Abstract

This practice-based doctoral research discusses the genealogy of Lumia, a historical art form using light as primary material, and analyses historical and contemporary Lumia practices including my own experimental practice. Three original concepts — void axis, technological voyeurism, and 'un-site-specificity' (a new term: conditions of a subversive space) — illuminate the historical and contemporary meanings and practice of Lumia.

Lumia shared particular influences: late nineteenth- and early twentieth-century chromaticism (conceived by western art music composers and abstract film-makers); and the notion of lighting as an exploratory artistic tool, which gained momentum with the advent of electrical lighting technology in the nineteenth century. Thomas Wilfred (1889-1968), argued that Lumia was the eighth art form, following painting, poetry, sculpture, architecture, music, dance, and drama. Over half a century, Wilfred staged his Lumia performances in music halls, theatres, and museums, and was a pioneer in the dissemination of Lumia art in non-live settings, including home entertainment equipment, automated kinetic art, indoor and outdoor projection installations. Wilfred viewed Lumia as a distinct art form and a source of inspiration for these other lighting practices.

Current academic research on Lumia focuses on three aspects: Thomas Wilfred's career; the intermedia appearance of Lumia (between traditional art forms); and the interpretation of Thomas Wilfred's aesthetic style. However, art historical discourses mostly dispute that Lumia is an independent form of art, which I — as a contemporary Lumia artist — examine through the lens of Technologically Extended Aestheticism (TEA) to make a critical case for the art's independent status.

This thesis argues that traditional art historical approaches, complemented by practice-based research, show Lumia to be fundamentally distinct: to have a particular role to play in understanding the aesthetic reality of lighting.

The main research question asks: what is the medium-specificity of Lumia and how does it inform contemporary lighting art and re-present Lumia within the history of art? This research hypothesises that Wilfred's prototype Lumia performance instruments, Clavilux, may be used to connect the idea of Lumia with the materiality of light as its medium - Clavilux is not a mere instrumental artefact but generates a comprehensive art historical discourse, aiding the search for the medium-specificity of lighting. This contrasts against investigating Lumia as an abstract and symbolic concept (such as Theosophical associations and Bergsonian interpretations of duration) and Clavilux as a media archaeological artefact. Such approaches are inadequate, negating contemporary Lumia artists' continuation of the art form. To appreciate Lumia's historic and current significance, it is imperative to evidence Lumia's contemporary position through practical observations, experimentations and demonstrations.

The knowledge of the medium-specificity of Lumia is applied to establish aesthetic methods of material, technological and intermedia interventions in creating new Lumia works. The new Lumia artworks created as part of this research are performative; they follow medium-specificity to evoke new ways of perceiving objects through lighting. This thesis initiates a contemporary dialogue with a historical art practice through the prototyping Clavilux, demonstrates prototyping as an alternative

research method, and will encourage lighting art practitioners, art historians, and artist-technologists to discuss and promote Lumia's historic legacy and contemporary manifestations.

Keywords: Lumia, Clavilux, Lighting, Medium-Specificity, Aestheticism, Prototyping, Apparatus, Artist-Bricoleur, Genealogy, Phenomenology, Void Axis, Technological Voyeurism, Un-site-Specificity

Lumia - the Art of Lighting the Void in Time: Prototyping New Instruments as a Historical Discourse

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This thesis represents partial submission for the degree of Doctor of Philosophy at the Royal College of Art. I confirm that the work presented here is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

During the period of registered study in which this thesis was prepared, the author has not been registered for any other academic award of qualification. The material included in this thesis has not been submitted wholly or in part for any academic award or qualification other than that for which it is now submitted.

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Glossary

Terms	Definitions
Aestheticism	Walter Pater, James McNeill Whistler, and Oscar Wilde are prominent figures of the late nineteenth-century arts movement, which emphasised the autonomy of the arts against mimesis.
Animation	A critical framework of time dependencies in medium-specificity rather than the technical definition of genre.
Apophenia	Establishing links between unrelated things.
Apparatus	A physical, virtual or conceptual instrument used in Materialist discourse.
Bracketing	Phenomenological reduction to eliminate preconceived notions and biases that prevent one from perceiving something as it is.
Bricoleur	A term coined by Claude Lévi-Strauss to describe a person who creates new knowledge through the use of any tools, regardless of their predetermined functions.
Clavilux	Thomas Wilfred coined this term to describe his performance instruments for Lumia.
Deep Form	A concept proposed by Michalle Gal to contextualise the notion of form within the Aestheticist and Formalist paradigms of contemporary literature and philosophy.
Diorama	A three-dimensional replica of a scene recreated. Clavilux, Lumia's performance instrument, is considered as a diorama of lighting conditions in this study.
Lighting	In this study, lighting is viewed as a distinct art form that employs light to express aesthetic concepts and reveal its performative aspects.
Lumia	A new lighting art form that emerged in the early 20th century that explores Aestheticist and Formalist values by creating new devices to access and perform light.
Luminal	Light-centric.
Medium	An agency of the arts. Particularly in this research, mechanical, technological, and conceptual devices are extensively explored, and Lumia represents the spatial-temporal dimensions of lighting.
Medium-Specificity	Specific values held by various media.
Pareidolia	Perception of specific images from abstract and ambiguous images.
Play	This study considers play to be the unexplored physical possibilities of media (related to bricoleur) beyond their prescribed functions.
Prototyping	Prototyping is re-imagined as an alternative historical research method on technological arts. For instance, in Lumia, developing Clavilux prototypes combines creation, speculation, documentation, observation, and presentation.

Technologically Extended Aestheticism (TEA)	A method proposed by this research for investigating aestheticism through material, technological, and intermedia explorations.
Technological Voyeurism	A type of technological simulation that reveals new perspectives on an existing object or enables the repetition of the object's ephemeral perspectives.
Un-site	Noun: A visible space, but only by subversive seeing. Verb: to see outwith an immediate site.
Un-site-Specificity	Specific values held by individual un-sites.
Void Axis	An axis that allows one to examine space by recognising how the void affects the presence of things and how it connects things.

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Chapter 1: Introduction

The research for this thesis was ignited by my initial question: how does the history of Lumia inform contemporary lighting practices, including light-based installation art, projection mapping, theatrical and architectural lighting design? This thesis captures my journey as a practitioner of revisiting, reconstructing through bricolage, and re-presenting the art of Lumia, most widely known as the lighting art practice of Thomas Wilfred (1889-1968).

As a trained theatre lighting designer, Lumia inspired me to see the medium of lighting as an independent art form and provided an artistic approach for my lighting practice. Before encountering Lumia, lighting was to provide accurate and precise illumination for performers and objects in its creative contexts. The reflection and refraction of light that is the material and aesthetic foundation of Lumia, when on display, was only an 'accidental image[1]' (Gamboni, 2002). This 'accidental' nature was assumed to be caused by carelessness and/or a lack of experience. Gamboni argues,

> Renaissance, particularly after Romanticism, and providing the terms for the development expressed in 1957 by Marcel Duchamp's radical formula, 'It is the ONLOOKER who makes the pictures.' This book [*Potential Images*] with which it will be concerned are those that depend on 'the onlooker's state of mind' and come fully into being, in conformity with the artist's

[1] Gamboni distinguished three types of images found in abstraction including 'accidental', 'hidden', and 'potential' - 'accidental' image is discovered through interpretation, 'hidden' image is discovered through decoding, whereas 'potential' image is revealed through the states of alignment between artists and spectators. From my aestheticist perspective, the alignment is achieved by embodying the medium-specificity by artists and spectators.

> intentions, only through the participation of the onlooker … Let me finally make it clear that the term ‘image’, as in the expression ‘potential image’, extends beyond (and calls into question) the figurative or mimetic image…
>
> (Gamboni, 2002, pp. 9-10)

This thesis regards the image of Lumia as 'potential' (Gamboni, 2002) but also as a critical case study that can be used to connect theory and practice of lighting art, because Lumia operates between its theoretical form (animation of lighting) and its practical form (theatre of lighting). In other words, in the context of Lumia, one must recognise two dimensional image as a derivative or partial phenomenon of the three dimensional condition of lighting, so focusing on the image alone would certainly lead to misunderstanding and/or undermining the medium specificity of lighting. In addition, the term ‘animation’ in this thesis refers to a critical framework of time dependencies in medium specificity rather than the technical definition of genre.

The ocular-centric bias observed in visual analysis, beginning with the examination of painting, seemed to have influenced how other forms of visual arts including Lumia have been studied. Here, I would argue that the way in which Lumia has been represented thus far in art history inadequately represents its significance as an art form.

As a historically informed maker, who has based the first two years of the PhD research exploring what was on offer in the archives of *Thomas Wilfred Papers (MS 1375)* (New Haven, Manuscripts and Archives, Yale University Library), I sought practically applicable knowledge of Lumia through my

literature review (see section 2.1) and practice review (see section 3.3 and subsection 4.3.3). In response to the literature and practice review, I reconstructed and represented Lumia through the following five steps: manualisation — material exploration and mechanical prototypes (see section 5.1, and subsections 5.2.1, and 5.2.2); simulation — virtual prototypes (see subsection 5.2.4); subversion (see subsection 5.2.6); conceptualisation (see subsections 5.2.3, 5.2.5, and 5.2.7); and dissemination — ways of sharing the research including conference papers, educational workshops, art exhibitions (see section 5.3) as a methodology to develop new types and concepts of Clavilux prototypes. In the conclusion (see chapter 6), I reflected on the impact that this research has had on my own artistic practice and discussed future research.

This research differs from other historical research on Lumia: this thesis situates Lumia within the context of performance rather than painting and film. Furthermore, it puts an emphasis on the artist's perspectives (see section 4.1), the maker's intelligence (see section 4.2), and the logic of prototyping (see section 4.3). My work aligns with Krauss's postmodern reading of sculpture in terms of research methodology and narrative. This is because, like Krauss's research, I questioned conventions of perception through material, formalist and phenomenological deconstruction. I then reconstructed the idea of Lumia through a series of practice-based interventions before examining the impact and determining my findings. Overall, the research for this thesis has helped me rediscover and elucidate the unique aesthetics of the void[2] that are animated and performed by lighting.

[2] Images of lighting are commonly found on surfaces, and one assumes the surfaces as screens. Void is an important spatial dimension in studying the medium-specificity of lighting that helps one see how light occupies space between surfaces via void.

Chapter 2: Key Historical Discussions and Research Problems

> What does it mean to search for the specificity of an elusive and ephemeral medium? What did it mean for Wilfred in the twentieth century? What does it mean nowadays for contemporary light artists?
>
> (Pernuit, 2022, Appendix C)

Dr. Pierre Pernuit is an art historian based at the Sorbonne, specialising in mobile colour. He kindly offered to write a foreword (see Appendix C) to the introduction of my recent exhibition, *LUMIA: PERFORMING LIGHT,* (2022)[3]. In his statement, he summarised my research establishing three main questions, based on his observations and from our conversations about Lumia from the time we met in 2017. My research asks: what is the medium-specificity of Lumia and how does it inform contemporary lighting art and re-present Lumia within the history of art? I thought Pernuit's questions precisely captured the three key dimensions of my research: medium-specificity, historical Lumia, and contemporary Lumia. Here, I wish to add another question from the perspective of praxis: What does prototyping Clavilux (Wilfred's Lumia performance instrument) reveal about Lumia, and how so?

[3] *LUMIA: PERFORMING LIGHT* was an exhibition by Trent Kim, commissioned by Place Partnership at OneRen as a taster event for the development of the new Paisley Film & Media Space. It opened on 12th April 2022 at The Art Department in Paisley, Scotland and ran until 17th April 2022. This exhibition also featured two guest Lumia artists, George Stadnik (b.1950) and Joshua White (b.1942).

Scholarly writings on Lumia did not convince me that lighting is a distinct art form; rather, it made me question Lumia's purpose and left me dissatisfied with scholarly explanations that treat Wilfred's surviving works as poetic relics of the past used as a rhetorical device. The lack of experience with Lumia as a lighting art form and Clavilux as its performance instrument did not appear to prohibit philosophical conclusions, and Lumia was reduced to visual inspirations.

In the beginning of my research, I took on the role of archaeologist, piecing together artefacts from different sources. Through the research journey, my approach was to discover the fundamental structure of lighting, inspired by Wilfred's Lumia. As I gained more experience working with light, my intentions shifted to what might be considered the practice of an 'artist-bricoleur; I gradually transformed into an artist-'bricoleur' (Lévi-Strauss, 1966). In other words, myth, technology, and the logic of light have become crucial to my comprehension of Lumia's aesthetics, which animate and perform the uncharted void. While the literature review and archival research (see subsection 4.3.3) revealed the need for praxis-based historical research inquiry, the practice review, material experiments, lighting compositions, cross-arts collaborations, technological interventions, prototyping — conceptual analyses and exhibition curation assisted in revealing the medium-specificity of lighting in Lumia. These collectively represent the process of its bricolage as a whole.

