared for the powers of amplification that were just beginning to unleash feedback in ear-splitting rock concerts, and foregrounds two essential points of audio feedback: its transformative potential and its resistance to control.

For me, the title of the piece creates a situation of ambiguous causality - is the title simply a description of the piece's violent transformation, or does the antagonistic audience-performer relationship only crystalize in light of the werewolf archetype? The creation of *Loup-garou* arose in part from a desire to ground audio feedback performance in an alternative mythology, one that does not draw such a fatalistic link between recursive transformation and murderous intent. The other main motivation for *Loup-garou* is the expansion of *The Wolfman*'s feedback explorations to include the realm of video. The inclusion of video feedback allows for further exploration of the transformative effects of recursion and also ties into the strong cinematic associations of shapeshifting (particularly since the contemporary werewolf is in large part a creature of the big screen). By using video feedback which operates on the scale of the stage, the liminal space between the performer's body and its mediated transformations might be expressed in terms which are visual as well as sonic.

4.2   Robert Ashley's *The Wolfman*

The Wolfman's first score was written by Robert Ashley in March of 1964, with the piece premiered in the Fall of that year.[4] The score specifies the sound system required for the piece's feedback, down to the recommended wattage for a hall size of arbitrary capacity. This system includes the microphone, amplifiers, and speakers required for the main feedback loop, as well as a tape machine for playing back one of two accompanying tracks by Ashley: *The Fourth of July*, or (the identically titled) *The Wolfman*.[5] Vocal expression

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4. Kyle Gann, *Robert Ashley* (Champaign: University of Illinois Press, December 16, 2012).
5. Austin, Kahn, and Gurusinghe, *Source*.

in the piece is confined to phrases lasting one breath each, with each phrase consisting of a modulation along one of four variables (pitch, loudness, vowel, or mouth closure). During each phrase, all other aspects of sound production, including the other three defined variables, are expected to remain as consistent as possible, allowing the performer to explore the capricious effects of the feedback in a relatively controlled manner.[6]

As noted earlier, the singer's body is very much a part of the feedback system in *The Wolfman*, and Ashley is careful to emphasize proper vocal technique and microphone interaction in order to incorporate the resonance of the singer's mouth. He specifies that the singer's tongue must touch the top of their mouth at all times, because "this particular kind of vocal cavity allows a certain amount of acoustical feedback to be present 'within' the sounds produced by the voice ..."[7] This also requires that the singer place their mouth very close to the microphone so that the filtration of the mouth is picked up, and as a result of this positioning the slightest vocal sound is magnified enormously by the combination of proximity and amplification.[8] Ashley laments that many people believe the piece to consist of a man screaming into a microphone, when the ironic reality is that the ear-splitting feedback is in fact modulated by exceedingly soft vocal sounds and resonances.[9]

The end of the score briefly addresses the potential for theatricality implied by the title. As the first performer of the piece, Ashley helped establish something of a canonical persona for the singer to inhabit, "a sinister nightclub vocalist, spotlight and all."[10] He certainly played into the part in the performance and its documentation, with the cover of *The Wolfman* album bearing a high-contrast, menacing shot of Ashley wearing debonair

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6. A version of Ashley's score notes that "The physical aspects of the production of the vocal sounds suggest ...the title of the composition ..." (Austin, Kahn, and Gurusinghe, *Source*) which seems to suggest that this singing process might, at times, bear a certain similarity to a wolfish howl.

7. Ibid.

8. Lucier characterizes this system of mouth and feedback as a kind of fantastical architecture: "What [Ashley] is actually doing is coupling – a small room of variable size (the human mouth) changes to a large one of fixed size (the concert hall). What an idea!" (Lucier, *Music 109: Notes on Experimental Music*)

9. Gann, *Robert Ashley*.

10. Austin, Kahn, and Gurusinghe, *Source*.
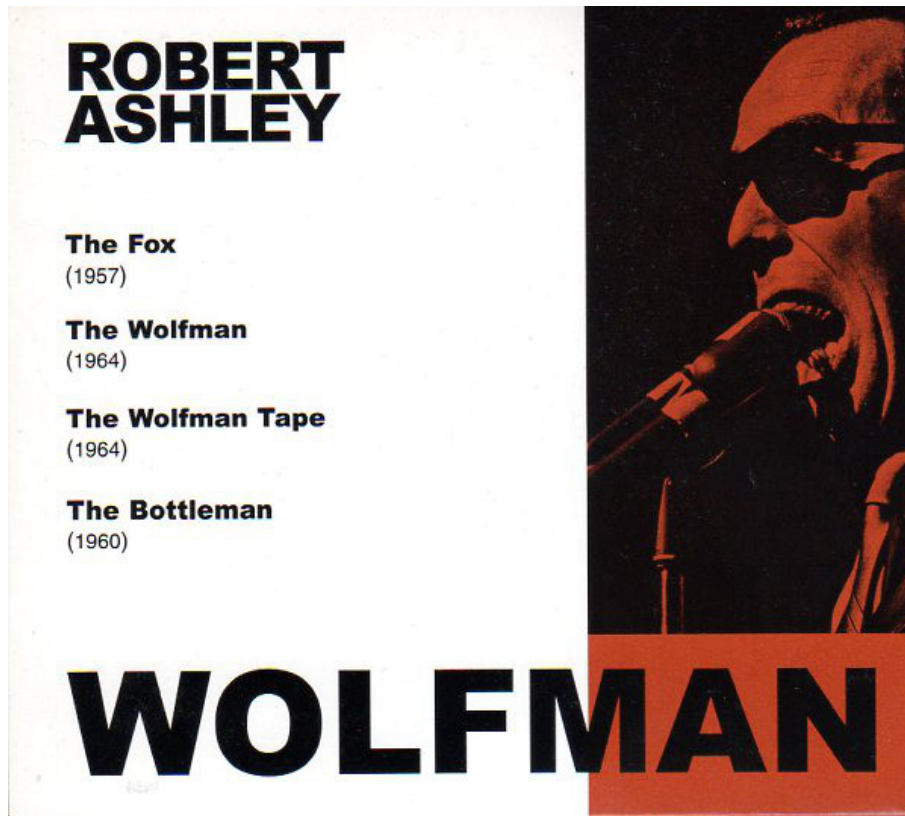
Figure 4.2: Record sleeve for *The Wolfman*

shades. In spite of this clear establishment of a very unusual sort of theater, Ashley explicitly discourages any performative excess that might take away from the presentation of the music, though I think his intent in this regard is not so much to eliminate theatricality but rather to dig into the menace which emanates from an uncanny stillness and reserve. The score of *The Wolfman* published in *Source: Music of the Avant Garde* offers an introductory quote which convinces me that the piece is not intended as the austere exploration of amplification which Lucier believes it could or should be, imploring the reader to "do things that have a message ... music has to be about something."[11]

While Ashley might not explicitly outline whatever it is that *The Wolfman* is about, I cannot help but think that the titling and the presentation might help to point the way. The dual figures of the werewolf and the jazz singer are culturally associated with fundamental issues underlying audio feedback, including transformation and amplification.

11. Austin, Kahn, and Gurusinghe, *Source*.

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Contextualizing werewolves, feedback, and jazz singers in the milieu of 1960's America may provide some insight into the ways that Ashley's piece and its use of feedback were understood in the moment of creation.

We can begin with the title of the piece: werewolves have long been the subject of folklore, but in the American consciousness they have a particular association with cinema where they feature as an archetypal antagonist of horror films. The films from the so-called Golden Age of horror in the 1920s and 30s were most often driven by titular monsters like Nosferatu or Frankenstein - inhuman beings who represented a violent threat to worldly order. While the werewolf never quite managed to stake a claim (so to speak) as the most popular of these antagonists, it contributed to and arguably founded a more introspective model of horror in which the audience identified with the monster rather than with their victims, an approach which would come to fruition the more psychologically focused horror of later decades.[12] Werewolf films still fit squarely within the paradigm of Golden Age monster flicks, but instead of the monster being something which is fundamentally Other, the audience instead witnesses the interior conflict between an afflicted human and their violent, animalistic side - a condition which is all too easy to parallel with an individual's struggles with repressed, societally unacceptable urges. The audience might well relate to the human side of the werewolf, provided that they express the desire to resist the terrible power associated with their transgressions.[13]

The Wolfman's own terrible power is, of course, its high-amplification feedback, and the piece debuted just as the deliberate use of feedback began to infiltrate popular music. The piece's premiere in 1964 came during the same year that The Beatles released the first pop record featuring guitar feedback. The opening seconds of "I Feel Fine" droned to the sound of Lennon's guitar leaned against an amplifier, and though the sound might seem relatively commonplace to the modern ear Nicolas Collins insists that the sound possessed a revolutionary symbolism at the time, "a sign that things were not going

12. Andrew Tudor, "Monsters and mad scientists," *Genre* 1 (1989): 1931–1960.
13. Ibid.

entirely according to plan."[14] Lennon was quite adamant that this feedback marked a first occurrence in the recording industry, saying that he would "defy anybody to find a record – unless it's some old blues record in 1922 – that uses feedback that way."[15]

The use of feedback in live contexts preceded this recording, but the increasing use of live feedback in the mid-1960s reflected the rising volumes of pop and rock concerts. Ray Davies of The Kinks recalls one example opening for the Beatles in 1964, in which, faced with an exceedingly loud audience, guitarist Dave Davies turned up his amplifier to the point of screeching feedback so that it might "cut right through the screams of the Beatles' fans."[16] *The Wolfman*'s debut in that same year placed the piece right on the cusp of this change in audio levels, and Ashley notes that for many audience members it was "the loudest music [they] had ever heard," since "people weren't yet playing records and live music nearly as loudly as they would in the post-Woodstock era."[17] The artistic potential of feedback would emerge more fully in the years immediately following 1964, with the onstage exploits of guitarists like Jimi Hendrix helping to solidify feedback as a component of virtuosic technique for performers willing to toe the line between control and chaos.[18]

The use of live feedback in popular music has been largely confined to the electric

14. Nicolas Collins, "All this and brains too–thirty years of howling round," *Resonance magazine* 9, no. 2 (2002): 6–7.

15. Alan Clayson, *The Gospel According To Lennon* (Bobcat Books, January 26, 2007).

16. Ray Davies, *X-Ray: The Unauthorized Autobiography* (Abrams, October 30, 2007).

17. Gann, *Robert Ashley*.

18. Just as Ashley centers the importance of the human body within the feedback loop of *The Wolfman*, scholars of Hendrix such as Wade Hollingshaus have noted how Hendrix's use of feedback is an expression of his own conception of the human body. His feedback virtuosity emerges not simply from his manipulation of the guitar but also from the use of his body to alter the sound waves within the feedback system. Murray notes that through the development of his practice, "[Hendrix] would be able to position his body and his guitar relative to the amplifier's speaker cabinets so that the resulting feedback would modulate to the precise tone he wanted..." (Charles Shaar Murray, *Crosstown Traffic: Jimi Hendrix & The Post-War Rock 'N' Roll Revolution* (New York: Macmillan, October 15, 1991)) Hendrix's use of feedback reflected a personal philosophy of the potential of the body which was grounded in electrical terms - the idea that the body might be superconductive and thus become part of what Hollingshaus calls a "carefully constructed electrical system." (Wade Hollingshaus, *Philosophizing Rock Performance: Dylan, Hendrix, Bowie* (Lanham: Scarecrow Press, September 12, 2013)) More generally we might say that, though his work is classified under rock music, Hendrix's desires fit squarely within the realm of generative art: a longing to move away from a focus on objects towards the interconnected system, with "the body . . . disappearing from view and into the music." (ibid.)

guitar and similarly amplified string instruments - the ability to limit the possible pitches of guitar feedback mean that, within a framework of tonal harmony, skilled players can ensure that much of their feedback relates meaningfully to the current chords and key. Microphone feedback, on the other hand, does not possess the harmonically limiting qualities of a length of string and as such is considerably more unpredictable in its output. Little wonder, then, that the use of microphone feedback features far more in experimental music than in pop and rock. The use of feedback within these experimental pieces is often more explicitly didactic and concerned with the physical phenomena that shape the feedback process, with a particular attention to the spatial relationships between microphones, speakers, and architecture[19] that are foregrounded in pieces like Steve Reich's *Pendulum Music* or David Tudor's *Microphone*.[20]

For many of these experimental feedback pieces, human involvement is limited to the initialization of the system which subsequently carries out its duties in an autonomous manner. *The Wolfman*'s "sinister lounge singer" moves away from austere explorations of physics and engages with the culturally complex impact these microphone technologies have had on singing practices in the twentieth century. The cool jazz singer which Ashley riffs on is intimately connected with the crooner style of jazz that came into prominence in the late 1920s and early 1930s, a style which was made possible precisely because of the development of microphones and audio amplification.

Before the use of microphones and amplification became widespread, solo singing practices in the United States required, as we might expect, the technical ability to project the voice at high volume. For the male singer, these requirements dovetailed nicely with standards of masculinity emphasizing physical fitness and strength: the success of the

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19. Even if these facets are often explicitly explored in experimental music, it would be a mistake to assume that guitarists are unconcerned with the importance of architecture in the production of feedback: as Perry notes about Hendrix "Once you start playing at the sort of volume the Experience used, the entire stage becomes sensitive to feedback ... When you can control feedback as well as Hendrix [did], you can literally 'play the stage' ..." (John Perry, *Jimi Hendrix's Electric Ladyland* (Continuum, March 31, 2004))

20. Eck, *Between air and electricity*.

singing depended in part on the physical intensity of the sounds the singer could produce. Microphones (and also radio) eliminated this ability as a prerequisite to reach an audience, and at times even required a reduction in volume during the early days of the technology in order to capture the singing voice without distortion. Instead of amplifying already existing vocal techniques, microphones led to newer, softer approaches to singing which developed in tandem with the adoption of the technology. One of these new, soft styles, the so-called "crooning" approach, combined these gentler sounds with songs containing a more romantic and vulnerable character, leading to the creation of intimate tunes that were directly addressed to female listeners who might be hearing the songs on their radios.[21]

Though many of these crooners experienced considerable success, their soft vocal stylings flew in the face of the mainstream masculine values of the 1920s. McCracken characterizes this era as a time when "a white man's masculinity was defined by his physical vigor and muscularity," and argues that within this worldview singing was acceptably masculine only to the extent that it exhibited strength and purity of health. He goes on to describe how middle-class singing guides from the time dissuade the reader from singing as personal expression, and "clearly define the purpose of singing as 'healthful' exercise that 'develops the lungs and purifies the blood by emptying the lungs more completely of used air.'"[22] Crooning's intimacy and deeply personal appeals contrast sharply with these values of personal strength, and the popularity of crooners amongst female audiences only reinforced the suspicion that this deviancy undermined a traditional masculine hierarchy.[23]

In taking on the guise of the jazz singer, Ashley makes a connection between the social threat of the crooner and that of the monsters from the Golden Age of horror films, with the crooner combining the erudition of the vampire with the deviant sexual threat of the

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21. Allison McCracken, ""God's Gift to Us Girls": Crooning, Gender, and the Re-Creation of American Popular Song, 1928-1933," *American Music* 17, no. 4 (1999): 365–395.