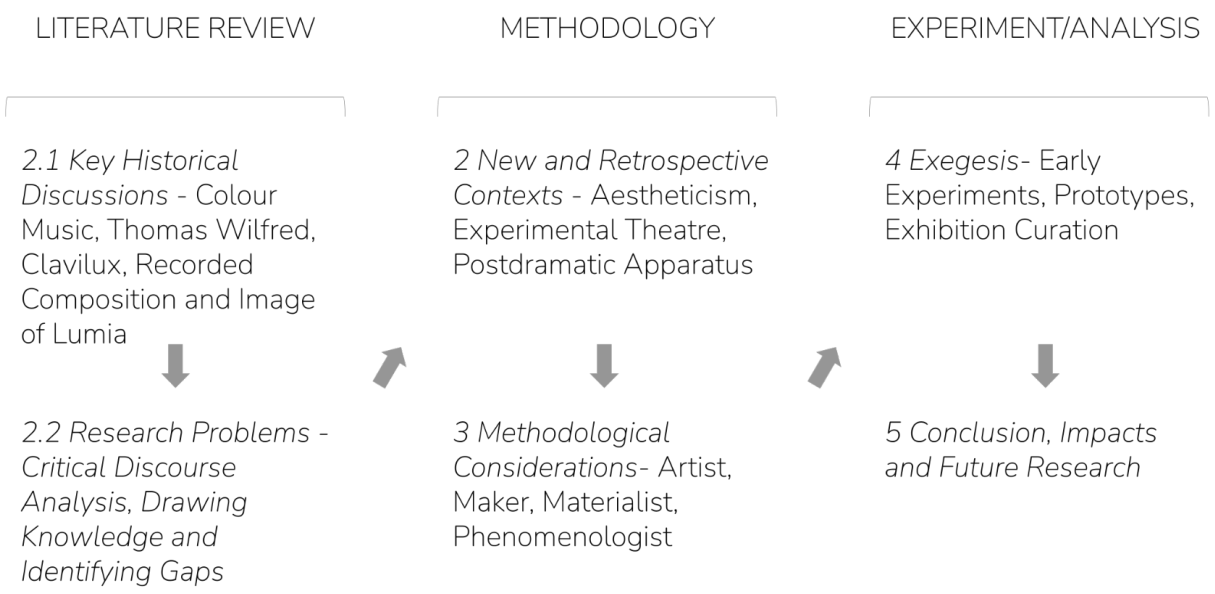


Figure 1. The Overall Flow of this Thesis (Source: Trent Kim)

The above chart summarises and illustrates the overall structure and flow of this thesis. Figure 1 explains the beneficial shifts that I made through the research journey, from drawing on historical, critical, retrospective-genealogical, reflective, to speculative, analytical and theoretical approaches and examples, which assisted in realising prototyping as a viable historical research method.

2.1 Key Historical Discussions

In this research, I argue that Lumia is a lighting art that provides an original performance paradigm, departing from dramatic theatre and mimetic scenography, going beyond image projection by researching new conditions of lighting[4] as its methodology. Additionally, it elevated the status of

[4] For this reason, I catalogue my own Lumia compositions by Opt. (Optics) numbers (see Appendix A); to focus on the conditions of lighting rather than the projected images of lighting. It is worth mentioning that Thomas Wilfred adopted musical Op. (Opus) numbers to catalogue his Lumia compositions.

lighting in the arts by rejecting the colour-tone analogy — where lighting was used to project pre-determined colours for music — and by demonstrating lighting as performance on its own.

> A work of art is not an instrument of communication. A work of art has nothing to do with communication. A work of art does not contain the least bit of information. In contrast, there is a fundamental affinity between a work of art and an act of resistance. It has something to do with information and communication as an act of resistance.
>
> (Deleuze, 2006, pp. 322-323)

Lumia as a new performance paradigm has not only been 'an act of resistance' in Deleuzian terms, but also a resistance methodology. I intend to argue throughout this thesis that Lumia is a paradigm of resistance — by shifting the focus from painting with light to lighting with light and revealing its medium-specificity at a deeper level. In other words, lighting conveys light's condition rather than its image, and understanding how lighting works informs how light can be seen beyond its imagery projection.

To accomplish this, I use a methodology centring on the technological, creative, and critical intervention that I call TEA (Technologically Extended Aestheticism), which was inspired by avant-garde artist-technologists which I refer here to as artist-bricoleur (see section 4.2) such as Thomas Wilfred, Edward Gordon Craig, Oskar Fischinger, but also the concept of the 'bricoleur' by Claude Lévi-Strauss (1966). I argue that the form of early prototypes suggested by some early twentieth-century, performance-based artists offers a more robust and comprehensive forum for

historical dialogues that can bridge history, theory, and practice. By doing so, I critically distinguish Lumia from applied art forms of lighting art such as theatre lighting, projection art, visual music, abstract film, and kinetic art, and I explore how this distinction informs contemporary arts and the everyday practice of lighting.

Lumia and Colour Music, *Thomas Wilfred, Clavilux and Lumia*, *Recorded Compositions*, and *Lighting and Image* will be discussed in detail in the following subsections. As part of the *LUMIA Digital Archive* (Kim, 2022), it is important to note that during this project I have documented events and artworks in interactive digital timelines. This method was particularly helpful in organising different types of archival and academic sources, recognising individual entries equally and identifying and retrieving relevant entries promptly.

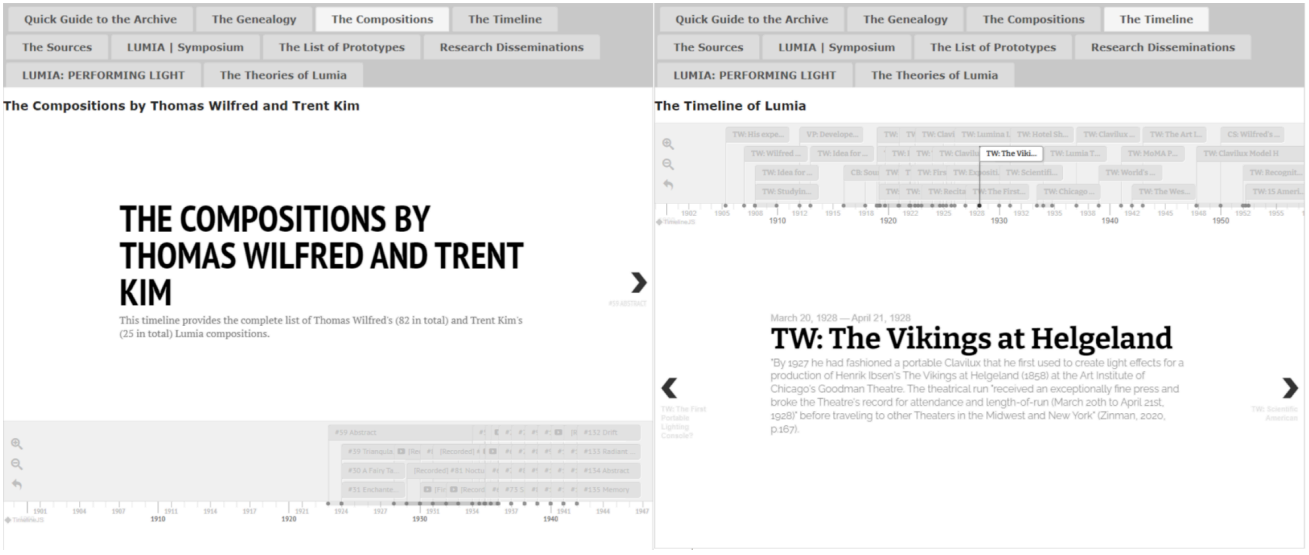


Figure 2. The Compositions and Timeline of LUMIA Digital Archive (Source: Trent Kim)

2.1.1 Was Lumia Colour Music?

> Thomas Wilfred was the first artist in this [twentieth] century to use light as the means for expression rather than for the illumination of real objects from nature.
>
> (Stein, 1971, p. 9)

As its Latin-derived name suggests, Lumia is about light. Thomas Wilfred (1889-1968), the founder of this art form, paved a way for lighting to be an independent art form of performance throughout his creative career as an artist-technologist. In principle, Lumia does not substitute for painting, but performs light. By this, lighting is placed next to traditional art forms such as painting, poetry, sculpture, architecture, drama, and dance. It discovered a distinctive aesthetic style which was perfected in Wilfred's later works for example, *Untitled 161* (see Figure 3).

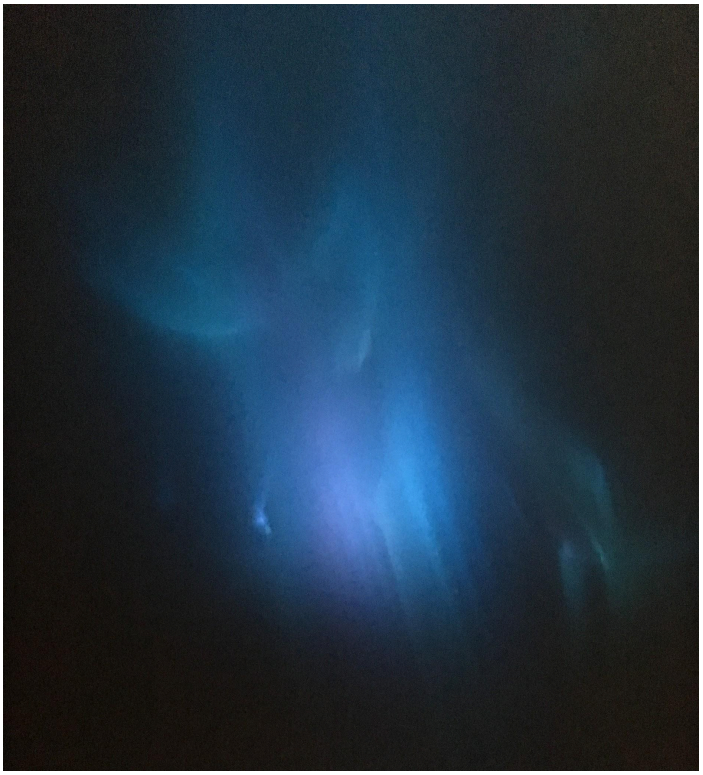


Figure 3. A Snapshot of Op. 161 Untitled (Wilfred, 1965-1966) (Source: Trent Kim)

Thomas Wilfred, a North American artist of Danish descent, founded Lumia in the early twentieth century. He was a baritone singer and traditional lute player before moving to Paris in 1908 to study painting (1908–1910) (Stein, 1971). From 1919 onward, and as a result of his passion for the art of lighting, he devoted his life to Lumia and the development of light performance instruments (known as Clavilux) to realise Lumia.

Despite the fact that Lumia was intended to be the purest lighting art form[5], there was an existing art form — colour music — which bore some similarity and was associated with Lumia. In context,

[5] Frederick Bentham (1976), a British theatre lighting designer and colour music artist suggested that there were three types of colour music artists. The first two were analogists and emotionalists who were divided by whether there is a universal rule between sound and colour. The third type of colour music artists were purists such as Thomas Wilfred and English artist, John Healey.

Wilfred's art was a form of colour music, but by 1910-20, colour music had already begun to decline in the art world; consequently, Wilfred rejected colour music and proposed a purer art of lighting.

Key events in the history of Colour-Music:

- 1704 – Opticks by Isaac Newton proposed natural order of a spectrum
- 1725 – Two essays by Louis-Bertrand Castel published about harpsichord for eyes (*clavecin oculaire*)
- 1734 – Prototype colour organ was constructed by Athanasius Kircher in response to Castel's essays
- 1789 – Proposal of using oil lamps to project colours through glasses by Erasmus Darwin
- 1844 – A notation system for colour music by D. D. Jameson
- 1869 – Pyrophone, a gas organ to produce hissing music (with an intention to develop visual effects) by Frederick Kastner
- 1877 – A machine to play a visual accompaniment on the top of piano by Bainbridge Bishop
- 1893 – A patented colour organ by Alexander Wallace Rimington

The history of colour music dates back to 1725, when a French Jesuit named Louis-Bertrand Castel proposed the concept of a 'harpsichord for the eyes' (Peacock, 1988, p. 399) in a letter to *Mercure de France*. Castel materialised his *clavecin oculaire* from what was initially a philosophical notion, despite widespread scepticism from observers. Castel initially experimented with prisms to project colours, but quickly realised their ineffective luminosity. He then switched to 'candles, mirrors, and coloured papers,' and 'each key operated one of the 144 cylindrical candle covers, allowing light to

shine through coloured paper when the flame was exposed' (Peacock, 1988, p. 399). Early colour organs were conceptual and theoretical (influenced by Newton's Opticks) and frequently employed a colour-sound analogy (Peacock, 1988). Inventors such as Erasmus Darwin, D. D. Jameson, Frederick Kastner, and Bainbridge Bishop contributed to the development of colour instruments for the new art form during the eighteenth and nineteenth centuries. Alexander Wallace Rimington, Professor of Fine Arts in London, patented his colour instrument in 1883, and its name, the colour-organ, has become the noun for this type of instrument. Rimington's colour-organ was over 10 feet tall and included '14 arc lamps and many filters varnished with aniline dye ... The five-octave keyboard resembled that of an ordinary organ and was connected by a series of trackers to a corresponding set of diaphragms in front of special lenses' (Peacock, 1988, p. 402). The organ's stops were used to control colour properties, including 'hue, luminosity, and chroma' (Peacock, 1988, p. 402).

> By the late nineteenth century, a disparate group of artists, writers, and inventors had become convinced that 'colour music' represented the art of the future. The idea of colour music was symptomatic of a fundamental shift in aesthetic theory. As an outgrowth of the Romantic and Symbolist movements, music was elevated to a status of supremacy over all other forms of creative expression.
>
> (Zilczer, 1987, p. 101)

Colour music was arguably the dominant expansion of the field of music, but by the beginning of the twentieth century, instrumental advancements were ready for a full trial. Russian composer Alexander Scriabin, who claimed to have synaesthesia (the condition of seeing colours in response to

sound), composed his final orchestral work, *Prometheus: The Poem of Fire* (1910), which featured a colour-light part (named 'Luce' on the musical score). Prior to his 20 March 1915 Carnegie Hall debut with the colour-light accompaniment, a new instrument named Chromola was constructed. The performance received negative reviews, primarily due to the lack of preparation in setting up Scriabin's colour-sound analogy in the system, which Peacock suggests was because 'the Chromola was considered one of the instruments of the orchestra rather than equal in effect to the combined instrumental and choral forces as Scriabin intended' (Peacock, 1988, p. 403). What might have been the start of a new era in colour-music missed its chance. Instead, after Scriabin's *Prometheus*, inventors and artists developed new approaches. For instance, Hallock-Greenwalt invented the Sarabet, 'a small table-like console… [which] controlled the reflection of seven colored lights onto a mono-chromatic background' (Peacock, 1988, p. 404) and in 1920, Adrian Klein created a colour projection instrument for stage lighting.

Figure 4. Exterior of Rimington's Colour Organ (Rimington, 1912) [REDACTED]

It is important to note that a series of hypotheses, prototypes, and performances sustained the evolution of colour music. Particularly, research into Rimington's process of prototyping his colour organ reveals that its design process was the place where technology, the visual arts, and philosophy interact with human perceptions[6].

[6] Rimington believed that colour music refined the role of colour on emotions beyond impressionist and expressionist painting, such as JMW Turner's (1912, p. 5).

Rimington experimented with various mappings of the senses between music and colour-light, such as the following:

a. By dividing the spectrum-band similarly to the musical octave.
b. By giving the colour-organ a keyboard like that of the organ or the pianoforte.
c. By arranging for the general control of the whole keyboard by means of stops — somewhat like those of the organ.
d. By providing higher and lower octaves in the colour scale of relatively paler and deeper intensity, somewhat analogous to (though not strictly corresponding to) the higher and lower octaves of the musical scale (though, of course, in the colour the wavelength remains the same).

(Rimington, 1912, p. 47)

The legacy of colour music should not be limited by its failure (from the perspective of moving image) as a visual art form; it was one of the earliest creative practices which integrated arts, technology, and science. It influenced, and still influences, artists who recognise an instrumental design (apparatus) as central to the aesthetics of their art (such as Takis (Panayiotis Vassilakis) and Nicolas Schöffer). Beyond the debate as to whether colour music or Lumia is the purer lighting art, Wilfred was clearly inspired by the methodology of colour music.

2.1.2 How did Thomas Wilfred Introduce Lumia?

Figure 5. (left) Illustrations of Thomas Wilfred's Lumia Recitals and and (right) his Photograph with Clavilux B (Source: Thomas Wilfred Papers (MS 1375)) [REDACTED]

Wilfred began developing concepts for his own light projection devices during his early years in Europe. After moving to the United States in 1916, he met Claude Bragdon and William Kirkpatrick Brice (also known as 'Kirk')[7]. In 1919, he built his first light performance instrument, the Clavilux A, in

[7] 'Kirk was the only rich man I ever knew who would stake an artist without making his benefaction the purchase-price of some sort of dictation or control … He also built and equipped the laboratory where the Clavilux was developed, and made and gave its inventor, Thomas Wilfred, a place for himself and his family to live, laying no claim upon their gratitude and treating them as honoured guests' (Bragdon, 1938, p. 106).

the studio designed by Bragdon, an architect, on Brice's estate. The studio was situated on Pidgeon Hill Road in South Huntington, Long Island, and measured approximately 20 by 40 feet, with a 15 by 24-foot curved screen and projection area.

The name Lumia did not appear until the 1930s, but his first performance instrument (used between 1919 and 1925) was given a name in late 1921. It was subsequently known as Clavilux A. It is essential to note that Clavilux came before Lumia. Wilfred received his first review from *Vanity Fair* (Farmer, 1920), presumably based on a private viewing. His instrument was labelled as a colour organ, and his practice was classified as a newly-emerging art form known as mobile colour. On 10 January 1922, the first public performance of Lumia took place at the Neighbourhood Playhouse in New York.

The following questions, which appeared in Wilfred's 1938 advertisement in the *Daily Texan* (a University of Texas at Austin, student-run newspaper), capture what motivated Wilfred's creative experiments with lighting in the 1920 and 30s.

Figure 6. Newspaper Advertisement for Clavilux Recital in the Daily Texan on 17 November 1938 (Source: newspaperarchive.com) [REDACTED]

Brice financed the development of Wilfred's first instrument, the Clavilux A, and continued to do so for the next two years. In September 1919, Bragdon, Brice, and Wilfred invited three other members (Harry Thomas Lindeberg, Van Dearing Perrine, and N. F. Trautmann) to join them in forming a new organisation called the Prometheans, whose mission was to develop 'the art of light in all its possible

manifestations' (Finkelstein and Vlachos, 2008). The society lasted only until 1922, around the time Wilfred invented the Clavilux B, the first portable projection device.

Bragdon (1938, pp. 120-121) noted that Wilfred's dominance was the primary cause of the Prometheans' demise. There is little evidence of Wilfred's active collaboration or discussion with other Lumia artists, so this claim is convincing. It is odd that Bragdon (1938, p. 299), who successfully organised and contributed as an artist to Song and Light festivals in 1916, 1917, and 1918, did not play a larger role in the society's development of Lumia.

> Van Deering [Dearing] Perrine, the painter, and Thomas Wilfred, "the Lute Player," not only shared my interest in colour-music but had themselves experimented with it independently, each in his own way, and before I entered the field.
>
> (Bragdon, 1938, p. 120)

Perrine, another member of the society, was a well-known artist whose works have been exhibited in New York galleries such as the Glaenzer Galleries, the Durand-Ruel Gallery, and the New Gallery. Perrine began utilising his own technique: copying a coloured light on a surface in paint, which he also referred to as 'Lumia' (Dearinger, 2004, p. 440) from 1912 onwards. In discussing the history of colour music, Wilfred described Perrine as having 'made a far more significant contribution to the art of light than all the others combined' (1947, p. 250). However, it is unclear whether and how Perrine contributed directly to Wilfred's Lumia.

The Prometheans were a group interested in developing the art of light and influenced by theosophical doctrine, similar to Hilma af Klint, Wassily Kandinsky, and Luigi Russolo, among other visual artists of the period. It is unclear, however, how theosophical ideas directly influenced Wilfred's artistic practices, although his poetic expressions in his writing, such as ‘cosmic consciousness’, ‘great common denominator’, and ‘universal rhythmic flow’, (Wilfred, no date) may arguably suggest potential associations , but any direct association would be lacking in foundation due to the lack of documented evidence.

Nevertheless, Wilfred's prose is frequently more descriptive and fictional than theosophical. Wilfred arguably embodied the phenomena of lighting by placing himself within it. For instance, he compared the experience of Lumia to being inside ‘an imaginary space liner, a sleek fantastic craft, capable of negotiating interstellar space with the speed of thought, and also of idling through the graceful tracery of a great suspension bridge, the submarine gardens of Lost Atlantis, or any realm whatsoever the artist’s imagination may create’ (Wilfred, no date, p. 22).

> ...while the two [art and science] may never truly merge, and while art can do very little for science, science can do much for art. Science [technology] furnishes the tools and materials for all the arts, it supplies lumia with lamps, lenses, color filters, and a thousand mechanical and electrical items – yet all this has in no sense made lumia a scientific art.
>
> (Wilfred, no date, p. 16)

In addition, his view on the relationship between art and science does not adhere to the theosophical principle of the unification of art, science, and religion.

2.1.3 What are Wilfred's Recorded Compositions?

In the course of his interview with Patricia Marx in 1968, only a few months before his death, Wilfred reiterated that Lumia was an art form distinct from painting, and should be performed (The NYPR Archive Collections, 1968). From 1919, Wilfred designed Clavilux A, B, C, D, E, F, G (seven models in total) to facilitate his performances. However, after the completion of his final Clavilux model in 1937, Wilfred ceased Clavilux development due to two main factors: the closure of his laboratory-theatre (The Art Institute of Light) and his enlistment in World War II.

Figure 7. Wilfred's Construction of Recorded Lumia Compositions — Vertical Model (1965) (Source: Thomas Wilfred Papers (MS 1375)) [REDACTED]

Wilfred worked on creating and selling automatons of Lumia after World War II, touring with his Clavilux instrument to demonstrate Lumia performances and innovating his scenic projection instruments for theatre. Wilfred also referred to those instruments as Clavilux. It is essential to note, however, that Wilfred's automatons were not a player-Clavilux (like a player-piano), but rather a miniature-scale performance of lighting similar to a model box for a theatre. Larger automatons, such

as *Op.158 Lumia Suite* from 1963, would be better described as a small lighting theatre, and what is displayed on the rear projection screen is a derivative moving image of lighting that enables us to see the form of lighting. One could argue that Lumia's display serves as an opaque window through which one can observe lighting beyond the image and mechanical performers.

> We may now define lumia's physical aspect.
>
> The composition, recording, and performance of a visual sequence in form, color, and motion projected on a flat white screen by means of a light-generating instrument controlled from a keyboard.
>
> (Wilfred, no date, p. 23)

The concept of recording was not limited to those automatons; despite Wilfred's use of the term, it was arguably a significant component of Wilfred's creative process in performing Lumia. In this context, recording should be examined critically as a creative process rather than the baseless assertion of mechanical automation and simulation of a pre-composed Lumia performance.

> ...he pulls different stops and his hands move from one manual to another — now the screen is a drifting mass of blue and ultramarine tendrils, now fantastic flowers of light unfold in red and orange and pale into a dazzling brilliance of rose and yellow as they slowly rise and evolve. At intervals he stops to write down a passage in a notation peculiar to the instrument — numbers and symbols on vertical staffs.
>
> (Wilfred, no date, p. 4)

First, recording was a part of composition, and progress was made through instrumentation. Second, it required ‘adjustments, modifications, or new additions’ (Wilfred, no date, p. 202) to the existing performance instruments. There were fewer compositional ideas and more technical improvisations and customisations that worked with lighting conditions (as opposed to images directly) in Wilfred's recorded compositions. The first direct indications of this are the less-defined and less-standardised mechanical parts present in the recorded compositions, which appear to suggest that each construction creates a new space as opposed to a standard instrument's interior. In addition, the durations of the recorded pieces were much longer than those of the Lumia performances.

Figure 8. Clavilux Recital Programme from 30 March 1939 (Source: Thomas Wilfred Papers (MS 1375))

[REDACTED]

In contrast to the shorter Lumia compositions performed at his recitals (see Figure 8), some of the recorded compositions lasted months or even years, such as *Multidimensional* (1957), which lasts 129 days, 9 hours, 35 minutes; *Nocturne* (1958), which lasts 5 years, 359 days, 19 hours, 20 minutes, 48 seconds; *Study in Depth* (1959), which lasts 142 days, 2 hours, 10 minutes; and *Untitled* (1966), which lasts 1 year, 315 days, 12 hours (Stein, 1971). These durations were calculated based on the total duration for cycles of individual parts returning to their original position: for example, a part of a three-minute cycle and another of a four-minute cycle would have resulted in a total duration of 12 minutes, but ironically, the bulbs used in those constructions would not have lasted long enough to handle such lengthy and continuous operations. Lumia's classification as either a form of generative art or an experimental form of lighting condition (architecture) that explores its medium-specificity is a contentious issue due to the contradiction between Wilfred's short compositions for live performance and those long durational recorded compositions.

2.1.4 Was Lumia Mobile Graphics?

Wilfred published *Light and the Artist* (1947) in the *Journal of Aesthetics and Art Criticism*, and presumably he had already devoted a great deal of time to writing his 232-page, unpublished manuscript (produced between 1945-1957), *Lumia: The Art of Light* (no date and which was never published). The journal article was an excerpt from the beginning of the manuscript, in which the history of Lumia was outlined and the analogy between colour and sound was rejected using a quote

from Goethe's *Zur Farbenlehre* (1810), thus giving rise to Lumia as a silent lighting art. In the final section of the journal, Wilfred discussed technical set-ups for Lumia performances and his aesthetic theory of Lumia (see figure 9). His theory was based on formal visual analysis by establishing form, colour, and motion as the three factors, and each factor suggesting four sub-factors. Wilfred's most iconic diagram was based on the theory presented in this article.