22. Ibid.

23. Ibid.

werewolf. The connection between horror and crooning is also etymological, as McCracken notes the latter word was often used in the past not just to describe the human voice, but "more often the sounds made by mythic figures like devils and witches.[24] While traditional singing was a way to properly "release" a singer's "pent up emotions,"[25] crooning offered no such release, and therefore represented a surrender to repression consistent with the tragedy of the werewolf. The proto-cyborgian augmentation that the microphone provides to the voice further emphasizes the unnaturalness of the style, and casts the practice of crooning as a devilish bargain in which the flouting of societal norms is rewarded with undeserved power and the negation of heroic effort.

By the time of *The Wolfman*'s premiere, cultural attitudes towards crooning and amplification were very much in flux. The initial deviancy of crooning had been successfully smoothed into a more traditionally masculine expression through artists like Bing Crosby and Frank Sinatra.[26] The double edge of this mainstream acceptance emerged with the rise of rock music, as jazz crooning was seen as an increasingly passé style in the face of more rebellious practices, and crooning records were soon being pushed out of mainstream radio circulation and into the more limiting category of "easy listening."[27] Though crooning had initially subverted the values of loud musical performance by emphasizing how *quiet* a microphone-enabled singing practice might be, rock's amplification was turning the tables and fully embracing sonic power in ways that were previously unimaginable. Softness and restraint no longer seemed like acts of rebellion when faced with a wholehearted embrace of machinic power.

The Wolfman merged these two deviant practices of amplification by integrating the quiet utterances of the crooners into the newer context of rock distortion. By taking a pseudo-crooning singing practice to rock levels of loudness, Ashley fulfills the monstrous

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24. McCracken, ""God's Gift to Us Girls"."

25. Ibid.

26. Ibid.

27. Vincent Stephens, "Crooning on the Fault Lines: Theorizing Jazz and Pop Vocal Singing Discourse in the Rock Era, 1955-1978," *American Music* 26, no. 2 (2008): 156–195.

potential of these vocalists, with the soft sounds that once simply *implied* a social threat being augmented to literally violent amplitude. Thus, the theatrical presentation and the title of *The Wolfman* help to provide mythological and cultural frameworks that contextualize its technical process. Far from being an abstract depiction of feedback, the piece contributes to a discourse on the use of technologies which turn the human body into a conduit for barely controllable forces.

4.3   An alternative mythology: lycanthropy as astral travel

While I do find the werewolf to be an insightful analogy to the audio feedback performer, I also cannot help but think that the association is rather fatalistic. The use of tragic mythological metaphor[28] is, in my view, rather prevalent in new media arts, from the idea of hypertext as a "labyrinth" to the Narcissus-focused analyses of video art.[29] The pessimistic associations that these tales bring to new technologies are understandable and perhaps even desirable; skepticism seems a healthier approach than uncritical enthusiasm. But, when we frame a technology solely in terms of an archetype with a tragic outcome I cannot help but think that we run the risk of limiting its possibilities, of perhaps subliminally pre-ordaining the applications of this technology to outcomes which are negative and harmful.

The relationship that *The Wolfman* establishes between feedback and werewolves illustrates the barely controlled violence that was, at the time, a necessary byproduct of the audio feedback experience. From Hendrix's quest to find the loudest amps and toughest tubes[30] to Ashley's per-seat wattage specifications,[31] artists were well aware that tremen-

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28. We might debate the categorization of the werewolf as a "mythological" being, since the werewolf in American cinema does not generally deal with gods or with the origin of the world, and therefore some might rather categorize it within the realm of the "folk-tale." Without getting too deep into the debate on how to categorize myths vs. folk-tales, I'll say that at this time I consider "myth" to be a supernatural story which can be read as metaphor, and which thereby provides a possible way for the reader or listener to put themselves in accord with the world. The werewolf, in this respect, very much might be understood to deal in metaphors surrounding repression and violence in society.

29. Rosalind Krauss, "Video: The Aesthetics of Narcissism," *October* 1 (1976): 51–64.

30. Murray, *Crosstown Traffic*.

31. Austin, Kahn, and Gurusinghe, *Source*.

dous volume was required in order to fully explore the intricacies of the early feedback system. The earlier description of The Kink's use of feedback against Beatles fans also serves as an example of how sometimes these massive volumes were both artistic and antagonistic.[32] As much as Alvin Lucier might try to claim that *The Wolfman* never *really* hurt the ears,[33] other listeners did not always share this perception, at times referring to the performance as "anarchic musical cruelty"[34] which "acquired a reputation as a malevolent piece that amounted to sustained torture for the audience."[35]

One of the ironies of *The Wolfman* is that these especially high volumes are arguably no longer necessary for producing the feedback sounds of the piece.[36] Isaac Schankler reviewed a 2014 rendition of *The Wolfman* in Los Angeles in which the electronics were digitally manipulated in order to lower the overall volume and shape the frequency response of the feedback. While the performers of this version noted that, "the technological limitations [in 1964] required the piece to be incredibly loud," Schankler opined that in this performance they were able to shape the sound such that it was "overwhelmingly intense but never painful."[37] Lucier's written commentary on *The Wolfman* also make note of readily available tools like compressors and limiters which might raise the noise floor for initiating feedback while lowering the overall volume.[38]

These sound manipulation techniques raise what I think is a productively existential dilemma for *The Wolfman*- if the violence of the process is made obsolete by technological advancement, does this also undermine the underlying mythology implied by the title?

32. Davies, *X-Ray*.

33. Lucier, *Music 109: Notes on Experimental Music*.

34. S. Alexander Reed, *Assimilate: A Critical History of Industrial Music* (New York: Oxford University Press USA, July 11, 2013).

35. Gann, *Robert Ashley*.

36. Noise aficionados might argue that creating the feedback at a lower volume will drastically change the aesthetic experience of the piece, and I can't argue with that - but I think Ashley's expressed desire for lower-pitched feedback in *The Wolfman* reveals that the harsh aspects of the sound were not, in his eyes, the essence of the work.

37. Isaac Schankler, "Loudness Isn't What It Used to Be: Southland Ensemble and Robert Ashley," NewMusicBox, July 24, 2014, accessed February 8, 2020, https://nmbx.newmusicusa.org/loudness-isnt-what-it-used-to-be-southland-ensemble-and-robert-ashley/.

38. Lucier, *Music 109: Notes on Experimental Music*.

The particular example of *The Wolfman* illustrates the possibility that technologies might be able to outgrow their mythological analogies. Ashley's choice of title was at the time both apt and prescient, but now that the production of the piece can be optionally freed of the antagonism of the werewolf, I felt presented with the opportunity to find a new analogy for feedback performance which might open up different performative possibilities.

In considering new mythologies for feedback performance, it was crucial to note that violence was not the only link established between werewolves and feedback in *The Wolfman*. Beyond the surface-level similarities between feedback and howling,[39] the more fundamental connection is the idea that both feedback and werewolves are about processes of transformation, and that in the case of audio feedback the transformation is often deeply intertwined with the bodies of the performers. The transformative capacities of feedback are also quite apparent when it is applied to video processing, with the recursion that occurs between camera and screen serving to alter the representations of anything or anyone entangled within the feedback path. So it was that in imagining a new *Wolfman*, I decided to not abandon the idea of the werewolf entirely, but rather look to other mythologies of shapeshifting which might inform the use of audiovisual feedback as a transformative process.

I was particularly drawn to the prominent role that shapeshifting plays in supernatural journeys across a number of different cultures, mythologies and spiritual practices. This concept appears in sources ranging from Norse religions, studies on shamanism, and astral projection, where journeys into other realms encourage or require a change of form on the part of the traveler as they depart the physical realm. I wrote earlier about a desire to create audiovisual "thin spaces," or points of contact between the world of the screen and the physical world of the performance space, and these various accounts of supernatural travel all point to a similar crossing from the profane earth to a space which, while real, is not of this world as we know it. Thus, it seemed that in drawing on these sources I might

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39. Lucier points out that one British expression for microphone feedback is "howl-round." (Lucier, *Music 109: Notes on Experimental Music*)

develop an underlying mythology which mirrors the act of projecting and transforming the image of the performer.

In the course of developing this mythical model for *Loup-garou*, I noticed several features that occur across multiple accounts of shapeshifting in the context of supernatural travel - features which, broadly speaking, contrast productively with the mechanisms of typical werewolf stories. For one thing, shapeshifting for travel tends to require intentionality on the part of traveler - whereas the werewolf is defined most often by a *lack* of control over their powers, journeying is often undertaken with a specific intent, and in many cases we might label these travelers as practitioners of a sort.[40]

The deliberation required of this kind of shapeshifting also marks it as a skill-based activity, one which in some accounts can be learned and improved over time. This is not the case for all accounts - many Norse tales of shapeshifting involve individuals who have inherited their powers,[41] and many shamanic traditions which involve learning still mark success as the result of a divine intervention.[42] Still, there are exceptions to these cases, not to mention contemporary practices of astral projection which are entirely predicated on the notion that supernatural travel is a learnable skill.[43] This further underlines a difference in agency from typical werewolf stories in which the werewolf is subjected to its condition. *The Wolfman*'s own deliberate and practiced application of feedback in performance actually places the piece itself at odds with this notion of a werewolf as one who has inherited their condition, and switching to a model of shapeshifting which is predicated on skilled use rectifies this particular contradiction.

The most important commonality to these practices of shapeshifting is the fact that they almost always occur in supernatural realms - that is to say the shape which is

40. Nevill Drury, *The Shaman and the Magician: Journey's Between the Worlds* (Oxfordshire: Routledge, 2019).

41. Stephan Grundy, "Shapeshifting and Berserkergang," in *Disputatio*, vol. Vol 3 (Evanston: Northwestern University Press, 1998).

42. Peter Buchholz, "Shamanism in medieval Scandinavian literature," *Communicating with the Spirits* 1 (2005): 234.

43. Edain McCoy, *Astral Projection for Beginners: Learn Several Techniques to Gain a Broad Awareness of Other Realms of Existence* (Woodbury: Llewellyn Worldwide, 1999).

altered is in most cases not the *physical* body, but it is rather an aspect of the person which appears in the other world. This separation of one's appearance from the physical body requires a conception of personhood outside of typical Western mind-body duality, in which a person might be able to not only change the way they look independently of their physical form, but also send out this new representation over great distances to accomplish a variety of objectives. Within Norse shapeshifting accounts this new shape is referred to as *hamr*, or skin, and it is this *hamr* that gives shape to the spiritual component of the human which can leave the body (the *hugr*) as it travels into the other realms and leaves the body behind.[44] In astral projection, this new shape is the so-called *vehicle* for travel, which might take many different animal, human, or non-representational forms depending on the skill of the practitioner.[45]

These ontological alternatives to mind-body duality could potentially serve as useful models for considering how videoed bodies correspond with the physical people that they [supposedly] represent. When a body is inserted into a video feedback loop, the video system serves to not only *depict* the body in transit but actually embodies a contemporary analog to the astral journey through the transformation of the physical body into the virtual. Indeed, similar analogies between astral and video worlds have been posited in writings such as those by Steve Dixon[46] and Todd Winkler,[47] who argue that the on-screen body and its surrounding world can function as a supernatural space. Just as the aforementioned tales of animalistic and supernatural transformation describe means of entering spaces which are typically inaccessible, video feedback depicts the entry of the body into the ubiquitous but fundamentally distinct space of electronic data. The notion that one might independently shape and move their appearance while their body

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44. Lotte Hedeager, "11. Split Bodies in the Late Iron Age/Viking Age of Scandinavia," *Body parts and bodies whole: changing relations and meanings* 4 (2010): 111.

45. McCoy, *Astral Projection for Beginners*.

46. Steve Dixon, Roger F. Malina, and Sean Cubitt, *Digital Performance: A History of New Media in Theater, Dance, Performance Art, and Installation* (Cambridge: MIT Press, 2007).

47. Todd Winkler, "The Processed Body as a Supernatural Being," in *Proceedings from the 2016 Connecticut College Symposium on Art and Technology* (2016).

is elsewhere underscores the inadequacy of mind-body dualism as a way of considering contemporary human existence that spans physical and digital worlds.

Loup-garou takes this notion of shapeshifting as supernatural journey to form the mythological metaphor for the piece's processes and performance. If the goal in many of these supernatural journeys is to bring back necessary knowledge, in *Loup-garou* the intent is, in part, to go to the other-world of the screen and bring back an experience of the uncanny in video, a reminder of the medium as a space distinct from but adjoining our physical world. The journey thus shifts from being an event which is singularly experienced by the traveler and becomes a collective experience - indeed, the audience's ability to witness the simultaneity of the performer and their double gives them arguably the more complete experience of the event than that of the performer/traveler.

4.4   Software development

The performance situation of *Loup-garou* bears a number of similarities to that of *The Wolfman* - we have the singer, dressed in suit and shades, and also the sound system and microphone which help to complete the audio feedback loop. What has most obviously changed is the addition of the video feedback network, which uses a combination of camera and projector in parallel alignment to cover the stage in a frustum of interactive light. Less immediately visible but no less important is the inclusion of the computer within these feedback loops, allowing for the shaping and sequencing of the audio and video feedback over the course of the performance. The changes in sonic and video feedback that occur through these parametric sequences help to set the conditions for transformation and depict the mythological journey of the piece.