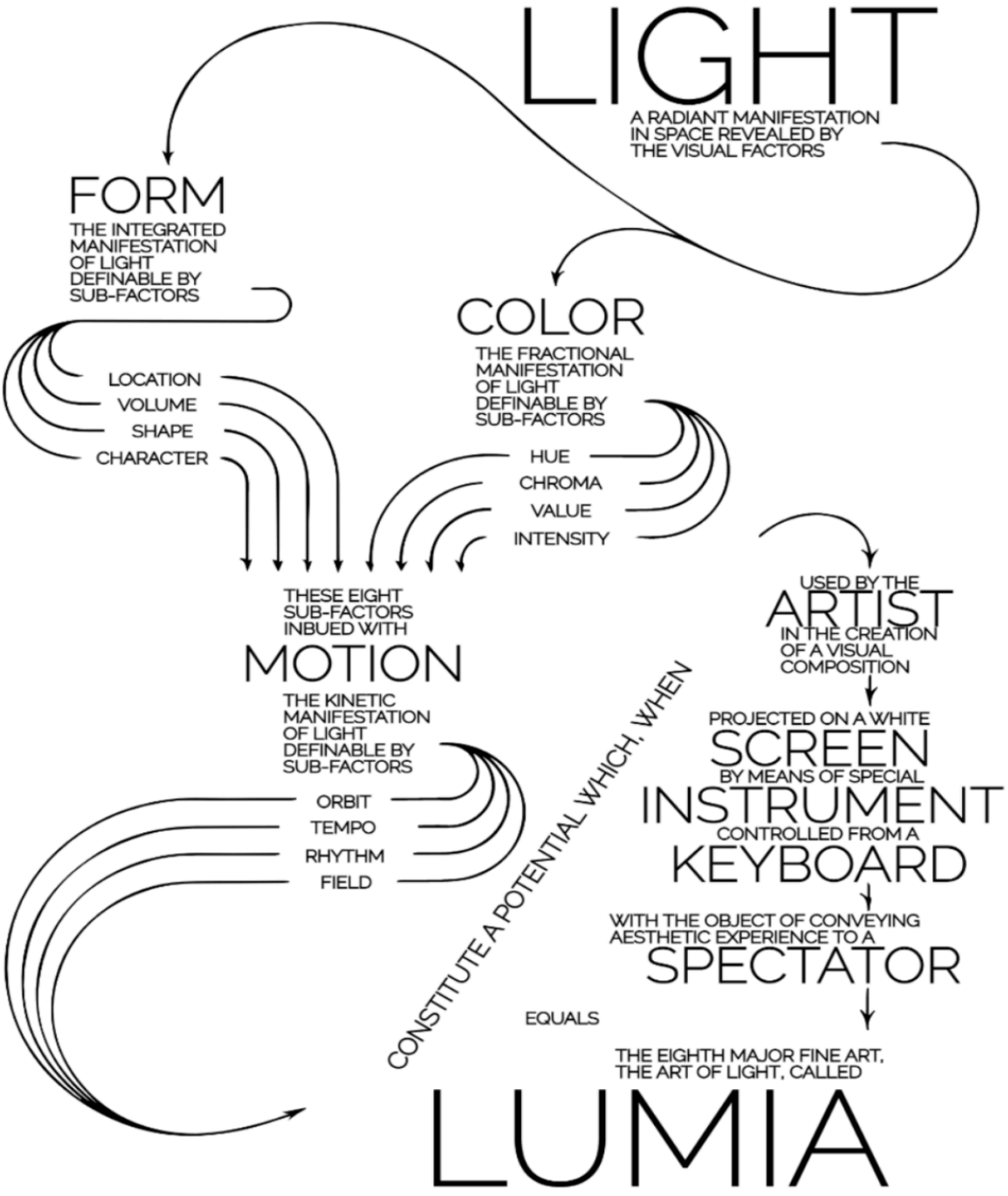


Figure 9. Theory of Lumia by Thomas Wilfred [Digitised by Trent Kim] (Source: Trent Kim)

Edwin M. Blake (1948) responded to Wilfred's 1947 article, *Light and the Artist,* by penning a letter to the editor in which he discussed three aspects of Lumia. First, Blake critiqued Wilfred's rejection of musical accompaniment to Lumia; second, he pointed out the limitation of Clavilux as a tool for mobile graphics (which, he argued, is how Lumia should be classified); and finally, he explained three different types of graphics: 'presentive', 'laminate', and 'depictive' (1948, p. 269) and he emphasised the importance of understanding geometry. Blake's points parallel those of a recent screen media study on Lumia (Zinman 2020; Johnston 2013), which sought to evaluate and incorporate the art as a component of cinema by analysing the two primary factors: the abstract image and the medium of light projection.

Wilfred's response to Blake's criticisms was defensive, equivocal, and inconsistent. Wilfred began by quoting Professor Albert A. Michelson who attended his Clavilux recital in Chicago - 'It seems to me that we have here at least as great a possibility of rendering all the fancies, moods, and emotions of the human mind as in the older arts' (Professor Albert A. Michelson, quoted in Wilfred, 1948, p. 271), before quicking moving onto discussing the art versus science topic. He then distinguished between a fine artist and a technician to defend Lumia's lack of developed craft. Given that Wilfred was both the creator and operator of his own instruments, this was an odd remark. Blake assumed that Lumia was what he believed it to be — three dimensional moving images that were constructed according to geometrical rules — when he posited that imagery production and modification are precise and fluid.

Wilfred continued by enumerating his previous Lumia works with music, and retreated slightly from his stance that Lumia is a silent art. He concluded by discussing his current experiment with

stereoscopy for Lumia, which ironically supports Blake's criticism regarding the types of graphics used to acquire image depth.

Figure 10. Wilfred's 'Esthetic Concept' and 'The Physical Equipment' (Source: Thomas Wilfred Papers (MS 1375)) [REDACTED]

In discussing the image of Lumia, it is important to note that Wilfred defined the screen as a partial view to encompass the optical behaviour of light within his instrument, and that the 15 x 24 foot curved screen (in his studio in Huntington) discussed earlier could be viewed as supporting his theory on the nature of image by light and the role of the screen.

In his letter to mathematician Edwin M. Blake, Wilfred clarified the term ‘space’ within Lumia by stating that it is not ‘infinite space’ but ‘dark space’ and it is not always necessary to ‘have an interstellar aspect’ (1948, p. 275). Wilfred's analysis of the side elevation image of Lumia (Figure 11), however, contradicts the medium-specific design of his Clavilux by treating the illusion of depth as physical depth.

Figure 11. Wilfred’s Imagined Three Dimensional Illustrations (1948, p. 84) [REDACTED]

As Figure 11 suggests, the depth was considered quite literally, and misrepresented the two three-dimensional images in a three-dimensional continuum when, mechanically, Clavilux was incapable of controlling the image accordingly, and the sense of a three dimensional continuum was only valid temporarily for that reason. In other words, his theory of Lumia is incompatible with the way light is conditioned by Clavilux and, more importantly, how image and animation of lighting works entirely differently to painting and animated illustration (or, in Blake's terminology, mobile graphics). His theory is even more problematic when applied to his later recorded compositions, in which lenses were replaced by reflective metals with random dents, and in which the long duration makes it difficult not only to observe but also to adjust, as any adjustment would affect the duration that has already passed. By proposing an incompatible theory, one is almost setting up a task for failure.

Wilfred's collaboration with Bragdon and Brice since the Prometheans (1919-1925) and the New York Camera Club (1919-1922), as well as his interactions with Claude Bragdon and Alfred Stieglitz, encourages researchers to use theosophical concepts to explain Lumia or, more frequently, to include Lumia in their subject area, such as cinema, abstract painting, or visual music. Wilfred pursued the fourth dimension that Bragdon and Stieglitz were interested in, according to Johnston's essay (2013), which is written from the perspective of early cinema.

Figure 12. Wilfred's Drawings to Show Patterns (Template and Roll) Used to Modify the Beam of Light (Source: Thomas Wilfred Papers (MS 1375)) [REDACTED]

In the meantime, a loosely observed technical similarity between Wilfred's modifiers and Hans Richter and Viking Eggeling's scroll paintings suggested that Lumia is another early example of abstract film[8]. The function of modifiers is not to determine the primary shape or image, but rather to fragment and distort the beam as a secondary mechanism. These modifiers were referred to as 'interference patterns', and in his private documentary, Christian Sidenius (1993), who was mentored by Thomas Wilfred and later worked extensively on reconstructing Wilfred's Clavilux models, demonstrated this.

[8] Wilfred identified five shortcomings in Walter Ruttmann's visual films: lack of depth, flicker, automatic rendition, faded colour of tinted films, and musical reliance on mobile colour.

Figure 13. Photographs of Unfolding, Op. 127 (1941) by Thomas Wilfred

(Source: Thomas Wilfred Papers (MS 1375)) [REDACTED]

The sequence of images included in his artist statement for his Museum of Modern Art group exhibition, *15 Americans*, is derived from *Unfolding, Op. 127* (1941[9]) (Museum of Modern Art, 1952, p.31). (see Figure 13) This was one of his compositions for Clavilux; it was intended to be performed live, making it distinct from his better-known, recorded Lumia compositions featured in galleries (Stein, 1971, pp. 81-84). The function of the interference pattern was to split or multiply the light beam, but the primary image is determined before reaching the patterns as the patterns were the last stage of the light beam manipulation. Typically, various shapes of the filaments in the light bulbs — the origin of the beam — determined the initial form, lenses were used to deform the light, and/or a three- dimensional object was placed on a rotating disc to determine the core image.

[9] The exhibition catalogue of *15 Americans* (Museum of Modern Art 1952, p. 31) dated *Unfolding, Op, 127* as 1940, but the 1971 exhibition catalogue of *THOMAS WILFRED: LUMIA* (Stein 1971, p. 84) dated the work as 1941, and this thesis uses the latter.

2.2 Research Problems

I attended Professor Noam Elcott's keynote speech, *What is a Screen?: Material, Human, Divine Notes on the Vertical Screen*, on 17 February 2017. In this speech, for the Yale University Art Gallery exhibition, *Lumia: Thomas Wilfred and the Art of Light*, Elcott proposed the term 'screen' as a way to broaden one's understanding of abstract film and film abstraction. There was a comprehensive list of examples and a collection of quotations connected by the 'verticality' (Elcott, 2017) of the screen. Professor Elcott's lecture was not about Lumia, but rather about abstract film; however, his lecture aided Lumia and the exhibition in spreading its foregone conclusion — Lumia as an example of using unconventional projection for abstraction within vertical cinema. During the Q&A session, I highlighted my understanding of the Clavilux mechanism based on my research of Wilfred's patent documents. (I have since developed a greater understanding of the mechanism.)

In particular, I discussed how the vertically aligned Clavilux pulley system would have contributed to making many (though not all) of Wilfred's works vertical. In addition, I expressed my concern regarding the manner in which theory undermines practical concerns and operations which in my view provide critical insights in terms of medium-specificity. Professor Elcott defended this position, admitting his limited knowledge of Lumia, and pointing out that Alois Riegl's definition of 'material, function, technique, and technology' as limitations to 'understand aesthetic experience' seems to assume that it is in the maker's best interest to produce aesthetic experience that transcends material truth. Critically, the position appears to permit theorists to under- or over-write what aesthetic experiences are, regardless of their medium-specificity (Elcott, 2017).

My observation, from the perspective of Lumia history, where the art has been curated to fit the scholar's pre-determined frameworks, echoes Triggs's assertion, made from the perspective of design history, that 'practitioner-historians operate both within and outside the institutional frameworks of curatorial practice' (2016, pp. 18-19).

Wilfred even voluntarily subjected Lumia to formal visual analysis, and in *The Future of Painting*, Wright (1923) proposed Lumia as a new development in the art of colour that emerged from painting, when Lumia was still an unnamed lighting prototype.

> The artform is in its infancy. What we shall see if humanity stays alive long enough, will not be indicated by anything done today because the Johann Sebastian Bach of Lumia has not yet been born.
>
> (The NYPR Archive Collections, 1968)

Lumia is treated as image or technological additions to the image rather than technologically enhanced aestheticism, which Wilfred, his followers, and I pursue by hand, where art and technology lose their conventional boundaries from one another. Wilfred repeatedly stated that Lumia was in its infancy during his lifetime; based on my review of the context, I interpret this as an inability to establish the structural and conceptual level of Lumia to justify its independent status. But also, I reiterate: the institutional frameworks 'subjugate' the knowledge of Lumia (Foucault, 1980).

Foucault identified two categories for subjugating knowledge: first, by dismembering and concealing the historical content beneath ‘a functionalist coherence or formal systemisation’ (1980, p. 81). Second, by treating ‘a whole set of knowledges … disqualified as inadequate to their task or insufficiently elaborated: naive knowledges,’ they would be placed at the bottom of the knowledge hierarchy ‘beneath the required level of cognition or scientificity’ (Foucault, 1980, p. 82).

I would argue that Lumia falls into the second category, due to the lack of theoretical articulation at a structural and conceptual level, and this should be acknowledged as the cause of Wilfred's sense of the art's infancy. As its pioneer and advocate, his was a candid and honest position.

Reviewing the existing literature on Lumia necessitates examining the underlying institutional contexts as well as the existing knowledge gaps. For detecting frameworks, I have adapted Fairclough's model of Critical Discourse Analysis. For identifying knowledge gaps, I have mapped out key literary sources on Lumia, utilised InfraNodus's Text Network Visualisation (Nodus Labs, no date; Paranyushkin, 2019) of Wilfred's Patricia Marx interview (The NYPR Archive Collections, 1968), and consulted archival and technical materials.