Loup-garou's audio feedback is processed to a considerably greater degree than was originally specified in *The Wolfman* - strictly speaking, *The Wolfman*'s score doesn't call for *any* processing in the signal path with the exception of volume adjustment.[48] One

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48. Austin, Kahn, and Gurusinghe, *Source*.

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of the most basic goals of *Loup-garou*'s audio processing is to stabilize and filter the feedback at lower volumes than the extraordinary levels found in classic *The Wolfman* performances. Such alterations might dilute the raw sonic power in comparison to the original piece, but as Schankler pointed out in their review of a contemporary *Wolfman* performance, software filtering of the feedback can still produce a sound which is intense without being explicitly painful, and a careful balancing of volume and spectrum might allow some listeners to better appreciate the finer details of the sonic results.[49]

Software signal processing offers a number of options for conditioning the feedback in order to lower the volume and shape the frequency content, including obvious choices like compressors, EQs, distortion, limiters, and digital reverbs.[50] In addition to these effects, one of the main processes *Loup-garou* uses for feedback control is a *temporal* alteration of the microphone signal. Unlike *The Wolfman*'s feedback, in which the only delay is the distance from speaker to microphone, *Loup-garou*'s software does not pass the microphone signal directly to the output. Instead, the microphone is intermittently recorded into a buffer, and it is the excerpts from this buffer that are played back in rhythmic patterns in place of the live mic signal. This has the effect of greatly slowing the accumulation of feedback effects: instead of the microphone's signal feeding back within a few milliseconds, it is temporarily frozen in time and only returns when the rhythmic sampler plays back the recording a few seconds after the fact. By slowing down the feedback to this degree, the typical cascades of reinforced frequencies are slowed to such an extent that they are easily avoided by either moving the microphone or altering the singing and filtering of the vocal cavity. The tightly coupled embodiment of *The Wolfman*'s feedback loop is made strange through this delay, which at times can blur the line of sonic creation between the

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49. Schankler, "Loudness Isn't What It Used to Be."
50. The last of these offers one possible solution to Ashley's stated issue with the link between small venue size and higher-pitched feedback - a cathedral-type reverb placed in the signal chain would likely bring down the resonant frequencies of the feedback system in a manner similar to the anecdote he told of feedback in a Barcelona cathedral. (Gann, *Robert Ashley*) Of course, Ashley would have been aware of the possibilities of artificial reverb, so it might be that he felt too committed to a relatively transparent feedback circuit to add that bit of artifice.

singing and the feedback.[51]

Over time I've added a number of additional audio processes to the *Loup-garou* software which further alter the feedback sound, with the parameters of these processes sequenced to change over the course of the piece in order to complement the video feedback and communicate the narrative of the journey. The processing replaces some of the functionality of the tape parts from *The Wolfman* - those tracks which Ashley specifies should be played simultaneously as part of the performance. Ashley's tape parts are, I think, largely included in *The Wolfman* for functional reasons, not only serving to excite the feedback in a broad spectrum but more importantly helping to reduce the dynamic range of the microphone input and ensure a more consistent feedback sound, especially when the vocalist is not singing. These functions are fulfilled by the audio processes I added to *Loup-garou*, with all of these new processes utilizing digital feedback to varying degrees.

4.5   Video software

The video feedback in *Loup-garou* engages more overtly with the mythology of shapeshifting as supernatural travel. The various states of feedback within the piece interpolate between two functional poles, one in which the video transforms and complicates the body of the performer, and the other in which it depicts the otherworldly realms from the mythic journey. As one might expect, the inclusion of moving pictures also creates new lines of dialogue between the piece and various cinematic histories, including horror films, Structural and Expanded cinema, and practices of worldbuilding in video feedback. The transformation effects in particular draw upon techniques of both horror and Structural film and illustrate the leveraging of medium awareness that features in these practices.

The video feedback setup in *Loup-garou* consists of a computer-connected webcam

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51. In contrast to Ashley's lament that most people thought he was "screaming into a microphone," (Gann, *Robert Ashley*) my earliest performances of *Loup-garou* were so opaque with respect to sonic causality that they led to the opposite assumption; many audience members were quite sure that I had not uttered a single sound.

mounted on top of a projector, both facing along the same path so that their fields of view cover the performance area. The camera's image is aligned with the bounds of the projection in software (Max/MSP/Jitter), and the camera's exposure settings are tuned such that there is roughly a 1:1 mapping between the input and output images. From this initial alignment the output image can be modified with alterations like zooms and blurs to create the desired feedback effects and transformations.
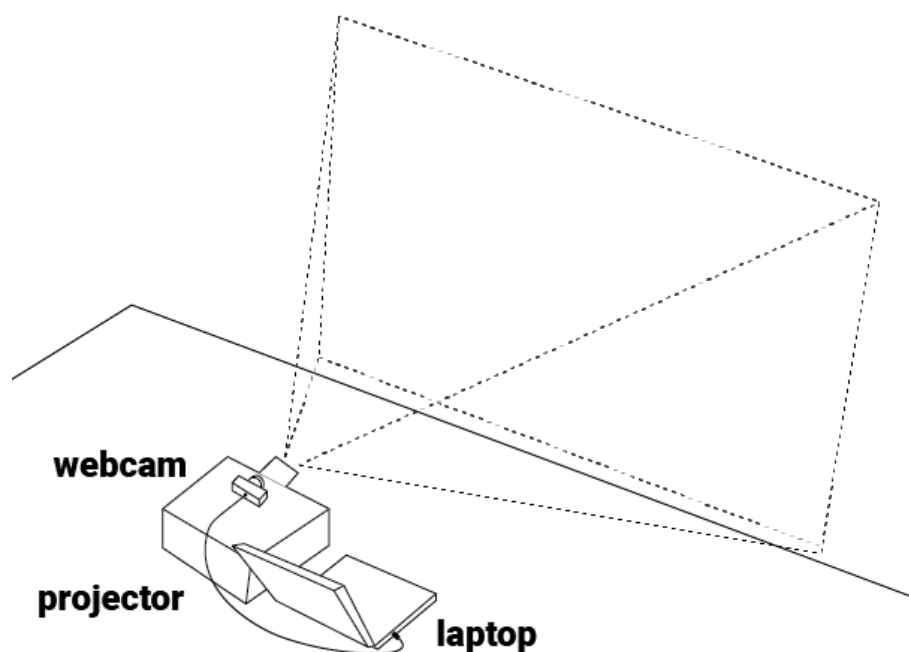
Figure 4.3: The video setup in *Loup-garou*

The video feedback processing bears a few rough signal flow parallels with the audio, including stretching out the feedback in time through sampling and discontinuous playback. Just as the microphone input to the audio processing is recorded to a buffer and sampled at rhythmic intervals, the camera input is recorded into a queue, the frames of which are played back in various rhythmic patterns. A new frame is added to the queue only once per second, but frames are played back from the queue at a rate of twelve frames per second - and moreover, the frames which are overwritten do not necessarily get replaced in order, so the difference in time between an onstage action and the projection

of its recorded and processed frame can be up to a minute or more.

This sampling and playback process leads to temporal discontinuities which are reminiscent of the cinematic technique of the jump cut. Strictly speaking jump cut can be, depending on context and intent, either a deliberate technique or a mistake - it is "[an] edit between two shots that feels abrupt or discontinuous, in terms especially of filmic space, and also filmic time."[52] The verb "feels" is important here - technically any cut in a film is a discontinuity,[53] but thanks to the conventions of continuity editing most films are able to make cuts within conventions that communicate orderly relationships between shots - therefore, in order for a cut to become a "jump cut" the viewer has to *experience* this discontinuity. The effect is, to quote Spadoni, one that "coax[es] viewers into a state of medium awareness,"[54] and even though Dancyger notes that the jump cut is now an accepted technique in mainstream film, it nonetheless still serves to "[warn] viewers that they are watching a film and to beware of being manipulated."[55]

The jump cut is not to be confused with the similarly titled jump *scare* of horror cinema (though a jump scare might *include* a jump cut), but the jump cut itself still holds a prominent place in horror cinema as a way of generating tension through deliberate violation of cinematic continuity. An early example is found in *Frankenstein* (1931), which features a scene in which the monster regards the camera menacingly after dramatically entering the room. The direct address of the camera is itself a violation of the comforts of the fourth wall, but the film's editing also serves to enhance this menacing effect through the use of a discontinuous zoom: rather than smoothly magnifying the monster, the film advances forward in discrete steps, drawing closer and closer each time.[56] Cinematic continuity ordinarily demands that, when cutting to the same subject, the camera angle

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52. Annette Kuhn and Guy Westwell, *A Dictionary of Film Studies* (Oxford: Oxford University Press, June 21, 2012).

53. Technically *all* successive frames are discontinuities.

54. Spadoni, *Uncanny bodies*.

55. Ken Dancyger, *The Technique of Film and Video Editing: History, Theory, and Practice* (Didcot: Taylor & Francis, April 26, 2013).

56. Spadoni, *Uncanny bodies*.

shift at least thirty degrees (the "30-degree rule"),[57] but by maintaining the same angle the tension mounts from the cumulative onscreen transgressions - as we cut closer and closer, the audience's growing discomfort with the artifice of the technique will perhaps (the filmmakers hope) be transferred onto the monster.[58] Examples of these deliberate continuity violations abound in earlier horror films from those of Georges Méliès to James Whale,[59] and they highlight the interest in evoking "medium awareness" that is shared between certain horror and Structuralist films. The difference is, of course, in the ends that these different filmmakers put "medium awareness" towards, with Structuralist film usually interested in a didactic dispelling of cinematic illusion, and horror more often content to let users conflate the uncanniness of artifice with the terrors of the onscreen narrative.

Loup-garou's video feedback combines with the software's discontinuous playback of frames to create a steady stream of jump cuts that disrupt the perceived time and space of onscreen activity. If the camera feed were simply passed through to the projector in real-time, an image transformation like a zoom or pan would likely give the illusion of continuous transformation, with features of the image expanding to fill the screen or smearing across the stage. Slowing the accumulation of new frames and playing them back out of order serves to disrupt the linearity of the transformation process - in the case of a zoom, the images will gradually grow but will do so in a halting rhythm, expanding and contracting as images from different points in time are pulled from the queue. When the performer steps in the center of this stuttering zoom, we witness an even more disjointed version of the *Frankenstein* effect, where the onscreen body grows larger in fits and starts.

The recursive zoom is one example of the ways that video feedback can be used to create onscreen transformations, another horror movie staple and one that is specifically

57. Steven Ascher and Edward Pincus, *The Filmmaker's Handbook: A Comprehensive Guide for the Digital Age: Fifth Edition* (London: Penguin, November 27, 2012).
58. Spadoni, *Uncanny bodies*.
59. James Monaco, *The Dictionary of New Media: The New Digital World of Video, Audio, and Print* (New York: UNET 2 Corporation, 1999).

important to werewolf films. The transformation scene within a werewolf movie fulfills a couple of seemingly paradoxical functions, on the one hand establishing the connection between the character's human and werewolf appearances, while also allowing the audience to compartmentalize these two aspects of the character.[60] The werewolf is often both the monster and the protagonist of its own film, and when it is indeed the leading role the audience must be able to empathize with its character.

Classic transformation scenes often focus on closeups of the process rather than the entire body, showing the changes in a hand, or a foot, or a growing patch of fur, and while these shots might well be partially a result of technical limitations they also help emphasize a distinction between the human and their altered wolf existence. Within *Loup-garou* similar close-up transformations occur through the video feedback, with the performer's head expanding until it swallows the frame, and their hand growing and dissolving into a mass of TV static and cellular forms.

The above techniques also resonate to differing degrees with P. Adams Sitney's four characteristics of Structural film production. In Sitney's 1969 text on the subject, he describes four techniques which collectively characterize his conception of Structural film practices: fixed camera position, flicker effects, filmic loops, and rephotography off of a screen.[61] Though I did not set out to specifically adapt each of these techniques into the performance of *Loup-garou*, they all appear within the work to varying degrees of faithfulness. *Loup-garou* itself is clearly not a Structural work by any definition - for one thing there is too much of an interest in form and rhythm in contrast to the Structural film's tendency towards stasis.[62] Still, I think the technical parallels reflect not only the considerable influence of many Structural practitioners on my own work, but more specifically point to the ways that certain filmic techniques are particularly effective at achieving the uncanny effects that are desired by filmmakers with a variety of different

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60. Tudor, "Monsters and mad scientists."
61. Sitney, "Structural Film."
62. Sitney defines "stasis" in Structural works by saying that "there are no climaxes in these films."

practices.

I'll briefly discuss the appearance of each of Stiney's techniques in *Loup-garou*, starting with the flicker. This effect is present for much of the piece, since the discontinuous playback of frames will often cause inadvertent flickers, and it shows with particular force during several sections when the camera's color is inverted, a process that leads to a recursive strobing effect as dark pixels become light and vice versa.[63] The other characteristics described by Sitney make their way into *Loup-garou* in more oblique ways - there is a "fixed camera" in the piece in the form of the webcam, though the camera's image is of course often manipulated and moved around in software. The reordering of the webcam frames acts at times in a functionally similar manner as a "filmic loop," creating a sense of uncanny automation, but unlike the strict repetition in many Structuralist films these loops are modulated each time by the image feedback and so their content gradually changes. Finally, "rephotography off of a screen" might initially be seen to describe the webcam's capture of the projection, however, rephotography is generally *not* a recursive process in Structural film, while in *Loup-garou* the recursion is practically the whole *raison d'être*.

Ultimately the transformation processes in *Loup-garou* are intended to forge a path between horror and Structuralist approaches which rely on the artifice of filmmaking. The intended experience of the work falls somewhere between those intended by these two fields - not so much fright or an abstract awareness of the moving image medium, but rather a perception of the uncanny difference between a physical body and its digitally manipulated forms. Just as the werewolf transformation sequence lets the audience both relate to and distinguish between the human and the wolf, the processing and performance situation of *Loup-garou* might similarly let the audience consider the related but distinct existences of the performer and the onscreen double.

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63. The technique serves in these cases not just to induce flicker but also to ensure that the feedback does not converge towards either extreme of light or dark - inversion of colors is common in video feedback for this reason.

4.6   Form

otherworld 2
(macro / astral)

"real" time / space

liminal zone
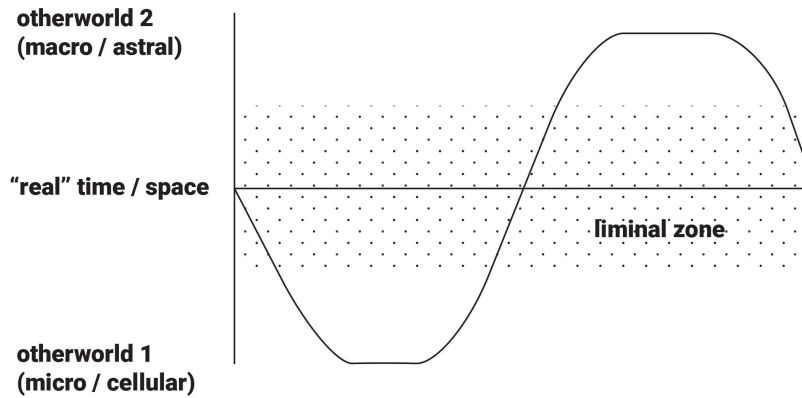
otherworld 1
(micro / cellular)

Figure 4.4: The narrative form in *Loup-garou*

The form of *Loup-garou* emerges from sequenced changes in the audio and video pro-
cessing software which combine with the actions of the performer to depict a shapeshifting
narrative of transformation and journey. This contrasts with the form (or lack thereof) in
The Wolfman, which for all its extremes of volume exists in a static and almost eternal act
of transformative violence (stasis also being, as mentioned previously, one of the defining
qualities of much Structuralist cinema). *Loup-garou*'s form evolves in a manner which is
for the most part rather slow, but it is nonetheless attempting to convey a journey, and
journeys require development.

The piece's travels involve two otherworldly destinations which we might fancifully
describe as cellular and astronomical, with these journeys undertaken not in the physi-
cal world but within the world and logic of the screen. Through audiovisual processes
of transformation and abstraction the performer becomes the shapeshifter, with these
shapeshifting processes depicting a fluid relationship between the physical body and the
onscreen double. These two otherworldly settings are bookended in the piece by sections
in which the transformations are enacted to travel to and from these worlds, with these
sections serving as liminal zones in which the difference between performer and double is

confused or collapsed and the possibility of uncanny experience might arise.

The form of the piece is then something of a dual arc - beginning and ending with the double physically coinciding with the performer and moving in the middle between these different screen-based worlds. When the piece begins the performer is standing in the center of the projection, and the projections and sound, though cut up in time, are relatively unprocessed - save for the fact that the camera colors are inverted. Since the performer and their projected images are very nearly aligned, a kind of emergent projection mapping occurs when the images of the performer overlay themselves on top of the physical body that they represent. Through this process the stage is established as a thin place where the physical/virtual boundary is made as slight as possible. Gradually the camera zooms in, the audio rises to the point of distortion, and the initial transformations are enacted, first as the performer's head envelopes the screen, then as their raised hand disintegrates into static.
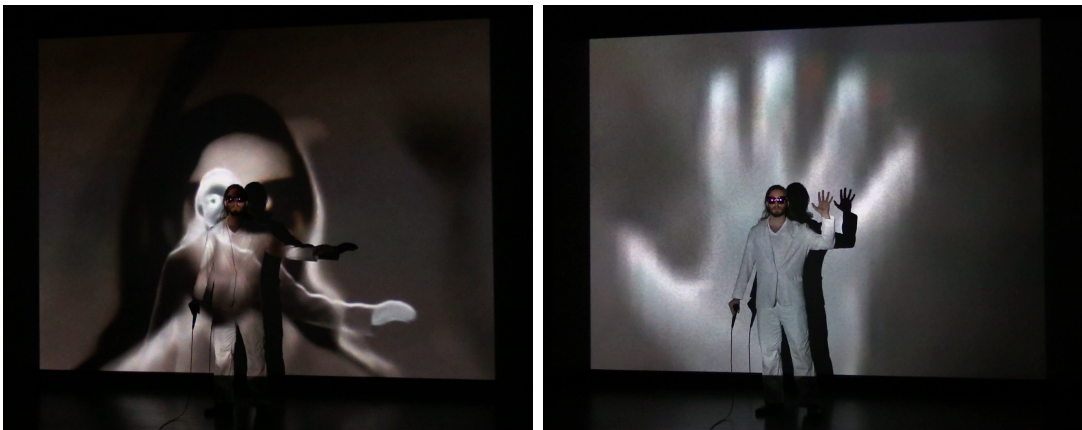
Figure 4.5: Initial *Loup-garou* transformations

Out of this static the first world emerges, with the video processing incorporating a number of convolution effects like sharpening and blurring to create automata reminiscent of cells or bodily tissues.[64] The choreography of the performer during the liminal transfor-

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64. Patterns of labyrinthian dots and stripes are common outcomes of analog and digital video feedback, with many of these outcomes described as "Turing Patterns," due to their similarity to results found in Alan Turing's work studying emergent pattern formation in biological systems. (Alan Mathison Turing, "The chemical basis of morphogenesis," *Philosophical Transactions of the Royal Society of London B: Biological Sciences* 237, no. 641 (1952): 37–72)

mation zones is deliberate, slow, and always oriented in a specific manner towards screen and camera, but within the otherworldly sections the physical body of the performer is freed from the task of transformation to roam about or even briefly leave the zone of the projection. These realms are also the only places where the performer directly interacts with the microphone, singing in the long tones of *The Wolfman*. Within the cellular world the sounds gradually shift from harmonic saturation towards elongated feedback ambiances of ever more microscopic samples.

Figure 4.6: The micro / cellular world in *Loup-garou*

It is at this moment that one of *Loup-garou*'s few sudden changes occurs, with the image processing suddenly zooming in to such a degree that a rectangular hole (or more poetically, a doorway) is created in the middle of the projection. The performer must once again traverse a liminal zone, this time framing the doorway with their shadow as the camera zooms back out so that this rectangular hole expands to fill the screen.[65]

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65. A moment of choreography in homage to Le Grice's *Horror Film 1*, with its shadow play and slow backward walk.

As the zoom continues to increase the image of the performer grows as well, and their once-visible outline disintegrates into an explosion of color and raucous sound.
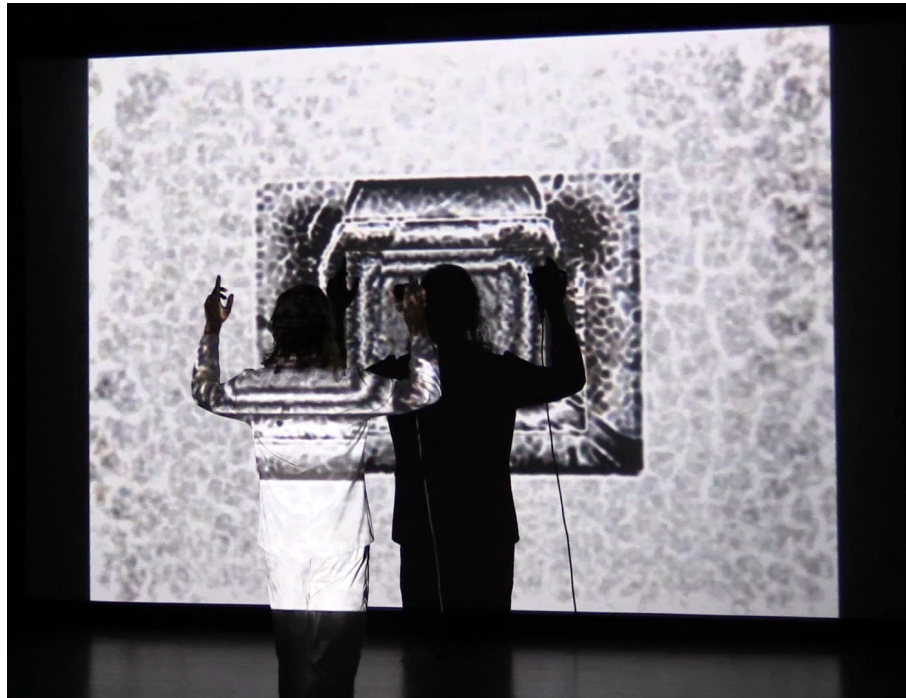
Figure 4.7: The feedback tunnel in *Loup-garou*

The second world which we arrive at represents the astronomical counterpart to the first cellular zone. Much like that world, it is a place in which the onscreen abstraction frees the performer to move about onstage and participate in the sonic environment. The difference in these worlds is aesthetic but also symbolic - in contrast to the microscopic cells we see expansive clouds of color, results of the noise of the webcam when zoomed in to excessive levels. The virtual space is sonically expanded by adding reverberation to the feedback, providing the low-end resonances that would occur in a performance space of unusual size.

Eventually the extreme zoom is brought back to equilibrium and the audio levels reduced, with the performer returning to the thin place where the piece began. The corridor of travel reemerges inverted, shrinking the double back down so that it might once again coincide with its physical body (astral projection teaches us that it is, after

Figure 4.8: The macro / nebula world in *Loup-garou*

all, best for the double to return as gently and smoothly as possible). As the virtual and physical worlds align once again, the performer advances on the projector until their body occupies nearly the whole of the projected image, ending the piece.

4.7   Conclusion

It is easy to fixate on the spectacle inherent in Robert Ashley's *The Wolfman*, from its unprecedented sonic assault to the singer's understated yet seductively sinister theatricality. But there also exists at the core of the work a deep interest in playing at thresholds of perception and performance, trying to merge the human performer with the machinic power of amplification such that the boundaries between the two become blurred. This attention to thresholds of feedback and representation are explored in a new light in *Loup-garou* by transforming both the sounds and also the images of the singer and the stage. By structuring the piece around these liminal zones where performer and feedback
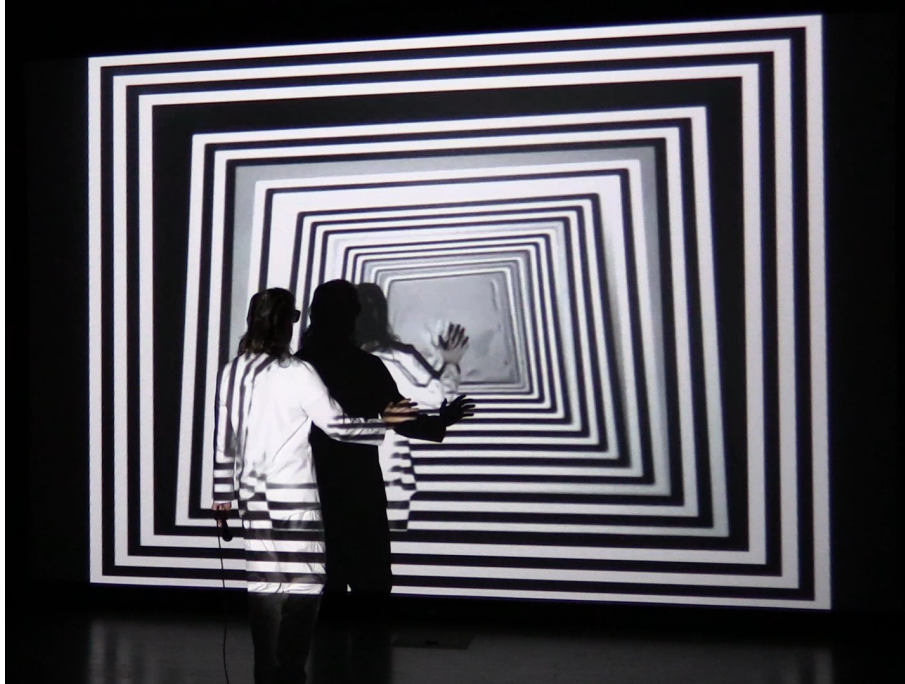
Figure 4.9: The return in *Loup-garou*

align, the piece touches on the difficulties and possibilities of feedback as a process of transformation.

CHAPTER 5

RED DOT

Mirrors and copulation are abominable, since they both multiply the numbers of men . . .
—Jorge Luis Borges: Tlön, Uqbar, Orbis Tertius
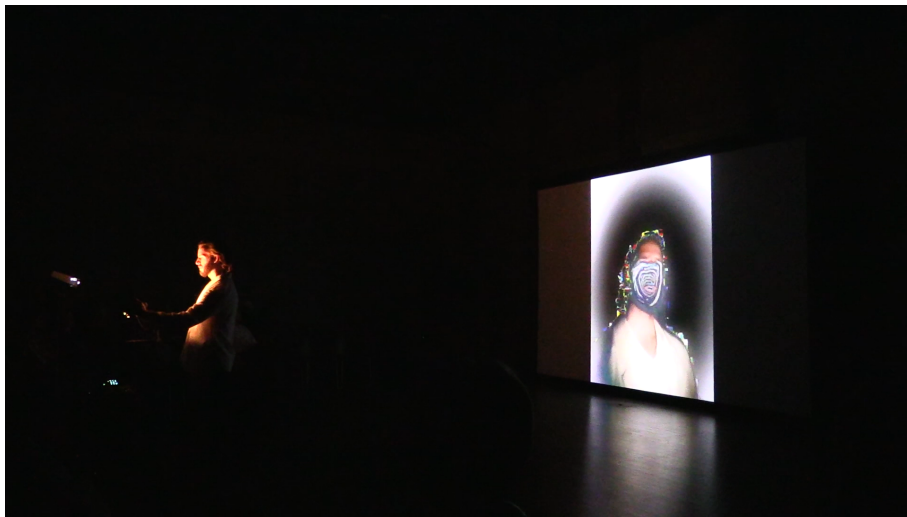
Figure 5.1: Still from a performance of *Red Dot*

Much like Borges' abominable mirrors, mobile phones and the internet produce distorted reflections that multiply humanity. Some of these multiplications are created by phone users themselves, who can adopt potentially numerous online personae through text, images, and video. There are, however, other digital representations which are neither controlled nor accessible by the people whose data produce them. As companies like Google and Facebook collect our data, they can build increasingly detailed virtual representations of our lives and actions, and mobile phones offer these companies the potential of near-constant data acquisition. As these digital representations increase in sophistication, the troubling probability arises that these tech companies know us profoundly in ways that we ourselves do not.