2.2.1 Critical Discourse Analysis - Convenient, Peripheral, Closed

Following Foucault's conception of discursivity, Fairclough (2010, p. 94) recognises events to be discursive, and proposes three core dimensions to systematically analyse them: first, ‘text or speech’ itself; second, ‘production’; and third, relevant ‘social practices’.

In this subsection, I will explain my analysis of partial text, peripheral production, and closed practice using specific literary instances.

> Wilfred: "It [Lumia] is an art to be performed in a concert hall and it will be that way when in later years it builds up."
>
> (The NYPR Archive Collections, 1968)

First, I would like to examine how scholarly texts on Lumia are partial in order to privilege their chosen part of Lumia's history (automatons) and to disregard the rest (performances), despite Wilfred's assertion in his last radio interview (The NYPR Archive Collections, 1968) that Lumia is a performance genre.

It was especially surprising to find this textual trait in the articles published in the two major Thomas Wilfred retrospective exhibition catalogues: *Thomas Wilfred: LUMIA - A Retrospective Exhibition* (Stein, 1971) and *LUMIA - Thomas Wilfred and the Art of Light* (Orgeman *et al.*, 2017).

> Initially, Wilfred thought of lumia as an art of public performance and the majority of his compositions were composed for the clavilux. Comparatively few of these were ever transcribed from a clavilux composition to an internally programmed instrument. In 1928, partly due to the demands being placed on him by individual art collectors and his own desire to be in museum exhibitions and collections, the artist reconsidered lumia's potential.
>
> (Stein, 1971, p.15)

The aforementioned quotation by Stein appeared in the 1971 retrospective exhibition catalogue, and it defended the worth of Wilfred's recorded compositions and/or established a case for her curating with just the automaton versions of Lumia, and without any Clavilux models[10].

It is important to note that none of Wilfred's Clavilux models (A, B, C, D, E, F, G, and H) have been preserved in a working condition since his death in 1968. The only extant physical artworks that survived are mostly the recorded compositions and a few semi-automated home Clavilux devices.

Furthermore, Wilfred's unpublished manuscript, *Lumia, the Art of Light* (written by 1947) primarily discussed Lumia as a live performance, and Wilfred devoted less than a page to recorded compositions in this document. Wilfred stated that 'recorded compositions may be exhibited or installed permanently in museums, galleries, halls, waiting rooms, or private homes' and he admitted that it seemed 'the simplest way to present a lumia artist's work in every part of the country' — at the time, in the midst of World War II in the United States (Wilfred, no date, p. 112). In fact, between 1933 and 1943, Wilfred ran the Art Institute of Light and his own research centre for Lumia at the Grand Central Palace (480 Lexington Avenue in New York), and he regularly performed Lumia recitals and continued his Lumia performances after WWII.

Wilfred must have had a difficult time financially throughout the 1940s, given his entry in the 1940 US census (his salary earned, including commissions, was listed as $0.00), the closure of the Art Institute of Light, and the lack of his projected scenery commissions in theatre[11].

[10] 'The works in this exhibition are internally programmed, self-operation instruments' (Stein 1971, p. 98).
[11] '[in the 1930s] ...the decline of the living theatre had already set in, talkies and "musical hits" dominated Broadway' (Wilfred, no date, p. 129A).

Maibritt Borgen's *Lumia and Postwar Art: Space, Time, Drama*, included in the 2017 exhibition catalogue, also privileges Wilfred's recorded compositions. And, in this case, even Wilfred's words were taken out of context and, arguably, misrepresented.

> In Wilfred's text, which he wrote himself, he called lumia a "drama of moving form and color unfolding in dark space" — a description that is not surp[r]ising considering that lumia compositions originated as a performance-based art, conducted in live, public recitals.
>
> (Orgeman *et al.*, 2017, p. 55)

The text that Borgen referred to came from the exhibition catalogue of *15 Americans* (1952), and here is the full paragraph by Wilfred.

> The lumia artist visualizes his composition as a drama of moving form and color unfolding in dark space. In order to share his vision with others he must materialize it. This he does by executing it as a two-dimensional sequence projected on a flat white screen by means of a specially constructed light-generating instrument controlled from a keyboard. By manipulating the sliding keys, he can release white light, mold the light into form, add color.
>
> (Museum of Modern Art, 1952, p. 30)

In fact, Wilfred was discussing Lumia's performance in that paragraph, but the partiality of the language adds to the establishment of a knowledge hierarchy that subjugates Lumia's understanding.

Second, I would like to claim that Lumia is frequently mentioned in the periphery of numerous scholarly works as a visual supplement to their central discourse. Elcott's keynote could be regarded as an example of discussing Lumia on the periphery of the cinematic discourse, but the same is true of many other writings, such as the previously mentioned *The Future of Painting* (1923), *A Primer of Modern Art* (1924) by Sheldon Cheney, and *Expanded Cinema* (1970) by Gene Youngblood.

In *A Primer of Modern Art*, Cheney introduced Wilfred's work as mobile colour, and referred to Clavilux as a colour organ (because the term Lumia had not been coined at the point of writing). He mentioned his visit to Wilfred's studio in Huntington, so the private viewing would have been performed by Clavilux A.

> Movement added to what Kandinsky has would lead us into the field of mobile color. Everything that he claims is possible there, as Thomas Wilfred has shown us; but that is not the art of painting.
>
> (Cheney, 1924, p. 167)

Wilfred's art was first mentioned in the chapter, 'The Swing Toward Abstraction', but his art by Clavilux was discussed rather dominantly over a 14-page chapter, 'The Art of Mobile Color', which immediately followed *The Swing toward Abstraction* (Cheney, 1924).

Figure 14. The Table of the Contents of A Primer of Modern Art (Cheney, 1924, p. xii) [REDACTED]

Cheney was a writer and art critic who was interested in modernist art and experimental theatre. He played a pivotal role in the development of the new American theatre between 1916 and 1921 as the creator and editor of *Theater Arts Magazine*. This particular publication invited experimental performance artists to contribute, including visionary scenographers like Adolph Appia and Edward Gordon Craig, as well as Claude Bragdon. The magazine ran Wilfred's article *Prometheus and Melpomne - How They Met as Equals* (1922). In this article, Wilfred discussed his projection design for Ibsen's *The Vikings*, in a production by Thomas Wood Stevens for the Goodman Memorial Theatre in Chicago. He described how he utilised a Clavilux device for theatre projection, to be controlled remotely from the orchestra pit. He also described the set-ups, clearly demonstrating the benefit of applying his Clavilux to this new territory.

> The Clavilux units were mounted on steel towers or in a semi-circular battery in the fireplace on the floor but most of the interest centred around the keyboard which I placed in the orchestra pit with a chair behind it, an aluminium console only one foot side and with keys no larger than a pencil head.
>
> (Wilfred, 1922, p. 641)

These are important contexts in the production of Cheney's 1924 book, and it is evident that the narrative is closely associated with his interest in avant-garde theatre; but even in the 14th edition of the book in 1966, where new chapters, illustrations and corrections have been made over the years, he did not include any improvements in the text on Wilfred's art. For example, the term ‘Lumia’ was

nowhere to be found, and Wilfred's further developments were not included in his last chapter, 'Twenty Years of Progress', which examined the twenty years since the first edition.

Figure 15. Newspaper Article on Lumia and Broadway on 20 April 1956

(Source: The British Newspaper Archive) [REDACTED]

As acknowledged in this 1956 article, 'The Decline of the Theatre on Broadway - New Theatre and Lumia Needed' by Terry M. Iles, Clavilux was found in theatres over the years and began a new lease of life under 'projected scenery', for which Wilfred even published a book, Projected Scenery: Technical Manual, in 1965.

Yet, the 1966 edition of Cheney's words on *The Art of Mobile Color* concludes with the following paragraph:

> But this much is sure: here is the beginning, or at least the first serious achievement, of an art as primitive, as complex, as capable of varied emotional beauty as music; and its medium is light — that light which was the earliest god of humankind, which to this day typifies all that is spiritual, joy-bringing and radiant. Perhaps, then, this is the beginning of the greatest, the most spiritual and radiant art of all.
>
> (Cheney, 1924, p. 188)

For Cheney, Lumia serves as a convenient example to bridge between abstraction and expressionism — by demonstrating how the sense of non-figurative, complicated aesthetics evokes emotion. Cheney calls this 'significant form'. However, Wilfred's Lumia performances, gallery exhibitions, and projected scenery techniques (utilising Clavilux in the theatre) had not been discussed. As a result, Lumia exists on the outskirts of the narrative of the book.

Lumia in *Expanded Cinema* by Youngblood (1970) is another example of peripheral placement. Without a distinct introduction, the term Lumia occurred multiple times throughout the book, in chapters such as 'The Cosmic Cinema of Jordan Belson', 'Synaesthetic Videotapes', 'The Artist as Ecologist', and 'Multiple-Projection Environments'. Youngblood's work implies that Lumia is a catch-all term to describe an abstract style of moving images created by light. Consequently, this oversimplified the critical discourse about light as a medium. However, it is important to note that

Lumia incorporated a form of screen in the set up so a technical connection with cinema can be argued.

In Youngblood's usage, Lumia refers to Wilfred's technique and style but it is difficult to see what the original form of Lumia meant to Youngblood. It can be argued that Youngblood, instead of researching into Wilfred's Lumia in depth, used the seeming lack of theoretical rigour in Lumia to reframe it as 'a paradigm for an entirely different kind of audiovisual experience, a tribal language that expresses not ideas but a collective group consciousness' (1970, p. 387). Lumia was regarded as an antiquity that inspired audiovisual practices such as Jordan Belson's Vortex Concerts and Jackie Cassen and Rudi Stern's Theatre of Light, and the book contends that Lumia now belongs to the expanded cinema and paracinema[12].

> The legendary Vortex Concerts conducted by Henry Jacobs and Jordan Belson at Morrison Planetarium in San Francisco's Golden Gate Park from 1957 to 1960 were quintessential examples of lumia art integrated with sound in an intermedia environment.
>
> (Youngblood, 1970, p. 388)

By showing those audiovisual practices that were influenced by Lumia but existing in a form of cinema, this book neglected how Lumia historically emerged in opposition to audio-visual tradition and the manner of filmmaking.

[12] According to Jonathan Walley, the term paracinema was coined by Ken Jacobs and 'refers to works identified by their makers as "cinematic" despite not using any conventional moving image medium' (2020, p. 108).

Figure 16. An Illustration from Wilfred's Patent 1,825,497 Light Projection Display Apparatus [Patented in 1931] (Source: United States Patent and Trademark Office) [REDACTED]

Figure 17. Wilfred's Design of The Heptarena Theatre (1965, p. 37) [REDACTED]

Further research into Wilfred's Lumia and projected scenery would have revealed the depth of medium-specific inquiry made by Thomas Wilfred through his innovative ideas such as the 1931 patent outdoor screen design (Figure 16) that was proposed as an alternative form of a dome

construction, as well as his design of The Heptarena Theatre (Figure 17), that brought to life the concept of a 360-degree cylindrical screen for live performance. By these designs alone, it is evident that Wilfred's Lumia is not a paradigm for experimental audio-visual practices, but rather the art of experimental lighting.

As the third and last part of my critical discourse analysis, I would like to discuss how academic texts on Lumia exercise closed practice by restricting the scope of references. Stephen Eskilson's (2003) *Thomas Wilfred and Intermedia: Seeking a Framework for Lumia* is the subject of this part.

Wilfred confirmed unequivocally that Lumia is an art form distinct from painting (The NYPR Archive Collections, 1968), and that it cannot be created like music[13]. Nonetheless, Eskilson's article asserts that 'scholars have neglected an essential element of Wilfred's work: the paradigm shift he embraced in the early 1930s, moving from a musical analogy for Lumia to a conceptual framework more analogous to painting' (Eskilson, 2003, p. 65). Eskilson's conclusion is to reject Wilfred's independence declaration and reaffirm that Lumia belongs to painting, in accord with several other art historians, such as Donna Stein, Willard Huntington Wright, and Sheldon Cheney.

[13] Wilfred composed *Lumia Suite, Op. 120* 'in strictest sonata form' and, following public performances, he determined that the audience did not express a preference for it because many of them did not even perceive the sonata form (Wilfred, no date, p. 71).

Figure 18. Intermedia Chart by Dick Higgins (Higgins and Higgins, 2001, p. 50) [REDACTED]

However, there was not a single mention of what Eskilson meant by intermedia. For example, intermedia (Figure 18) does not necessitate a stateless medium merging with established media. Intermedia is a creative act, and, as the Fluxus artist Dick Higgins wrote in the 1960s, modern art 'seems to fall between media' and mirrors wider social change: 'approaching the dawn of a classless society, to which separation into rigid categories is absolutely irrelevant' (Higgins and Higgins, 2001, p. 49). Additionally, Higgins argued that by recognising intermediality, we acquire a 'sense of dialogue' (2001, p. 49). In *Discourses and Models of Intermediality*, Jens Schröter (2011) studied intermediality discourse in detail.