Red Dot is a multimedia performance that explores these anxieties through themes of self-knowledge and destiny. It is a one-sided conversation between a faceless tech entity and the human subject of its data-collection, with this conversation communicated through the interface of a mobile phone. The piece envisions a post-agency future in which our digital selves have become so well-defined that decision-making can be completely optimized and automated - provided that the human subject can be trusted to act in their own self-interest.

5.1 Motivation

The performance of *Red Dot* centers largely on experiences of interacting with mobile devices, as well as the broader digital networks that we are connected to through these phones. In particular, I wanted to explore how my own conception of selfhood has been complicated through this relationship with mobile devices, which manifests in ways that are both visible, like manipulation and dissemination of online personae, and also opaque, such as through the discreet collection and analysis of daily activities by large organizations. Presenting these ideas in a piece designed for a concert setting also pushes against the phone's typical use as an interface for individual consumption of content. Finally, working with the phone as an expressive interface allows for engagement with many of the tools that companies use to quantify and extract features of our daily lives.

We can start with this issue of phones as interfaces for creative expression. In the abstract, current smartphones contain a remarkable variety of sensors that enable a wide range of interactions, including inputs like microphones, multitouch screens, GPS, accelerometers, and cameras, as well as outputs like screens, lights, and speakers. The sensors are useful on their own, but a distinct advantage of phones over more specialized hardware is that the *combination* of all these sensors makes them even more powerful, since these multiple inputs provide context that can be used to derive richer information. Combining accelerometer and camera data, for instance, makes object tracking

considerably easier since we can infer the relative motion of the camera source,[1] while the multiple cameras found on many new phones can be combined to analyze images in three dimensions.[2]

Advances in software are further unlocking the potential of these camera-based interfaces. The aforementioned application of multiple cameras is one example of using software to unlock the potential of sensors which act in concert, but even single-camera interfaces are becoming viable sources for interface tasks that once required specialized hardware systems. One example which is particularly relevant to multimedia performance is pose tracking, the act of detecting and tracking a set of bodily joints. Real-time pose tracking used to require specialized technologies like Kinect or MOCAP which rely on additional hardware, in the case of MOCAP necessitating a room's worth of setup along with specialized suits.[3] Now, however, work being done in machine-learning classification is making pose detection from single cameras an increasingly feasible real-time solution[4] (to say nothing of the possibilities from combining this software with multiple camera angles). Within a few years, a couple of consumer phones acting in concert might be capable of tracking a large number of people in one space at real-time speeds. More specialized pose detection is already an integral part of the augmented-reality smartphone experience, like the face landmark detectors that undergird selfie filters,[5] as well as the hand landmark detectors which feature in Google's recent work on hand tracking for mobile devices.[6]

1. Stephan Gammeter et al., "Server-side object recognition and client-side object tracking for mobile augmented reality," in *2010 IEEE Computer Society Conference on Computer Vision and Pattern Recognition-Workshops* (IEEE, 2010), 1–8.

2. H. U. Xiaoyan and Chang Yuan, Mobile device with three dimensional augmented reality (patent, filed May 16, 2013).

3. Midori Kitagawa and Brian Windsor, *MoCap for artists: workflow and techniques for motion capture* (Abingdon: Routledge, 2012).

4. Dushyant Mehta et al., "Vnect: Real-time 3d human pose estimation with a single rgb camera," *ACM Transactions on Graphics (TOG)* 36, no. 4 (2017): 1–14.

5. Peng Wang and Yimin Zhang (Yimin Zhang Peng Wang), Method of augmented makeover with 3d face modeling and landmark alignment (U.S. patent 20140043329A1, filed February 13, 2014).

6. Valentin Bazarevsky and Fan Zhang, "On-Device, Real-Time Hand Tracking with MediaPipe," Google AI Blog, August 19, 2019, accessed March 25, 2020, `https://ai.googleblog.com/2019/08/on-device-real-time-hand-tracking-with.html`.

On the one hand, we might say that these developments show how phones can one day supplant specialized hardware interfaces like the Kinect for pose detection or the Leap Motion for hand tracking. However, it is also worth considering the fact that the cultural impact of the smartphone is very different than that of something like a Kinect. The contemporary smartphone is a fascinating interface in large part because it is a nearly ubiquitous technology, not an esoteric piece of equipment marketed to a narrow group of technophiles. It is not only ubiquitous in the sense of ownership (with an estimated 80% of Americans owning such a device),[7] it is also nearly omnipresent for the typical user, following them around for almost all of their daily activities and all the while surreptitiously sending out data to various tech companies for their internal use. The technical success of these hybrid hardware/software interfaces, like the ones underlying mobile phone pose detection, serves as something of a reminder about the powers of large-scale data collection and analysis: the very software that enables this feature detection and tracking is made possible only *because* of large datasets of analyzed human motion.

The potential of the phone as an interface for expression is also complicated by the typical use-case of the phone, where information and media are often presented to individuals who, though linked together via network, are generally using their own personal devices - mobile phone-based performance often consists of individuals addressing other individuals. The characteristics of phones which make them ideal for constant personal use (small size and network connectivity) also enable if not actively encourage physical isolation from neighbors, and much of the content designed for phones is explicitly intended to make this isolated experience as addicting as possible. The technologies which I think best reflect the unique expressive capabilities of phones, namely augmented-reality processes of filtering and overlaying, are in large part an extension of this isolationist tendency since they rely on a subjective viewpoint to "correctly" render content with the proper perspective. The phone's omnipresent connection to the online digital world makes it a

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7. Monica Anderson, *Mobile Technology and Home Broadband 2019* (Washington, D.C.: Pew Research Center, June 13, 2019).

sort of distorted thin place - while it can easily be read as a portal to an adjacent but otherwise invisible world, the phone's tendency towards addictive immersion often serves to blur the distinction between physical and digital existence, in contrast to the typical thin place which serves to orient the visitor with respect towards the supernatural and profane realms. A part of the performance situation in *Red Dot* is an attempt to fight against the inherently isolationist tendencies of the phone by bringing it into a setting for collective experience, and perhaps in fighting those tendencies the piece might make the use of the phone overtly unnatural.

5.2   Narcissism and the mobile phone

The figure of Narcissus weighs heavily on our perception of phone usage, not only in the aforementioned isolating tendencies of mobile phones but also in their explicitly developed abilities as instruments of reflection. So-called "selfie culture" has come under particular fire for what is perceived as not only "narcissistic pandering" but an acquiescence to the surveillance state: a willing dissemination of private features and information into a public sphere where they can be analyzed and used to develop even more refined surveillance algorithms.[8] In this way the narcissistic drive assumed to be inherent in mobile phone usage is associated, fairly or not, with an acceleration of private and public harm. Nonetheless, I find myself disagreeing with many of the interpretations of the Narcissus myth that underlie these critiques, and I think that a more nuanced reading of the myth itself might inform a more productive discussion on improving the relationship between our physical and digital selves.

The typical understanding of Narcissus in popular culture is of a vain person who exhibits excessive self-pride and -love, and this reading informs our views on so-called narcissistic expressions: we are likely to imagine that any action labeled "narcissistic" comes from an unwarranted notion of self-love. Looking back to Ovid's telling of the myth,

8. Henry A. Giroux, "Selfie Culture in the Age of Corporate and State Surveillance," *Third Text* 29, no. 3 (May 4, 2015): 155–164.

however, we can see that the idea of narcissism as purely self-love is overly simplistic. In Ovid's writing, when Narcissus looks into the lake he does indeed fall in love with the reflection, but the notion of self-love is complicated by the fact that Narcissus (at least initially) does not recognize this reflection as himself.[9] This conflation between self and other is, I think, the tension that gives richness and resonance to Narcissus' tale. Narcissus sees a vision which is ideal and unattainable, and withers away as a result.

This seems to me a much more apt descriptor of the detrimental effects that some people experience from interacting with social media - loneliness and isolation induced by visions of unattainable reflections. For all intents and purposes, the photos and videos in social media spaces *are* reflections in the sense that they are distortions of the physical situations they depict. The world of online images is related to but ultimately distinct from the physical world in its filtering and curation and mediation. Still, to the casual viewer, it is all too easy to conflate the real and virtual worlds just as Narcissus conflates his reflection with an idealized other. Unlike Narcissus, who sees but a single reflection, the online viewer has an infinitude of selfie reflections to project their wants onto. One of the more compelling reasons to work with mobile technologies is, I think to try to engage productively with this situation; to try to make use of cinematic techniques which might disrupt or break the spell of the reflecting pool which obscures the line between self and other, physical and virtual.

The reflection in a pool or selfie is compelling because we might imagine it to represent a perfect person. It perhaps reminds us, at some level, of the ideal of self-knowledge - Narcissus is in fact warned in Ovid's myth that he will live to a decent old age, *provided he does not know himself*,[10] and sure enough the revelation of his reflection proves to be his earthly demise.[11] The irony of selfies and social media is the fact that our public,

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9. Leah Tomkins, "The Myth of Narcissus: Ovid and the Problem of Subjectivity in Psychology," Publisher: Cambridge University Press, *Greece & Rome* 58, no. 2 (2011): 224–239.

10. Allen Mandelbaum, *The Metamorphoses of Ovid* (Boston: Houghton Mifflin Harcourt, April 1, 1995).

11. Strictly speaking, though, this "demise" involves Narcissus turning into a flower, which to me at least hardly seems the worst outcome.

online reflecting is most helpful at allowing *others* to learn more about us - the data which we post becoming part of a larger trove of information which companies can use to build up models of our features and our activities.[12] Lev Manovich, in *The Language of New Media*, wrote about how new media "functions as a new kind of mirror that reflects not only the human image but human activities,"[13] and just as in the myth of Narcissus there is a danger in these new kinds of mirrors. The video mirror does not pose a threat because we might learn too much about ourselves, but rather because others might learn more about ourselves than we would like.

Beyond the violation of privacy inherent in social media and mobile phone use, there is also the insidious threat that the scraped-together models of our habits and choices will be used by massive corporations to influence our future decisions. The practice of using data to drive targeted advertising is already well known, as are attempts by firms like Cambridge Analytica to identify and influence political choices. One of the smaller examples which I found particularly ominous came several years ago when reading about the app Crystal, an email service which advertises its ability to target the content and tone of your emails towards a specific recipient.[14] The premise behind Crystal is that, by combing the internet for our (ostensibly public) individual data, the service is able to build a model of each person's personality traits and communication preferences, and is thus able to tell you whether a person likes small talk, risk-taking, emojis, exclamation points, any of a number of different facets of communication. Whether the service works or not seems less pertinent than the fact that companies *think* this glut of data will allow them the omniscience to make better decisions for us than we could make ourselves. This goes well beyond the benefits of big data as a tool for improving diagnoses or suggesting healthy choices - it points towards a future where companies try to establish a superiority

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12. Giroux, "Selfie Culture in the Age of Corporate and State Surveillance."

13. Lev Manovich, *The Language of New Media* (Cambridge: MIT Press, 2001).

14. Elle Hunt, "Crystal knows best . . . or too much? The disconcerting new email advice service," The Guardian, May 18, 2015, accessed February 18, 2020, `https://www.theguardian.com/media/2015/may/19/crystal-knows-best-or-too-much-the-disconcerting-new-email-advice-service`.

of algorithm-based judgement.

Red Dot attempts to tie these various concerns around mobile phones together in performance. Sensors and feature analysis are not simply tools for isolated interaction, but also reflect a recursive practice of acquiring personal data in order to develop even more sophisticated tracking techniques. The Narcissistic mirroring of the phone is presented as a shadow of the real danger - the invisible, algorithmically constructed self who points towards a future which is past individual decision-making and agency.

5.3   Background

I began working with mobile phones in performance through a collaboration with artist and director Kate Bergstrom in 2017. This collaboration produced a piece titled *Friend-ship* which explored themes around the construction of identity through online images and social networks. Through the creation of this piece I began to engage with some of the concepts and technological challenges that would be further expanded in *Red Dot*.

Figure 5.2: Still from a performance of *Friendship* (2017)

Friendship is a work for two performers, two phones, and a computer connected to two projectors and stereo sound. The piece revolves around the idea of friendship as a performance, focusing in particular on the ways that relationships are used online to construct a virtual self-image, as well as the idea that friendship can become mythologized and turned into a ritual which reenacts the original relationship-building myth.

These themes are not expressed verbally but rather through choreography of motion and audiovisual processing. The two performers have phones whose microphone audio and camera feeds are streamed to a central computer. The computer splits each projection in half to render a total of four projection surfaces, and for each surface alternates between four possible images: totally white frames, totally black frames, or one of the two camera images. In this way the camera feeds from the performers' phones are not only overlaid in space but also mirrored in double, an expression of the mirroring which is at the heart of online video.

The piece begins with the two performers facing one another with their phone cameras. The performers are, at this point, very much mirrors of one another - the virtual other that we see in selfie mode is now made flesh and standing opposite. The audience sees this relationship through the physical orientation of the performers, as well as the strobing videos which shine onto their bodies. The performers move closer to one another, each exploring this reflexive mirroring that is occurring between the images they've taken of the other, and the other's images of the self. Much like the video, the sounds are cut up from the audio of the phone's microphones and are rhythmically played back in the space - when the rhythms speed up, this cues the performers to advance through another round of the same choreography. As the motions repeat faster and faster, the metaphor of relationship mythmaking is expressed: the languid explorations of the early relationship give way to forced repetition and a desire to recreate the initial experience.

The connections between the phones and the computer are established using a group Skype call, with the computer's Skype window and audio routed into Max/MSP using

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Open Broadcaster Software. The phone screens are cropped out of the overall Skype window within Max, where they can then be routed for display on the projectors. This setup is obviously quite limited in certain respects - for instance, the dimensions of the phone cameras within the Skype window need to be hard-coded, meaning that using a different phone in performance would require manually adjusting the crop bounds in Max. Using Open Broadcaster Software to route the window texture into Max also introduces some slight latency, and this setup obviously requires a reasonably stable internet connection in order to function. Nonetheless, as a hacky approach it works quite well given Skype's low latency, and since Skype also handles sharing of video between all devices the performers can see each other's screens, a crucial aspect of the performance. The lessons from this initial work would prove useful during the software development for *Red Dot*.

5.4 *Red Dot* - form and performance

Unlike *Friendship*, the narrative in *Red Dot* is rendered in large part through spoken text. The piece revolves around a one-sided conversation delivered by a nameless technological entity who has been collecting and studying the data of the performer (the latter of whom shall henceforth be called "the protagonist"). This entity opens with a monologue ruminating on the impossible promise of self-knowledge before tipping its hand - as a result of its ubiquitous acquisition of personal data, the entity claims to be able to construct an ideal model of the protagonist. Such a model could take any decision that the protagonist might need to make and render out the correct outcome - the choice most likely to lead to long-term fulfillment. All the errors in judgment and short-sighted planning that are inherent to humans could be solved by the impersonal objectivity of big data.

There is one catch, but the catch is not some Faustian bargain that the protagonist must strike to gain access to this impossible knowledge - after all, the protagonist has already entered into the fateful agreement before the start of the story when they granted this entity access to their personal data. The catch is, rather, that the protagonist might

be so blandly self-destructive that their actions poison the predictive capabilities of the entity and threaten its understanding of positive behaviors. The entity has, quite possibly, encountered someone whose lack of self-knowledge is so profound as to defy analysis. The hero of this narrative is then a person who is so utterly pathetic in their actions that they reveal nothing of their true self through their technologically monitored life.

Figure 5.3: The protagonist pulling along the thread that binds them to the phone

Throughout the performance the connection between the protagonist and their mobile phone (both mirror and portal into the virtual world) is literalized through a rope which connects the two at all times. At the start of the piece the protagonist pulls themselves along the rope towards the phone, the latter of which is held by a stand several feet off the ground. By the tension of this action the phone's camera is trained on the protagonist, and this feed is processed and projected to the audience as a glitching picture of the protagonist as they come closer and closer. When the phone is finally reached the protagonist turns it around to face the screen, revealing a processed selfie feed representing the incomplete virtual self that this entity is attempting to construct. Where the face should be there is only an infinite void, superimposed by the mouth of the entity as it continues to speak.

The one-sided conversation is suddenly cut off as the protagonist drops the phone to dangle it suspended from the rope to which it is bound. They swing the phone at the

Figure 5.4: The entity and the protagonist

end of this rope in arcs of increasing speed and diameter, transforming the motion of the phone into an audiovisual performance in which the sounds and camera images blur and cascade. The protagonist's intent is, as ever, unclear - it remains ambiguous if this is an act of futile rebellion, trying but unable to break the connection, or if it is at last an act of self-reflection through the camera which is, throughout the twisting and turning, consistently trained on their person.
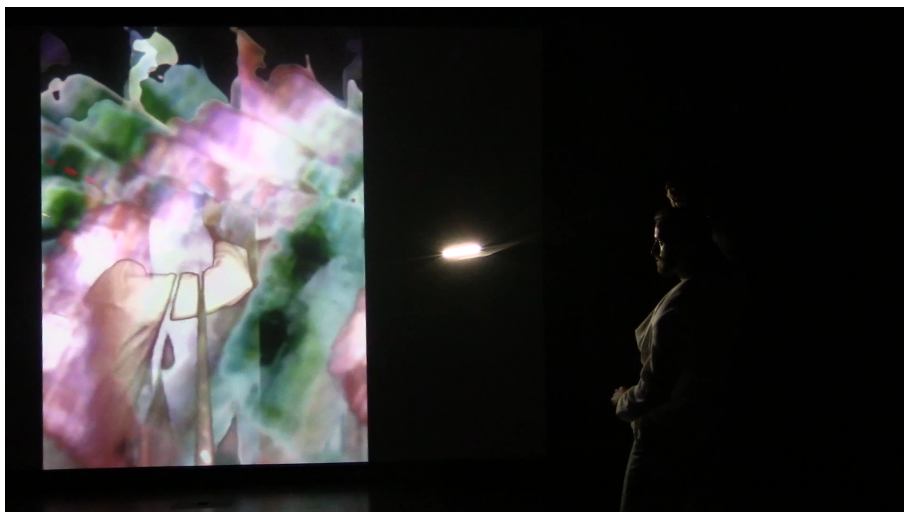

Figure 5.5: The *Red Dot* phone swinging section

After the swinging slows to a stop and the music correspondingly diminishes, the

phone dangles from the protagonist's grip once more, with its camera focused unerringly on the fist that suspends it. A pair of scissors appears, lifting slowly towards the line, and the entity reenters the conversation as its hold is threatened. The story ends quite literally mid-sentence as the voice, lights, and projections cut to nothingness.

Figure 5.6: Cutting ties at the end of *Red Dot*

5.5   Technology and setup

Red Dot is in part an attempt to incorporate augmented reality experience into staged performance. As such it requires a means of transmitting data from a phone to projectors and speakers which can display media for a general audience. This could be done without a computer, but given the synchronization that I wanted between sound and video processing, it seemed most straightforward to stream the necessary data between the phone and a computer and allow the computer to otherwise run the show. The relationships between hardware and software are detailed in figure 5.7, with hardware outlined with dashes and signal flow given with solid lines.

I'll outline the important connections in summary, beginning with the video pipeline - first, the phone's screen is captured and transmitted using scrcpy, a computer application
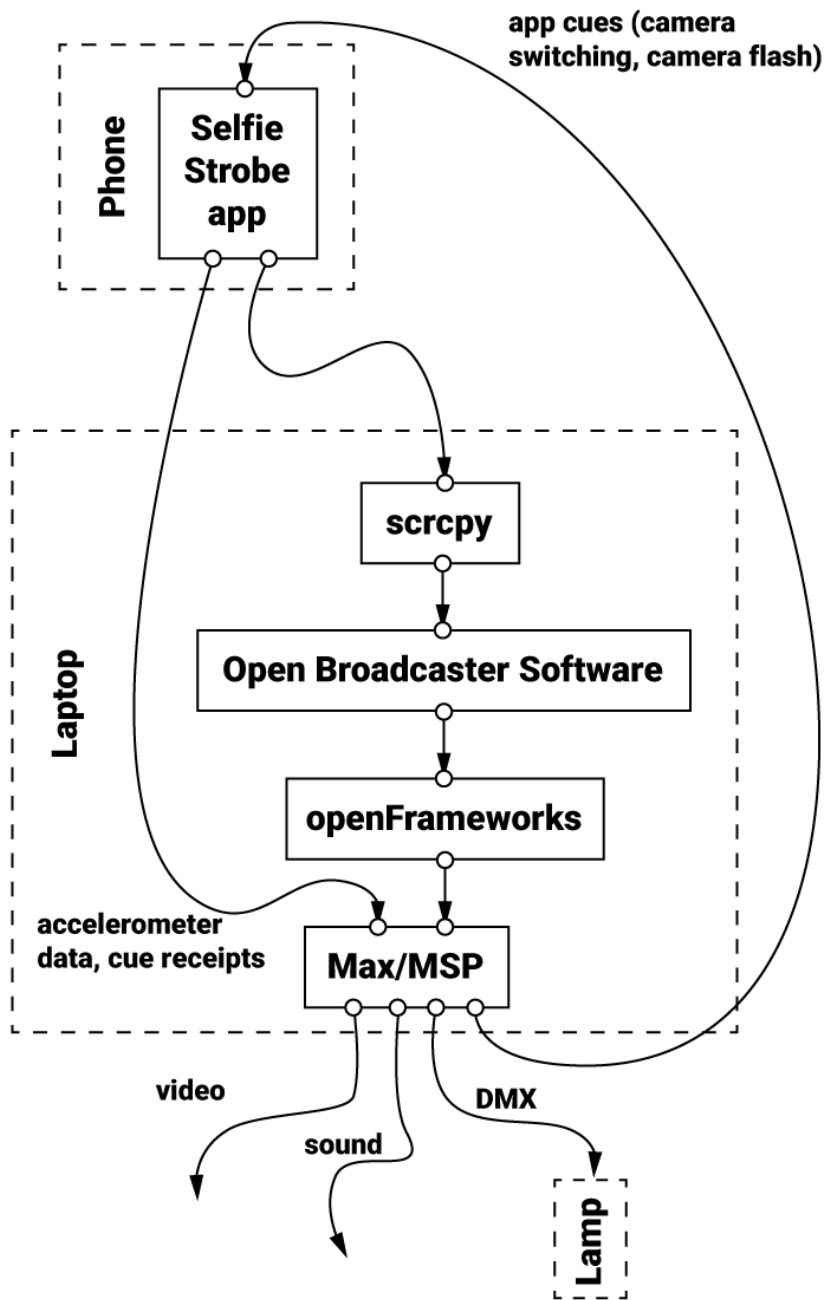
Figure 5.7: *Red Dot*'s signal flow

that allows a user to view and interact with their phone through their PC.[15] The phone's

screen is displayed in the scrcpy window, and the window's contents are grabbed by Open

15. Romain Vimont, "scrcpy," March 25, 2020, accessed March 25, 2020, https://github.com/Genymobile/scrcpy.

Broadcaster Software, which uses the VirtualCam plugin to make the scrcpy window contents available as a webcam to all other applications. This virtual webcam is opened in an openFrameworks application which uses the dlib toolkit to detect any faces and find the locations of relevant facial features,[16] allowing openFrameworks and Max/MSP to draw any masks for face filtering. The camera and facial manipulation textures from openFrameworks are then shared with Max/MSP using Spout (which is essentially Syphon for Windows) and these textures are composited and processed before being displayed on the projector.

The sound originates entirely from the computer, though it makes use of the phone's camera feed and accelerometer data to generate some of the audio. The audio materials themselves are a mix of processed recordings and real-time synthesis. The narrative is driven in large part by the monologues, which were recorded in an ASMR style with a large-diaphragm condenser microphone placed close to the mouth. The uncomfortably intimate atmosphere of the recording style, which tends to emphasize tiny vocal sounds, was processed with intent to give an uncanny and impersonal feel. This was done by making several copies of the voice and subtly lowering their formants by different amounts, trying to produce a vocal sound that contains an ambiguous number of speakers while conveying an air of deep-voiced authority.

I wanted the music during these monologues to convey a feeling of glitchy unease, as though the very act of data acquisition was being sonified in real time. The processed video of the camera is used to control a software synthesizer which I have developed, which is essentially a feedback network of samplers and delays whose connections and parameters are controlled by the pixel values of a low-resolution image. The sputtering glitches in the video thus are synchronized with an increasingly chaotic sonic texture which rises in agitation as the first speech goes on. The glitched sound is counterbalanced by a series of samplers playing vocal snippets in a syncopated minimalist manner, intended to give

16. Satya Mallick, "Facial Landmark Detection," Learn OpenCV, October 18, 2015, accessed March 25, 2020, `https://www.learnopencv.com/facial-landmark-detection/`.

something of a placidly corporate feel with motoric rhythms and inoffensive harmonies. As the monologue reveals its displeasure, however, the sung samples drift out of their just-tuned harmonies and into a more overtly unsettling dissonance.

The phone swinging is the major break in the form and sound-world of the piece, transforming it briefly into a noise-music number. For this section I use a synthesizer system that I developed which places microphones and speakers in a virtual space such that they feed back. The microphones can then be moved, creating an intuitive link between the simulated sound and the virtual motion that generates it. The accelerometer data from the phone is used to push a virtual microphone around in a circle in this virtual space, tying the motion of the phone with the intensity of the resulting music.

5.5.1 Video streaming

During the initial planning for *Red Dot* I believed I would need to begin with an open-source app for streaming the camera feeds. While pre-built streaming apps like Skype offer low latency and can be used in a quick if hacky manner (as in the previous piece *Friendship*) the use of a pre-built app would have limited the performative possibilities of the phone. In order to avail myself of all the options provided by the phone and its tools I would need at the very least to be able to edit the app that would be used in performance.

In the course of developing the performance I found several open-source applications that can be used to turn Android phones into IP cameras. IP (Internet Protocol) cameras send image data over the internet - a typical use is for security systems, where the image feeds from one or more cameras can be remotely monitored and stored on computers. Older smartphones which have been replaced for day-to-day use will often still have functioning cameras and wireless capabilities and can to a certain degree replace traditional IP cameras with the right apps. One particularly useful aspect of IP cameras for media performance is that they can transmit over a local network, and thus do not require an

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actual internet connection to function.

The open-source IP camera apps that I tested used either MJPEG or H.264 codecs to encode video before transmission. MJPEG initially offered a certain practical advantage because I ultimately wanted the video to be streamed to an openFrameworks application for image analysis, and the openFrameworks addon ofxIpVideoGrabber allows users to easily grab video from MJPEG-encoded IP camera streams directly within openFrameworks.[17] Using the app CameraServe[18] I was able to stream the camera feed from my phone into openFrameworks, but ran into limitations of latency and image quality. These issues were likely caused in part because of the higher bitrate requirements of MJPEG compared to other codecs like H.264 - while the latter codec focuses on encoding the differences *between* consecutive frames, thereby attempting to save bandwidth on video whose contents change slowly over time, MJPEG only compresses the individual frames.[19] This means that, in many cases, video encoded with MJPEG will be larger and require more internet bandwidth for equivalent quality.

The libstreaming API, in comparison, allows users to encode and stream H.264 video from their phone.[20] The video is transmitted using UDP (User Datagram Protocol) which is often used for real-time applications because of its speed, and was decoded on the computer using FFmpeg. This speed comes at the cost of being error-prone, since UDP does not check whether all sent information has arrived uncorrupted, and in the case of libstreaming this led to some delightful glitchiness due to inadvertent datamoshing when information from video frames was lost. Still, even though the latency was improved with libstreaming it nonetheless exceeded the delay I believed would be acceptable in performance.