The four types of discourse suggested by Schröter are described below:

> I present four types of discourse on intermediality: 1) synthetic intermediality, a "fusion" of different media to super-media, a model with roots in the Wagnerian concept of Gesamtkunstwerk with political connotations; 2) formal (or transmedial) intermediality, a concept based on formal structures not "specific" to one medium but found in different media; and 3) transformational intermediality, a model centered around the representation of one medium through another medium. Model 3) leads to the postulate that transformational intermediality is not located in intermediality but in processes of representation, and thus transformational intermediality is the flip side of model 4) ontological intermediality, a model suggesting that media always already exist in relation to other media. Thus, model 4) suggests that there is no single media but that intermedial relations take place ubiquitously[14].
>
> (Schröter, 2011, p. 2)

If Wilfred sought intermedia through Lumia, it would have been a crucial act, not a 'pragmatic' (2003, p. 68) survival compromise as Eskilson indicated, but rather a process of uncovering its own mediality. If Lumia were revisited through the lens of Schröter's theory, the goal would be to emphasise 'formal intermediality' in order to highlight the shared structures with music and painting, as opposed to representing Lumia through either music or painting, as would be the case with transformational intermediality.

[14] Jihoon Kim in *Between Film, Video, and the Digital* makes a similar claim and uses it 'to examine the relations between the media constituting the medium of the moving image' (2016, p. xi).

Researchers addressing intermedia should also consider any potential political connotations. Thomas Wilfred was invited to the 1967 USITT (The US Institute for Theatre Technology) conference, for a panel titled *Theatre outside the Theatres*, along with other experimental theatre practitioners. Participants included Michael Kirby of Happenings and Fluxus and Billy Klüver of Bell Laboratories, who participated in a historical intermedia performance project, *9 Evenings: Theatre and Engineering* (1966). Earl Reiback, another established Lumia artist, was among other prominent figures.

The panel discussion examined the relationship between technology and art, as well as the function of uncertainty in performance creation. Wilfred's contribution to the conversation was limited to his theatre lighting design and projected scenery practices (but not Lumia), and he shared a rather traditional view on the role of the scenic artist, stating that as ‘an accompanist’, the artist ‘cannot surround the play with a setting that will intensify the action’ (Gaiser, 1967, p. 50).

This panel discussion indicated Wilfred's approach to projected scenery as an applied art practice, and he did not add to the major discussion surrounding ‘be-in’ (Gaiser, 1967, p. 52), exchanges between arts and technologies that contributed to the underlying discourse on intermedia.

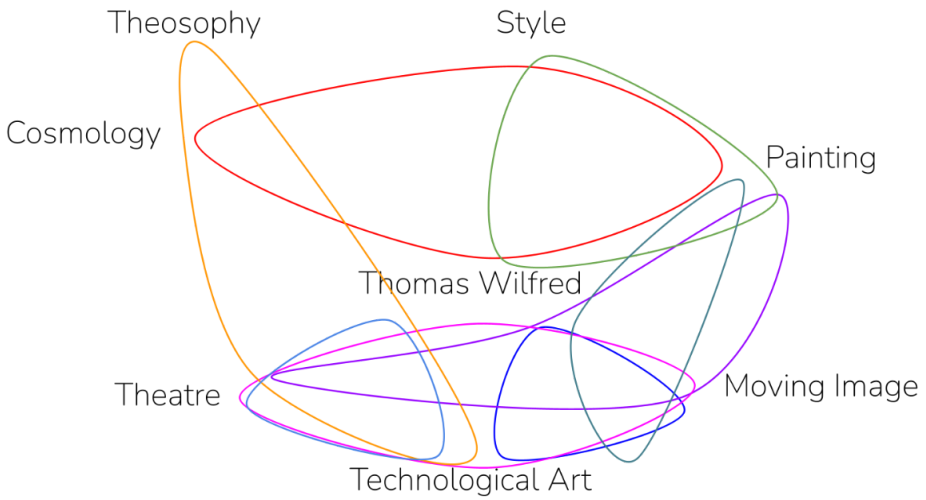
Eskilson's paper did not address the consequences of Lumia's pursuit of intermedia, nor did it explore what intermedia might entail for avant-garde performance acts such as Lumia. Eskilson linked Wilfred's ‘drama of moving form and color unfolding in dark space’ to ‘the tropes of abstract expressionist painting’, based on the fact that Lumia displayed ‘a two-dimensional sequence

projected on a flat white screen' (2003, p. 67). Lumia, by logical extension of this, should not be considered as an abstract expressionist painting but rather a cinematic genre.

Eskilson concluded that 'Wilfred struggled at different times to position his unorthodox art within the institutions of both music and painting, but ultimately failed in both endeavours' (2003, p. 68) and it seems to suggest that art historians and critics played no influence in the historical decline of Lumia. Eskilson's article utilised only a brief list of sources and excluded any reference to intermedia in association with performance and/or cinema.

2.2.2 Drawing Knowledge and Identifying Gaps

As discussed in the preceding subsection, analysing the features of text, production, and practice among the current literature was helpful in identifying the obstacles posed by institutional frameworks in establishing Lumia as a distinct art form. Even before the art was given a name, it was anticipated that its purpose would become part of the history of painting. In contrast, more recently, Lumia became a historical inspiration that inspired new cinematic practices.



A - Perception - Keely Orgeman (2017), Maibritt Borgen (2017)
B - Theosophy - Claude Bragdon (1913), Andrew Johnston (2013)
C - Abstract Art - Willard Huntington Wright (1923), Sheldon Cheney (1927), Donna Stein (1971)
D - Kinetic Art - Frank Popper (1968), Marc Bornstein (1975)
E - Projected Scenery - Thomas Wilfred (1965), Christian Sidenius (1982)
F - Early Cinema - Gregory Zinman (2011)
G - Intermedia - Stephen Eskilson (2003)
H - Performance - Thomas Wilfred (1920), Christian Sidenius (1982)

Figure 19. Colour Coded Literary Diagram (Source: Trent Kim)

I created a literary diagram to analyse the literature on Lumia in further depth by associating key authors with recurrent themes. Thomas Wilfred's career is the most prominent theme in literature, although there was a north-south divide, with the north expressing visual interpretation and the south emphasising technological innovation. The west side reflects the Lumia performance, while the east side reflects the Lumia exhibition, which is almost organised in chronological sequence from Wilfred's earliest Lumia to his most recent Lumia.

The objective of the literary diagram was to reveal the hidden forces and to illustrate that Thomas Wilfred is the only common denominator. One might imagine that the Lumia literature would be

primarily concerned with the medium of light, but instead it focuses on how to improve and expand other media utilising Lumia. The above-mentioned characteristics of the literature on Lumia arguably pose research problems. First, their incapacity to inform modern Lumia practice widens the gap between theory and practice. Second, the absence of practical considerations identified in these essays obscures the ongoing challenges within the art form that impede its development into contemporary practices. Third, philosophical discourses without the knowledge of lighting portray Lumia as a false 'imitation (phantastike)' [for instance, projection art] rather than a true 'imitation (eikastike)' [for instance, Lumia] (Nwodo, 1984, p. 202). Here, I would like to differentiate between the knowledge of lighting and the interpretation of lighting. The knowledge of lighting is prehistoric and phenomenological; it serves as an unalterable standard determined by its material nature. The interpretation of lighting, however, is historic and discursive and inspired by subjective and ocular observations of light.

Further, the knowledge of lighting can be associated with the philosophy of art, and the interpretation of lighting can be associated with the aesthetics of art. According to Christopher Nwodo, 'trueness' (1984, p. 198) in the context of the philosophy of art can be understood in Heidegger's terms as revealing being, as opposed to a metaphysical counterpart — where truthfulness lies in subjectivism. Therefore, the philosophy of art should be seen as an ontological inquiry, whilst the aesthetics of art demonstrates an epistemological inquiry. However, the difficulty is that epistemological explorations are plural and possible even with a limited knowledge of lighting (or almost none if Lumia were regarded as one of the familiar art forms).

Thomas Wilfred's personal events and statements do not define the ontology of Lumia; nonetheless, what motivated Wilfred and other Lumia artists to pursue the medium-specificity of lighting demonstrates the ontology of Lumia. I suggest that the multiplicity of philosophical discourses on Lumia does not reflect the advanced knowledge of Lumia, but rather reveals a lack of veracity, and that these discourses may be viewed as solely methodological experiments.

Thomas Wilfred was skilled at working with light, and his mechanical and conceptual designs reflected his thinking. However, when describing his art, he was untruthful about its materiality. Due to too many physical factors, his Clavilux machines were unable to control colour, shape, and motion individually and effectively; therefore, analysing the visual outputs in isolation creates a faulty basis for interpretations. Regarding this, I would like to recall the conversations between Edwin M. Blake and Thomas Wilfred from subsection 2.1.4.

Claude Bragdon (1866-1946)	Colour	Form	Mobility	*Music	Colour-Music
Thomas Wilfred (1889-1968)	Colour	Form	Motion	*Silence	Lumia
Mary Ellen Bute (1906-1983)	Light	Form	Movement	Sound	Seeing Sound

Figure 20. Theoretical Comparison between Bragdon, Wilfred and Bute (Source: Trent Kim)

Figure 20 compares and contrasts three theories reflecting unique types of abstract animation by Bradgon, Wilfred and Bute, all of whom had direct contact with Lumia but went on to establish their own approaches. Bragdon concluded that Wilfred's Clavilux was unable to adequately 'correspond to the melodic element in music, and the colour-sequence to the harmonic, like a song and its accompaniment' (1938, p. 125) so he resorted to animated cartoons. As seen in *Synchromy No.4: Escape* (1938), Bute utilised Lumia as a distinctly separate and musically 'disinterested' layer that did not immediately respond to a specific musical aspect throughout, but rather as a negation of/impartiality to Bute's 'absolute film' that 'addresses the eye and the ear' (1941, p. 25). Wilfred's Lumia theory failed to give a complete account of Lumia, but his Light-based practices proved his extensive knowledge of lighting.

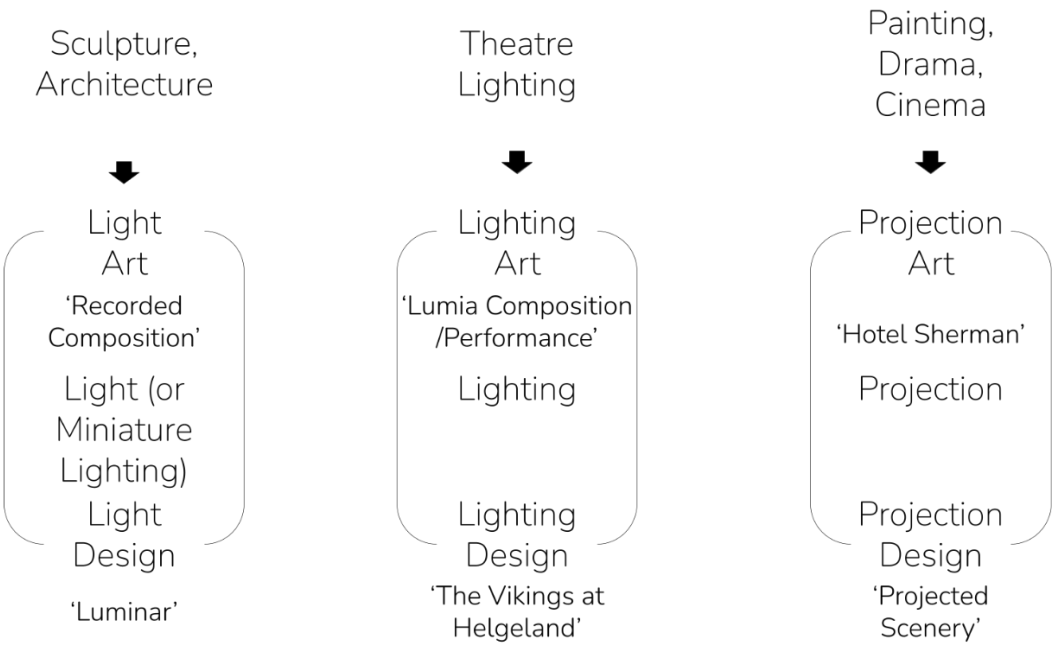


Figure 21. Distinctions between Light, Lighting and Projection in Respect to Wilfred's Light-based Practices

(Source: Trent Kim)

In my archival research, I have learned that Wilfred established different artistic forms of lighting and it led me to distinguish between light as an object, lighting as an action, and projection as a function based on the categories of his artworks that I evaluated, as illustrated in Figure 21. These classifications may help explain why Wilfred distinguished Lumia from projected scenery; Lumia is distinct from painting with light (projection). In the context of stage lighting, it is crucial to emphasise that the term 'light' was sometimes used to refer to a lighting practice associated with the discipline of painting, like colour music, whilst the term 'lighting' referred to a more spatial manifestation. Frederick Bentham wrote in *The Art of Stage Lighting*, 'what we are considering [colour music] is what as a youth I used to call "Light as an Art"'. Bentham stressed the word in question is 'light', and not 'lighting' (1976, p. 363). In other words, in his view, light as a form of fine art serves as an alternative to paint.