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17. Christopher Baker, "ofxIpVideoGrabber," January 8, 2020, accessed March 25, 2020, `https://github.com/bakercp/ofxIpVideoGrabber`.

18. Sasha Kotlyar, "CameraServe," March 20, 2020, accessed March 25, 2020, `https://github.com/arktronic/cameraserve`.

19. John Honovich, "H.264 vs MJPEG - Quality and Bandwidth Tested," IPVM, July 28, 2010, accessed March 25, 2020, `https://ipvm.com/reports/h264-mjpeg-bandwidth-quality-test`.

20. Simon Guigui, "libstreaming," February 8, 2019, accessed March 25, 2020, `https://github.com/fyhertz/libstreaming`.

These problems were ultimately solved by using scrcpy, a program for Android debugging and remote control using a computer.[21] scrcpy is based off of Android Debug Bridge, a command-line tool for controlling Android devices from a computer. When an Android device is connected via USB to a computer, the terminal command "scrcpy" will push a Java application to the device that acts as a server, streaming an H.264 capture of the phone's screen.[22] A computer application will start up at the same time and serve as the client, decoding and displaying the Android's screen on the computer. scrcpy has remarkably low latency since it does not buffer the video.[23] When connected for wireless communication it uses TCP (Transmission Control Protocol) rather than UDP, and since TCP is oriented towards error-free transmission[24] it avoids the information loss and datamoshing that occurred with libstreaming.

5.5.2 Performance challenges with scrcpy

scrcpy offered performance advantages compared to every other open-source Android streaming app that I tested, but it also presented several challenges to reliable performance that needed to be addressed. One issue for performance is finding a way to quickly and reliably establish the video connection between computer and phone. To be fair, this is not an issue which is specific to scrcpy - all of the apps which streamed on a local network required that the computer access the video stream using the phone's IP address. Unfortunately, this address can change when switching networks, potentially requiring the user to look up the phone's IP address and manually enter it into whatever program is accessing the stream. Use of a dedicated router can minimize this problem, but it's prohibitive to use the same router for all of the testing of a piece - it would be better for the computer and phone to automatically swap IP addresses and use these to establish

21. Vimont, "scrcpy."

22. Ibid.

23. Romain Vimont and George Stamoulis, "scrcpy for developers," February 16, 2020, accessed March 25, 2020, https://github.com/Genymobile/scrcpy.

24. The Linux Information Project, "UDP definition," October 12, 2005, accessed March 25, 2020, http://www.linfo.org/udp.html.

their connections.

Unlike most video streaming apps, scrcpy requires that the user first connect the computer and phone over USB, even if the goal is to transmit wirelessly. This might seem like a drawback, but it actually offers a solution to the IP address problem: since the two devices must be first connected in a non-wireless manner, we can create a new terminal command that establishes the scrcpy connection, and also grabs both devices' IP addresses while they're connected. After writing a script which took advantage of this initial connection, the startup procedure for *Red Dot* video streaming goes as follows - connect the phone over USB and run the connection script, which will grab the IP addresses and save them into a text file on the computer. The script pauses until you disconnect the USB cable and press enter, at which point it establishes the wireless connection and the scrcpy application opens to reveal the phone's streamed screen. In performance situations this established video streaming with only two presses of a button, and the text file for IPs also allowed Max/MSP to automatically set up UDP communication with the device.

The other major issue with scrcpy as a tool for performance comes from the fact that it captures the *entire* phone screen. While the IP camera apps only stream the video from the selected camera, a screen capture sends everything appearing on the phone's screen, including notifications. Besides the fact that these notifications would create an onscreen interruption, there's also the distinct possibility of alerts or messages being passed on to the audience mid-performance if the phone is connected to one's media accounts or a mobile service provider. One could very well argue that this interruption is in fact exactly what we should embrace in mobile phone performance - but it was not to be for this particular piece. Operating on a local area network with no internet access solves many of the app notification problems, but not the issue of texts and calls from a service provider, and these notifications are in fact the most difficult to disable. Android seems, at this current point, to have disabled the ability for individual apps to mute notifications for incoming phone calls (a prioritization of the telephone aspect of mobile phones which

seems misplaced the longer I think about it). The only surefire solution that I found was removing the SIM card - a minor annoyance but a necessary step.

5.5.3   App development

scrcpy established the video stream from Android to PC, but I still needed an app to manage the use of the phone's hardware and its communication with the computer. This app (under the working title of Selfie Strobe) needed to be able to display and switch between the front and back cameras, turn on the flash and strobe it at selected rates, and grab the data from the phone's accelerometer. It also needed to exchange information with the Max/MSP patch running the performance, with the patch sending cues to alter the app parameters, and the phone in return sending the accelerometer data.

Though I did not use libstreaming to transmit video, I did use one of the libstreaming examples (example 2, specifically) as the starting point for the app.[25] This provided me with code that displays and switches the cameras onscreen in the correct aspect ratio, and also provided code for easy toggling of the flash. I also anticipate that this app might prove useful in the future if I want to stream from the phone's microphone, since the only major downside that I have encountered with scrcpy is that it does not currently transmit audio. Grabbing the phone's accelerometer data was a relatively straightforward process, and the flash was strobed through the use of a timer which would alternate on/off commands for the torch. The phone used in performance only has a flash for the rear camera, and this flash is disabled when the front (selfie) camera is in use. As someone who wants to use the phone's hardware components independently of their intended functions, I find this somewhat annoying, but this was solved in performance by using a lamp controlled by DMX during the front-facing camera section.

For communication with Max/MSP, I used the JavaOSC library to send OSC-formatted

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25. Simon Guigui, "libstreaming examples," August 9, 2015, accessed March 25, 2020, `https://github.com/fyhertz/libstreaming-examples`.

messages over the network using UDP.[26] While the OSC format was not particularly critical, I found that the library itself was useful for its ability to format messages and establish the network connection. The Max/MSP patch and the Selfie Strobe app each needed the IP address of the corresponding device in order to send data, but I solved this with the startup script that I wrote to run scrcpy, with this script grabbing both device's IPs while they're connected and writing the addresses to a file. The Max/MSP patch reads this file and uses the phone's IP in order to send OSC messages. Once it establishes a connection it sends the Selfie Strobe app a message containing the computer's IP, which then sets the appropriate variables in the app order to send messages back to the computer.

As mentioned earlier in this appendix, UDP is fast but is not error-free, and there is a significant possibility that any single message might be lost or incomplete. For messages that are delivered as quickly as possible like the accelerometer data, this is not a big problem, since the individual values shouldn't change drastically from one reading to the next and any missed messages will be quickly followed by new ones. However, this represents a potentially major problem for singular messages that communicate important state changes. If the computer sends a single message to switch the cameras for a particular section and that message goes missing, that section of the performance will no longer work as intended.

In order to solve this problem, I did a bit of reinventing the wheel by taking some concepts from error-free transmission protocols and applying them with UDP. The updated system uses receipts to verify that critical information was received by the other party and uses timeouts to resend information believed to be lost. For instance, when Max/MSP sends a message to Selfie Strobe to switch cameras, the Max patch stores the updated camera state in a variable. When Selfie Strobe receives a message to switch cameras, it executes the action and sends a return message to Max with the updated value. If Max receives this receipt and its value matches the stored variable that it sent out, the message

26. Chandrasekhar Ramakrishnan, "JavaOSC," October 30, 2019, accessed March 25, 2020, `https://github.com/hoijui/JavaOSC`.

is considered successfully delivered. If a corresponding message does not return within the timeout period (typically set to a quarter of a second) Max assumes that the message has not been successfully received and sends out the message again while resetting the timeout period, continually sending the message until receipt is confirmed. There are several possibilities for exceeding the timeout - the message might not reach the app, or it might successfully reach but then the app's *receipt* does not return. The messages might also simply take an unusual amount of time for delivery. In any case, retransmitting the message in this manner has effectively eliminated all of my previous issues with dropped messages disrupting the sequencing of events and has made the performances much more reliable.

5.5.4   Video pipeline

The phone's screen is streamed to the computer using scrcpy, where its contents are displayed in the window of the scrcpy application. I needed to access the video in open-Frameworks in order to analyze the video for the face filter section, so I use Open Broadcaster Software to grab the scrcpy window's contents and make them available to other programs as a camera input. Open Broadcaster Software is a program for streaming and recording media, and it is able to grab textures from any window for recording or rebroadcasting with minimal latency (Syphon can do this on Mac, but unfortunately the Windows equivalent Spout currently lacks the ability to grab from an arbitrary window). Open Broadcaster Software uses the VirtualCam plugin to make any window available as a webcam, and while this step of the process does introduce some latency the total delay between phone transmission and openFrameworks was considerably less than any other open-source streaming solution I tested. Processed textures from openFrameworks are shared with Max/MSP using Spout, and Max/MSP handles the final compositing before sending the output to the projector.

This is, undeniably, an excessive number of applications for video routing, with the

VirtualCam plugin in particular adding some delay to the signal. Future work will look at porting scrcpy into an openFrameworks application, thereby omitting the need for VirtualCam and reducing the total number of video applications from four to two. We could potentially reduce this even further by porting all of the Max video processing into openFrameworks, but since Max's processed video is used to generate some of the audio, and openFrameworks is a much simpler option for implementing the facial analysis, it seems like there is some value to separating their respective video tasks and simply sharing the relevant textures.

5.5.5 Face filtering

Contemporary face filters like those used in Snapchat and Instagram rely on analyses that communicate the locations of important facial features. One common approach is to analyze an image of a face to find a set of landmarks - points corresponding to features like the right corner of the right eye, the tip of the nose, the bottom of the lower lip.[27] Real-time face landmark detection has been widely available for artistic use for a number of years at this point, at least since Jason Saragih's development of the FaceTracker library in 2013.[28] Facetracker was incorporated into Kyle MacDonald's ofxFaceTracker addon for openFrameworks in 2012, making it widely available to oF users,[29] and Gene Kogan used this to create the FaceOSC app, a standalone app that uses OSC to stream not only the facial landmarks but also higher-order inferences like head orientation and eye blinks.[30]

FaceOSC is still an easy and straightforward way to get a rich set of facial information into any application that accepts OSC messages - however, I ended up using a more recent

27. James Le, "Snapchat's Filters: How computer vision recognizes your face," Medium, July 22, 2018, accessed March 25, 2020, `https://medium.com/cracking-the-data-science-interview/snapchats-filters-how-computer-vision-recognizes-your-face-9907d6904b91`.

28. Jason Saragih and Kyle McDonald, "FaceTracker," August 21, 2017, accessed March 25, 2020, `https://github.com/kylemcdonald/FaceTracker`.

29. Kyle McDonald, "ofxFaceTracker," July 6, 2018, accessed March 25, 2020, `https://github.com/kylemcdonald/ofxFaceTracker`.

30. Gene Kogan, "FaceOSC," January 17, 2016, accessed March 25, 2020, `https://github.com/kylemcdonald/ofxFaceTracker`.

approach implemented in the dlib C++ toolkit. Primarily oriented towards machine learning problems, dlib also offers a number of image processing tools for face and facial landmark detection.[31] Plus, the fact that it is written in C++ ensures a high performance ceiling as well as integration with openFrameworks.

The first step in detecting facial landmarks requires detecting the boundaries of any faces contained within the image. There are a number of different approaches to detecting faces in real-time - I used dlib's HOG (Histogram of Oriented Gradients) face detector due to its relatively high speed and accuracy in comparison with other common approaches such as Haar-like cascade.[32] The detector worked relatively well but was the main area of speed / quality tradeoffs in this project, since it runs on the CPU and is not exceptionally fast.[33] The detector's success at finding and accurately bounding faces improves greatly with larger image sizes, but larger images also substantially drop the frame rate. One possible technique for improved performance involves running the face detector once every few frames while running the landmark detector every frame: since the face likely hasn't moved much, and the landmark detector is much faster, performance increases substantially with a potentially low drop in quality of tracking.[34] Nonetheless I opted for face tracking on every frame using a relatively low-resolution image for face detection, and used some glitchy processing to minimize the appearance of tracking errors (see the "Video Processing in openFrameworks" section for more details).

The landmark detector in dlib implements the technique outlined in Kazemi et al's "One Millisecond Face Alignment with an Ensemble of Regression Trees."[35] There are two

31. Davis E. King, "Dlib-ml: A Machine Learning Toolkit," *Journal of Machine Learning Research* 10 (Jul 2009): 1755–1758.

32. Amal Adouani, Wiem Mimoun Ben Henia, and Zied Lachiri, "Comparison of Haar-like, HOG and LBP approaches for face detection in video sequences," in *2019 16th International Multi-Conference on Systems, Signals Devices (SSD)* (March 2019), 266–271.

33. Satya Mallick, "Speeding up Dlib's Facial Landmark Detector," Learn OpenCV, May 24, 2016, accessed March 25, 2020, `https://www.learnopencv.com/speeding-up-dlib-facial-landmark-detector/`.

34. Ibid.

35. Vahid Kazemi and Josephine Sullivan, "One millisecond face alignment with an ensemble of regression trees," in *2014 IEEE Conference on Computer Vision and Pattern Recognition* (June 2014), 1867–1874.

different models provided with dlib for landmark detection - one a more lightweight option with only five points, and the other a richer set of sixty-eight points corresponding with contours of the eyes, chin, lips and nose. Other models could be used that track different features - you just have to find or train the model. I used the sixty-eight point version as this offered the largest amount of data for extracting and manipulating facial features.

A brief aside on AR technologies - dlib was particularly useful because its face detector could run on a computer. Since I was going to use a computer for image processing and projection already, I initially thought it would be best to let the computer handle the more computationally intensive tasks, leaving the phone to simply stream its video and data. Of course, this ignored the fact that AR simply doesn't make a whole lot of sense on a computer - it's not a device that is supposed to move in space! While my own phone might not be a processing powerhouse, newer models are not only capable of handling the computational demands of current AR processes, they are in some ways *much* better equipped to handle these demands than computers are since they have access to more camera and spatial orientation data. In the near future, I imagine it will simply make more sense to do any and all AR processing on mobile devices, and only stream to computers after this processing is complete (if the computer gets involved at all).