Perhaps it could be questioned whether Wilfred's recorded compositions were intended to paint with light or to perform lighting in a scaled-down and automated form. Or, does the concept of recording prompt us to speculate the potential stages of Lumia's performance from notation to documentation?

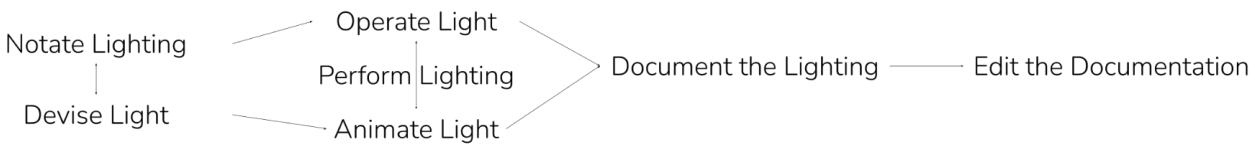


Figure 22. Potential Stage of Lumia (Source: Trent Kim)

Matthew Luckiesh, in *Artificial Light - its Influence upon Civilization* (1920), proposed lighting as a fine art, and raised the following critical questions: 'Will lighting ever become a fine art? Will it ever be able alone to arouse emotional man as do the fine arts? Are the powers of light sufficiently great to enthral mankind without the aid of form, music, action, or spoken words?' (1920, p. 342) Meanwhile, Luckiesh used the phrase 'mobile light' (1920, p. 355) to discuss lighting as a fine art and, importantly, distinguish it from mobile colour or colour music.

> If the art [mobile light] does not develop rapidly it will be merely following the course of other arts … If mobile light becomes a fine art, it will be man's most abstract achievement in art and it may be incomparably finer and more ethereal than music. If this is realized, artificial light in every sense may well deserve to be known as the torch of civilization.
>
> (Luckiesh, 1920, p. 356).

The divisions between painting and theatre and style and technology in my literary diagram, could be a result of the gap in knowledge of lighting: the medium-specificity of lighting — how to perform light.

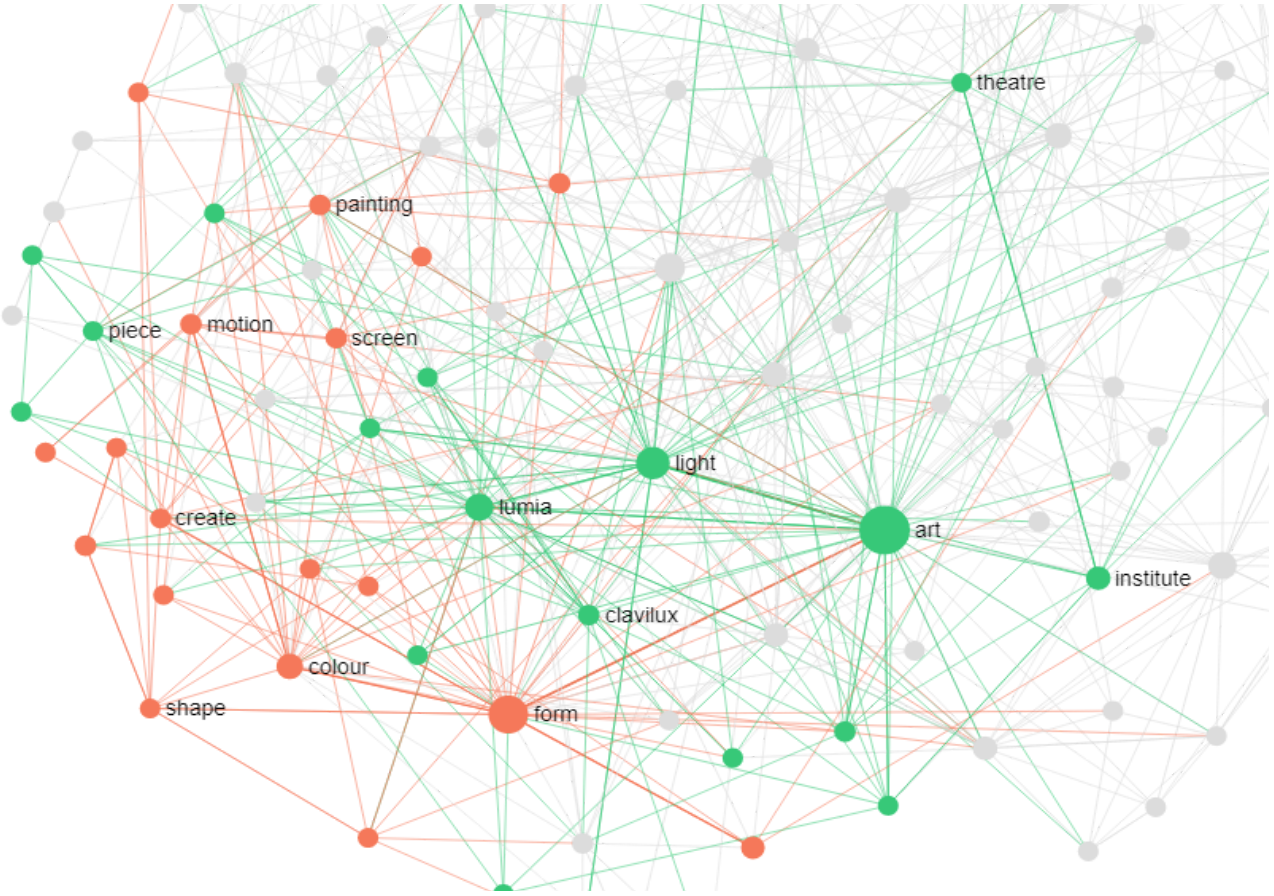


Figure 23. A Disconnection in the Text Network Analysis of Patricia Marx's Interview with Thomas Wilfred

(Source: InfraNodus Lab)

The visualisation as represented in Figure 23, maps the transcript of Wilfred's last interview with Patricia Marx. I have used InfraNodus's text network visualisation and discourse analysis from which to draw out key points of connection and themes. This particular colour coding illustrates the disconnection between two textual networks. The green group consists of painting, motion, screen, create, colour, shape, and form, whereas the orange group consists of theatre, institute, art, light, lumia, and Clavilux.

The system-detected disconnect echoes what I noticed while creating the literary diagram. In this network, the orange network (Wilfred's gallery works and visual analysis) is disconnected from the green network (Wilfred's Lumia performance practices). Importantly, all of the terms that directly contribute to the ontology of Lumia, such as Lumia, light, and art, are part of the green network, and keywords such as theatre and clavilux, that are frequently overlooked by art historians, may provide the bridge between theory and practice, as well as knowledge and interpretation of lighting.

The literature review, archival research, critical discourse analysis, literary diagram and text network analysis have helped illuminate and identify a gap in knowledge: Lumia as an independent performance of light. In chapter 3, I will discuss contexts concerning this knowledge gap including aestheticism, experimental theatre and postdramatic apparatus.

Chapter 3: New and Retrospective Contexts

Lumia's ontology (which is governed by the medium-specificity of lighting), Lumia's theatrical setting, and the role of Clavilux in studying Lumia are the three gaps in knowledge discussed in the previous chapter. And, in this chapter, I have examined three new and retrospective contexts in order to recontextualise Lumia historically.

3.1 Aestheticism

One of the art historical contexts commonly overlooked in discussing Lumia is Aestheticism — despite Wilfred's explicit interest in exploring Lumia as an independent art form.

> "To see the object as in itself really is" has been justly said to be the aim of all true criticism whatever; and in aesthetic criticism the first step forwards seeing one's object as it really is, is to know one's own impression as it really is, to discriminate it, to realise it distinctly.
>
> (Pater, 1873, Preface)

The philosophy of art as an ontological inquiry resonates with Walter Pater's remark on art criticism, and 'seeing one's object as it really is' (Pater, 1873, Preface) offers the truth. To comprehend Lumia as it truly is, it is necessary to break the impasse of linguistic mimesis (see subsection 3.1.1).

Pater and other aestheticist scholars recognised music's achievement in demonstrating the importance of the distinction between matter and form while creatively blurring their border as art.

3.1.1 Mimesis

Despite the concept of mimesis grounding (placing limitations on) various historical remarks on Lumia, there is a lack of acknowledgement. Therefore, this subsection briefly reviews the relationship between mimesis and aestheticism.

Visual mimesis and conceptual mimesis, according to Michalle Gal (2015) are the two predominant types of meaning production in artworks. Visual mimesis presupposes that the picture of a piece of art represents an image of a subject, and hence depicts the subject. By contrast, conceptual mimesis assumes that the artwork's picture seeks to visualise the concept. The purpose of conceptualisation is to generate a mental experience of the concept. For instance, Sol LeWitt described the process of conceptual art making as ‘all of the planning and decisions are made beforehand and the execution is a perfunctory affair’ and suggested that its objective is to make the work ‘mentally interesting to the spectator’ (1967, p. 80). Therefore, the appreciation of art initially takes place outside the artwork through recognising the concept and then both maker and viewer continue to discover the gaps between the textual concept and visual manifestation. Aestheticism, the art movement that emerged in late nineteenth-century Britain, fundamentally rejected such mimeses that rely on external references for art, but famously campaigned for ‘art for art’s sake’ to grant art’s independence — for it to reveal a form of life rather than imitate one. In other words, art does not imitate reality but reveals

reality. John Cage stated that 'the function of art is to imitate Nature in her manner of operation' while borrowing the idea from *Transformation of Nature in Art* by Amanda K. Coomaraswamy (Cage, 1967, p. 31).

3.1.2 Self-Referent

In this subsection, I continue the discussion of mimesis, but from a semiotic perspective. This context will also offer a necessary foundation for my methodological discussion in subsection 4.2.1 The Concept of Centre.

The aestheticist paradigm lasted until the mid-twentieth-century and Gal (2015, p. 47) argued that the era of aestheticism (but also formalism) found in British and American art ended in the 1960s due to the return of mimesis in art criticism through conceptual mimesis.

Whether it is visual or conceptual mimesis, 'meaning is to be instilled into the structure of the work in order to render the structure valid or ordered' — so the meaning depends on its referent (the subject or concept) rather than the form itself (Gal, 2015, p. 49). It shares the 'nature of the linguistic sign' (Saussure, 1916, p. 65). By contrast, aestheticism placed an emphasis on form over content, so art would 'be immune to all types of external completion, like conceptual and distinct meaning' (Gal, 2015, p. 49).

From Walter Pater, Oscar Wilde and James Whistler, to Roger Fry, Clive Bell, Clement Greenberg and Michael Fried, aestheticism gradually transformed into 'extreme formalism' (Gal, 2015, p. 14). I would suggest that the key principle in the aestheticist paradigm is that form becomes self-referential. For instance, it can be found in Greenberg's observation on the avant-garde art movement in *Towards a Newer Laocoon* (1940); rejecting any external subjects while discovering content within form to become independent and self-sufficient.

Walter Pater proposed a concept of 'internal order' as 'the source of the aesthetic experience' and Gal proposed 'deep form' to refer to a unique symbol that is 'opaque, non-semantic, non-referential, but productive' (2015, pp. 98, 153). And both concepts aim for the same objective: to establish 'form' as a self-referent.

Wilde argued that art criticism should not be 'an analytic interpretation of the artwork … but rather a formal creation that emanates from its deep form' (Gal, 2015, p. 113). For example, in *The Picture of Dorian Gray*[15] (1890), the medium-specificity of painting that turns ephemerality into permanence reveals a new reality rather than imitating reality.

> All art is at once surface and symbol,
>
> Those who go beneath the surface do so at their peril.
>
> Those who read the symbol do so at their peril.

[15] *The Picture of Dorian Gray* tells the story of a young Englishman named Dorian, whose wish to swap his appearance with the image of his self-portrait comes true at the cost of giving up his soul. This story speculates about the switch between the nature of painting and the nature of human life in the context of sin and moral corruption.

> It is the spectator, and not life, that art really mirrors.
>
> (Wilde, 1890, p. 4)

As Wilde emphasised in the preface of *The Picture of Dorian Gray*, the purpose of art is not to visually imitate a subject or concept, but to unveil it in its whole and completeness. As he famously stated in *The Decay of Lying*, 'life imitates art' (Wilde, 2010).

> Beautiful, but - what does it mean? This last question we would answer with another question: what does a Haydn quartet mean? It represents no recognizable sounds from everyday life, it tells no story, yet you would never ask what it means.
>
> (Wilfred, no date, p. 109)

I would suggest that Wilfred's intention for Lumia should be characterised as light for light's sake, and that his ideas and words should be reconsidered via the aestheticist paradigm. This paragraph, for instance, taken from Wilfred's unpublished manuscript, expresses his aesthetic philosophy, emphasising form without interpretation.

3.2 Experimental Theatre

Theatrical context is typically absent from writings about Lumia. Wilfred has made it clear that Lumia is distinct from projected scenery; Lumia is a unique type of performance art. It is crucial to note, however, that in Wilfred's writing, the terms theatre and performance are not interchangeable. This is

because, as we learned from Wilfred's participation in the USITT panel discussion (subsection 2.2.1), theatre signifies drama.