I designed the face filter algorithms in openFrameworks using a combination of 2D compositing and mesh distortions. There are a number of ways to work with existing face filter toolkits, though many of them are tied to specific platforms (like Facebook and Instagram) and many of the existing toolkits are specifically aimed at mobile implementation. I wanted to be able to draw masks that would composite textures onto specific points of the face, and also be able to isolate and animate individual facial features. This would allow me to remove the face during the front-camera selfie section, and animate the mouth from the real-time camera feed to lip-sync with the text of the spoken monologue.

5.5.6 Making the masks

I wanted a workflow where I could draw masks in Photoshop that would correspond with the set of facial landmarks detected with dlib - for instance, I might want to make a mask covering only the areas around the nose points, or another one that would cover the lower half of the face. To facilitate this workflow I did some preprocessing to create the necessary data, including a guide image of dlib's facial landmarks to be used within Photoshop, and corresponding files containing the coordinates of all the landmarks within this guide so that the created masks could be properly mapped onto the real-time face coordinates.

I made a standalone program in openFrameworks solely for the creation of the guide and its corresponding files. The program took in a webcam feed and used dlib to identify the facial landmarks for any faces detected, overlaying these landmarks as dots on top of the image. When I align my face within the image and find the landmarks are well-matched with it, I can press a button and freeze the camera input and facial analysis.

At this point, the program uses an addon called ofxDelaunay to obtain the Delaunay triangulation of the set of facial landmark points.[36] This produces a mesh composed of triangles which cover the convex hull of this set of points, giving a two dimensional surface covering all of the facial landmarks that I can use for drawing textures. The mesh created with ofxDelaunay stores the triangles as a list of indices corresponding to the facial landmarks, and I store this list of indices in a text file so that I can recreate this surface for any set of identically organized facial landmarks without having to calculate the triangulation again. I then draw this triangulated mesh as a wireframe over the frozen face image so that the lines of the triangles are drawn onto the corresponding facial regions. If we were to draw a mesh onto an arbitrary face using its detected landmarks, these are the regions we would expect to be covered.

36. James George, "ofxDelaunay," January 28, 2015, accessed March 25, 2020, `https://github.com/obviousjim/ofxDelaunay`.

The face image is cropped using the bounds of the facial landmarks, such that the leftmost landmark is now at the left edge of the picture, and the rightmost landmark spans its width, with a similar bounding process on the y-axis. The landmark coordinates are updated accordingly for their locations in the new image, and they are saved as a list in a text file - these will be used as texture and vertex coordinates in the performance openFrameworks application. The face image, including the overlaid wireframe, is saved as a png.

This image is the guide for creating masks and can be used in Photoshop to indicate which areas of the face mesh will be covered by a given mask. The masks are created by drawing onto new layers over the corresponding areas of the guide, with the guide ultimately removed before saving the final image in order to ensure that the background is transparent. These masks, which must be saved in an image format which uses an alpha channel, can then be loaded into the openFrameworks app which is used in performance. Figure 5.8 shows the two stages of this process, where first, the facial landmarks are used to generate a reference image as well as a mask mesh, and second, the reference image is used to draw masks for compositing new content onto faces.

Figure 5.8: The mask creation process in *Red Dot*

In addition to the mask images, the performance app also loads the text files containing

the triangulation indices and the vertex coordinates of the guide image. To draw a mask onto a new face which is detected by dlib, we need to morph the mask image, which was made to fit the guide face, so that it lines up with our newly detected face. We can do this easily by making a mesh whose vertex positions correspond to the newly detected face landmarks, and whose texture coordinates correspond to the guide image's landmarks from the text file we loaded. By binding the mask texture to this mesh and drawing it, the location of every point on the mesh will overlay the proper point on the newly detected face, and the texture it draws at this point will come from the analogous area of the mask texture. The mesh's vertices will be triangulated using the triangulation indices loaded from the text file.

For the actual performance, I use a mask which is intended to cover most of the face so that it can be ultimately filled with video feedback. The mask, created using the process above, is loaded into openFrameworks, and when a face is detected the mask mesh is drawn into a separate buffer - not the buffer containing the phone's camera feed. This is so that the mask can be sent separately, with Max handling the compositing. I wanted Max to also receive information about the general location of the face in 2D space, so that feedback parameters like texture zooms could be oriented relative to the face's position. I used the tip of the nose as the rough center, since I could get this information by grabbing the corresponding facial landmark and normalizing its location. These coordinates could have been transmitted as OSC messages, but it was easy enough to encode this data in the mask texture - I mapped the x-coordinate of the nose tip to the red value of each pixel, the y-coordinate to the green, and the alpha value of the mask to the blue channel.

5.5.7   Animating the mask

During the moments when the performer is looking into the phone's camera, I wanted the onscreen body to seem to speak in sync with the recorded monologue. The face is already being replaced with video feedback due to the mask outlined above, so a new pair of lips

can be composited on. I wanted these lips to match the orientation of the onscreen head, and achieved this by creating and manipulating a mesh from the detected lip landmarks.

When the openFrameworks application is launched it creates a new mesh specifically for the mouth, initializing it with the number of vertices that matches the number of landmarks corresponding to lip points. Unlike the face mesh, I triangulated the lips mesh by hand since it had far fewer connections, and also because the Delaunay triangulation would by default create triangles covering the hole of the mouth, which I wanted to be left open. When a new face is detected in a frame, the lip mesh's vertices are updated to match the positions of the newly detected landmarks.

My mouth tends to remain closed in the performance, so I created controls to open and close the lip mesh. I first calculated the angle of the mouth in screen space (3D space seemed like overkill) using the landmarks for the mouth corners. I then made controls that displaced all of the lip vertices perpendicularly to this angle, with the upper and lower lip vertices moving in opposite directions of course (the mouth corners are left out of the displacement). By mapping the amplitude of the voiceover track to the displacement of the lips, I was able to get a rough lip sync with a mouth that maintained a plausible position and orientation on the face. The lip mesh itself was written to a separate buffer on every frame, with this buffer shared with Max over Spout.

5.5.8   Video processing in openFrameworks

The wireless video streaming and face filtering occasionally introduced glitches that I felt took away from the performance. The video streaming would occasionally drop a few frames, and while scrcpy and the use of a dedicated router greatly improved the frame rate and reliability of the video stream, I still found myself noticing moments where the action froze for a split second. In a section predicated on motion like the phone swinging, a brief freeze might be quite jarring. Similarly, the face filter would occasionally fail to detect a face within the frame and the mask would disappear - and since the narrative

implication of the mask is that it represents an incomplete picture of the protagonist, dropping the mask even briefly puts a bit of a hole in that theme.

I found a solution to both problems by creating a queue of previously played frames that could be drawn upon to replace any input frames exhibiting these particular undesirable qualities. The input frame would be subjected to tests that depend on the needs of the current state of the piece: if this frame passes the tests, it is displayed and its data is added to the queue, otherwise the next available frame from the queue is used instead.

Frame drops were detected by taking the absolute difference between the pixels of the current frame and the one immediately preceding it. By downsampling this difference image iteratively until it is a single pixel, we can reasonably tell whether the new frame is distinct by sampling this pixel's RGB values and determining if any of them clear a threshold. The face detection evaluation is even simpler, as the face detection code will simply not return any facial bounds if it detects no faces. While playing back previous frames creates a stuttering effect whenever they enter, I found that the consistent frame rate and face overlays were much less jarring than the previous interruptions.

5.5.9   Video processing in Max/MSP

The Max/MSP portion of the video processing is primarily responsible for compositing and feedback effects, most of which are fairly common. One effect which I had struggled to replicate was a glitchy texture that was made possible by the H.264 compression on the camera stream. By taking the difference between two consecutive frames and highlighting pixels where the absolute difference was greater than zero but lower than a very small threshold, areas with low amounts of detail would tend to light up. It just so happened that these areas contained many of the blocky rectangular structures we associate with glitch imagery, without the obvious grids that sometimes come from trying to replicate compression artifacts in a shader. Sometimes it's easiest to get a particular effect by working with the real thing.

5.5.10   Sound processing in Max/MSP

The monologue sections make use of the image-controlled synthesizer to sonify the occasional bursts of pixels coming from the video processing. The main sound processing that is unique to the piece comes from the use of the phone as a gestural controller, with the phone's accelerometer data used to maneuver a microphone feedback synthesizer within Max, tying the speed of motion to the intensity and character of the sound.

Accelerometers do not directly provide information about speed, of course, since velocity must be derived from acceleration. Moreover there is the added complication that accelerometer values don't begin from a baseline of zero when an object appears to be still - they register the pull of gravity, as even when an object is otherwise motionless it appears, to the sensor, to be accelerating towards the ground.[37] Thus if our accelerometer returns values in meters per second squared, we would expect the magnitude of the acceleration for a stationary object to be -9.8.

If we only care about the magnitude of acceleration, that is to say we aren't concerned with acceleration along any particular axis, it's fairly easy to cancel out the effects of gravity by adding 9.8 to the magnitude, centering the overall acceleration around zero. I found that by making a few assumptions about the motion of the virtual microphone I could simply use the absolute value of the acceleration's magnitude (with gravity removed) in order to influence the mic's motion.

The swinging motion of the phone means that for all intents and purposes it is moving in a circle - this meant that, instead of having to infer the motion of the phone along three axes of motion, I could reduce motion to a single dimension by worrying only about the angle of the microphone as it moves around a circle. Thus, reducing the acceleration data's dimensions from three to one is not a particular drawback, as I need only be concerned with the overall speed.

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37. Peter H. Veltink et al., "Detection of static and dynamic activities using uniaxial accelerometers," *IEEE Transactions on Rehabilitation Engineering* 4, no. 4 (December 1996): 375–385.

The other assumption that I make in calculating the mic position is more of a perceptual one, and it relies on the idea that similarity in quality of motion between phone and simulation is much more important than the accuracy of that motion. That is to say, I guessed that it would be enough for the virtual microphone to move at similar speed to the phone, and any difference between the position of the mic in virtual space and the phone in physical space would have negligible perceptual impact. With these two assumptions in mind, I tied the mic's motion to the phone's by deriving the microphone's angular velocity from the absolute magnitude of the phone's acceleration. The magnitude of acceleration was also smoothed and mapped to other sound parameters like resonant feedback and distortion in order to better match the sonic and physical energy.

5.6 Conclusion

The contemporary mobile phone is an intriguing interface for multimedia and expanded cinema performance, what with its arrays of interfaces and sensors like cameras, flashes, and screens. The phone itself also seems to be particularly oriented towards the creation of uncanny experiences, considering how it blurs the line between the digital and physical worlds (both in "augmented reality" and in everyday use). I expect to see a great deal of fun and uncanny work engaging with the transformative capabilities of mobile phone video, but I am also quite curious to see how we might engage with those uncanny aspects of phones which are not so easily visible. Things like the paranoia surrounding devices that may or may not be listening, or the apparent telepathy of online ads that are just a little too relevant to real-world discussions. I think that experimental film and video helps me to live in a world dominated by screens and projections, and hope that newer work can help us better engage with technological processes which are invisible but no less influential and pervasive.

CHAPTER 6

FINAL THOUGHTS

*The truth is, we know so little about life, we don't really know what
the good news is and what the bad news is.*

— Kurt Vonnegut Jr.

Although conclusions are typically places for summarizing any knowledge that has
been advanced, there is a certain irony in trying to distill logical outcomes from studies
on the uncanny. The irony begins with the fact that the uncanny is itself a concept
predicated on a state of unknowing, on a lack of conviction and a feeling of uncertainty.
But the deeper issue in uncanny studies comes from the slipperiness of the concept itself.
There is an element of recursion to the concept of the uncanny that has delighted many
writers, namely the fact that the uncanny is such a deeply irrational experience that the
concept itself seems to thwart satisfactory definition. It is a subject that is perhaps too
entrenched in repression to ever be fully brought to light.

Nonetheless, in the course of this research I came to several conclusions about interac-
tions between the uncanny and multimedia performance which I found to be of practical
use in my own work. I now believe that many experimental works in the vein of Struc-
tural film and Expanded Cinema, among them a great deal of my favorites, make use
of the inherently uncanny nature of film and video as a means of critically engaging the
audience. This especially explains the use of techniques and performance situations in
which live human bodies are entangled with film in a complex manner, like the physio-
logical responses to flickers or the use of the performer as a projection surface. Framing
these techniques as uncanny devices has helped me to draw connections with other film
practices which I might have overlooked, including horror films and the wide variety of
experimental approaches found in early cinema.

For my own part, I do not think that the uncanny is simply a means to some higher purpose, but is also a deeply meaningful experience in and of itself (even if that experience is, by definition, largely inarticulable). I think that screens and videos are strange and uncanny, and yet they so easily become a banal fixture in my daily life. It is helpful to me to encounter work that foregrounds these moving picture oddities, that allows me to sit with the feelings of technological uncertainty that are latent in my normal life.

In closing, I would like to return to a quote of Ken Jacobs, who said "As for mistakes in perception, they can be fun, and can teach us modesty as regards knowledge of The Truth of Things. Religion is bullshit, philosophy falls short. Simple luck in being born with a constitution that can take a steady diet of bewilderment gets us through." Though he was talking specifically about the technique of the flicker, I think his point applies just as well to Ito's games of space and time, or the flashing shadows of a Le Grice performance. Maybe the best outcome of these enterprises is not that they result in a more complete picture of the world, but rather that they remind us of our own limits of conception and perception. Speaking only for myself, those moments of pleasurable uncertainty do somehow help to get me through.

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Appendices

APPENDIX A
PERFORMANCE DOCUMENTATION

Video documentation of the three dissertation pieces is available via the Brown Digital Repository. These particular performances were all filmed at a dissertation concert (titled *Portals*) which took place October 18, 2019 at the Granoff Center for the Creative Arts in Providence, RI. Video and sound recording was conducted by James Moses and Joanna Podias.

Dawn Chorus
DOI: https://doi.org/10.26300/vnws-a846

Loup-garou
DOI: https://doi.org/10.26300/emaw-se77

Red Dot
DOI: https://doi.org/10.26300/324r-h305