> When a play is mechanically reproduced - no matter how perfectly, the essence, which is drama, is no longer there.
>
> (Wilfred, no date, p. 122)

Wilfred mentioned in passing Lumia's potential role in the theatre, describing it as ‘a visual accompaniment which folds itself around speech and action as closely, and with as much flexibility, as music around an opera libretto’ (Wilfred, no date, p. 123). By comparing Lumia to music, it seems to imply a certain degree of autonomy in its existence.

The following comparison chart was made based on the light projection methods discussed in two distinct sources; it aids in gaining a deeper understanding of Lumia's applications inside Wilfred's projected scenery.

Lumia, The Art of Light (1945-47)	Projected Scenery (1965)
Direct Beam	Lens Projector
Moving Filament	
Uniplate	Uniplate Projector
Multiplate	Multiplate Projector
	Effect Attachment
Swinging Beam	
	Lensless Projector
Focal Stage	Focal-Stage Projector [Special Projector]
Multibeam	
Reflection	Reflection Projector [Special Projector]
Field	

Figure 24. Mechanical Method Comparison between Lumia and Projected Scenery (Source: Trent Kim)

As can be seen in Figure 24, the most technical methods of Lumia and projected scenery overlap, but focal stage and reflection were the two primary techniques that produced Lumia's signature smoky[16] appearance: refraction and reflection.

In the realm of theatre, however, Lumia was adapted as special projectors to provide a non-illusionist[17] and aesthetic component to the performance. Lumia is presented here as a

[16] In the film, *Lumia*, Hal Flicksman who was the associate director at the Corcoran Gallery of Art when the 1971 retrospective exhibition took place, discussed the 'smoky' look, and Wilfred's secret was adding dents on a reflective surface to create them (Finkelstein and Vlachos 2008).
[17] Prominent figures in the non-illusionist movement for theatre include Adolphe Appia (1862-1928) and Edward Gordon Craig (1872-1966) (see subsection 3.3.2).

referential art form of theatrical lighting, comparable to painting in the context of scenic art. In contrast to painting, Lumia is a performance in its own right, akin to music, dancing, and acting. Lumia's presence on stage should have been a silent revolution in which a scenic element found its ability to perform without referents for mimesis, whether from dramatic text or scenographic illusionism — by making itself a self-referent to inspire a new narrative. In my practice experimentation, Clavilux Model K (subsection 5.2.6) will demonstrate this specific aspect of Lumia composition.

3.2.1 Postdramatic Theatre

Hans-Thies Lehmann coined the term ‘postdramatic’ to describe new forms of theatre that challenged the traditional usage of dramatic signs (2006). Lehmann’s intention for researching postdramatic theatre ‘was not to find a conceptual framework that accommodates everything’ but ‘to decide whether an aesthetic attests to true ‘contemporaneity’ or whether it merely perpetuates old models with technical accomplishment’ (2006, p. 20). Hans-Thies Lehmann viewed the late nineteenth- and early twentieth-century avant-garde theatre as its roots, despite the fact that postdramatic theatre mainly covers experimental theatre since the 1970s. The avant-garde theatre's timeframe aligns closely with the period of Wilfred's Lumia performance practices in the 1920s and 1930s; while also providing a comparable timeline for Lumia performance practices following after Wilfred and as part of postdramatic theatre.

Lehmann traced dialectics as the origin and core of drama and distinguished drama from epic. To Lehmann, ‘drama is based on a feat of abstraction that sketches a model world in which the

plentitude not of reality in general but of human behaviour in the state of an experiment becomes evident' (2006, p. 39), and it differs from epic's factual and referential characteristics. Further, through the lens of Aristotle's *Poetics*, Lehmann suggested that the essence of drama is 'a logical (namely dramatic) order to the confusing chaos and plentitude of Being' that 'constitutes it internally as an unbroken, complete unity and wholeness' (2006, p. 40). Therefore, drama is 'a flow of time, controlled and surveyable' (2006, p. 40). Drama first perfected the inner logic of tragedy, and the postdramatic theatre paradigm would explore 'a theatre without the tragic' (Lehmann, 2006, p. 42). Further, through Hegel's dialectics, Lehmann reiterated that drama 'in appearance does not conform to the true concept and only through this purification brings about the ideal' — therefore it results in 'exclusion of the real' (2006, p. 44).

A new theatre practice cannot be achieved by 'provocation alone' but needs to 'create something new under its own steam' to evidence the abstraction and purification, to establish its own identity as a whole (Lehmann, 2006, p. 28). To me, the performance of Lumia satisfies the postdramatic theatre paradigm, even though Wilfred's interest was not directly provocative within the context of dramatic theatre. Lumia was a result of rigorous studies inside the form itself and found performance as its essential form. Moreover, the fact that Lumia was invited to theatre through Wilfred's projected scenery was, in itself, a serendipitous provocation, introducing this entirely new type of method in producing moving images on stage.

Through Lumia, Wilfred observed 'the unearthly' and 'abstract human' aesthetics, and these were not mere descriptions of visual styles but of its internal structure, independent from the real (and here the real is the representation of the human being) (The NYPR Archive Collections, 1968).

In principle, postdramatic theatre identifies new opportunities in theatre beyond drama, therefore theatre in this context is not an art form but a forum for new independent art practices to emerge. What was once seen as 'glued together' aspects of language and body separate in theatre, character representation and audience address are each treated as autonomous realities; once the sound space separates from the playing space, new representational chances come about through the autonomization of the individual layers' (Lehmann, 2006, p. 51).

> If signs can no longer be read as a reference to a certain referent then the audience helplessly confronts the alternative of either thinking nothing in the face of this absence or instead reading the forms themselves, the language games and the players in their here and now presented 'being-as-it-is' (Sosein - Heidegger).
>
> (Lehmann, 2006, p. 56)

3.2.2 Avant-Garde Theatre

Michael Kirby proposed two categories of avant-garde theatre: 'antagonistic' and 'hermetic' (Lehmann, 2006, p. 57). Hermetic approaches led by Symbolist aesthetics sought its underlying order and presented a sense of wholeness and self-containment (Lehmann, 2006, p. 57). In contrast, antagonistic approaches emphasised provocation. I contend that Lumia would have been an excellent example of hermetic avant-garde theatre.

Wilfred's unsuccessful attempt to explicate his performance of lighting may have been the result of a direct transfer of painterly abstraction, similar to that of animated film, rather than the development of

Lumia's own framework of abstraction. To distinguish his art from reality, Piet Mondrian defined abstraction as ‘the intensification of consciousness’ using painting's formal components, such as shape and colour, and he aimed to ‘consciously convey the opposite of the natural, so far as it may be plastically expressed’ (1986, p. 50). Therefore, the abstraction was not a distortion of the real, but revealed its completeness governed by ‘a dynamic movement’ in a form of ‘palpable reality,’ the new plastic reality (Mondrian, 1986, p. 390).

Mondrian's concept of abstraction shared a fundamental premise with Stanislaw Ignacy Witkiewicz's notion of ‘pure form’ as ‘an absolute construction of formal elements and does not represent a mimesis of reality’ (Lehmann, 2006, p. 64). This anti-mimesis of reality is a challenging issue for theatre designers, especially if it were created purely through lighting. Lehmann stated that immediately applying abstraction to action would be radical and ‘thus ultimately negligible for the definition of theatre’ (Lehmann, 2006, p. 36). This is why I believe that inviting Lumia through projected scenery achieved a degree of intervention at the expense of its autonomy.

3.3 Postdramatic Apparatus

Applying abstraction directly was difficult to realise ‘by the expectations of dramatic theatre’ (Lehmann, 2006, p. 49), yet visionary theatre artists created new apparatus to pursue new theatre. This section examines two significant cases of new theatrical apparatus by Gertrude Stein (1874-1946) and Edward Craig Gordon (1872-1966) followed by revisiting Wilfred's Clavilux design. Those examples are discussed as postdramatic apparatus that rediscovered theatre as deep

form, and by positioning Lumia next to the other examples, this chapter argues that Lumia should be also considered as part of avant-garde/postdramatic theatre history.

3.3.1 Gertrude Stein's Landscape Play

As the glossary suggests, the term 'apparatus' refers to a physical, virtual or conceptual instrument used in Materialist discourse, and to emphasise the scope of this term in this thesis, this subsection introduces a conceptual apparatus for theatre, 'landscape play' by the American playwright, poet and novelist, Gertrude Stein. 'Landscape play' was Stein's experimental way of delivering a story on stage by showing rather than telling, and it encourages the audience to appreciate the form of performance similar to how Lumia performs light itself instead of becoming a mere vehicle to deliver a subject matter.

> I felt that if a play was exactly like a landscape then there would be no difficulty about the emotion of the person looking on at the play being behind or ahead of the play because the landscape does not have to make acquaintance.
>
> (Stein, 1988, p. 122)

Stein reasoned that 'the emotion of the one seeing the play is always ahead or behind the play' (1988, p. 99) which prompted her to invent her new method of writing. In her plays, Stein 'tried to tell what happened without telling stories' (1988, pp. 121-122), and landscape in this context refers to the non-referential, non-narrative, and non-dramatic aspects of a play. Thus, Stein achieved 'a

defocalization and equal status for all parts, a renunciation of teleological time, and the dominance of an ‘atmosphere’ above dramatic and narrative forms of progression’ (Lehmann, 2006, p. 63).

ACT TWO
(Three)
Four and nobody wounded, five and nobody flourishing, six and nobody talkative, eight and nobody sensible.
One and a left hand lift that is so heavy that there is no way of pronouncing perfectly.
A point of accuracy, a point of a strange stove, a point that is so sober that the reason left is all the chance of swelling.
(The same three.)
A wide oak a wide oak, a very wide cake, a lightning cooky, a single wide open and exchanged box filled with the same little sac that shines.
The best the only better and more left footed stranger.
The very kindness there is in all lemons oranges apples pears and potatoes.
(The same three.)

Figure 25. An Excerpt of Geography and Plays by Gertrude Stein (1922)

As Figure 25 demonstrates, both the writing and the play maintained a steady presence. What I mean by steady presence is that the audience’s experience would match the tempo of the play. Stein's nervousness was caused by the temporal differences between hearing, seeing, and remembering in the conventional structure of a play. By presenting her plays metaphorically in the form of a landscape, describing the scene without telling stories, Stein singularised the temporality, allowing the audience to experience her plays steadily.

I would say that Stein accomplished this by radicalising the role of text in storytelling as a formalist apparatus that narrates phenomena rather than an epic. Stein, in constructing her new theatre practice, enabled text to be liberated from drama.

3.3.2 Edward Gordon Craig's Stage Scenery

Edward Gordon Craig was a theatre practitioner who revolutionised the use of scenography in order to challenge the illusionist theatrical tradition. Craig stated that 'one should not stage Shakespeare's great plays at all … because the acted Hamlet would kill some of the infinite wealth of the imaginary Hamlet' (Lehmann, 2006, p. 49). Craig introduced his notion of Über-Marionette in *The Actor and the Über-Marionette* (1908) and maintained that 'A[a]rt arrives only by design' and that theatre as an art form is better envisioned without actors due to the 'accidental nature' (1908, p. 3) of human bodies. Rather than physically excluding actors from the stage, Craig proposed 'another form of presence of the player' (Lehmann, 2006, p. 73) for the theatre of Über-Marionette.

Alongside Stein's landscape play, Craig's Über-Marionette may be described as 'a scenic poem as a whole' (Lehmann, 2006, p. 63). Craig devised a new kind of stage scenery and obtained a patent in 1912 to formalise his idea. By doing so, he introduced his vision into existing theatre practices, similar to the way in which Wilfred's Lumia was introduced through his projected scenery.

Figure 26. Craig's Stage Scenery US Patent 1,022,020 [1912] (Source: Google Patents) [REDACTED]

Craig defined his invention as 'apparatus for producing scenic effects on the stage and is particularly adapted for use in the representation of "poetic drama"' (as opposed to realistic drama) (1912, p. 1). Moreover, he articulated his vision's practical advantages in a clear manner:

> In the representation of such plays [poetic drama] the producer has hitherto been obliged to choose between the alternatives of either employing scenery formed and painted so as to produce the illusion of the actual scene intended by the playwright, or using plain curtains as a background. Many persons have come to the conclusion that the latter method has certain esthetic advantages and it has the material advantage of cheapness and easy transport.
>
> (Craig, 1912, p. 1)

In addition to the aforementioned practical benefits, Craig realised through this new apparatus that the scenery is a continuous fluid component, which can be argued to be a kinetic landscape from the perspective of Stein. This is a clear illustration of how Craig's concept of Über-Marionette was implemented by making the scenery transform, hence making it perform.

As discussed in subsection 2.1.1, the new apparatus led to new performance practices for colour music. The examples of Stein and Craig demonstrate that new performance practices were also materialised by new apparatus in experimental theatre. As briefly mentioned in the USITT conference panel discussion, technological innovations also inspired progressive performance collaborations such as *9 Evenings: Theatre and Engineering* (1966).

Betancourt published a collection of experimental instruments by artist-inventors for visual music, and the list included Bainbridge Bishop, Alexander Wallace Rimington, James M. Loring, Charles F. Wilcox, Henry Fitch Taylor, Alexander Burnett Hector, Mary Hallock-Greenewalt, Maude Maple Miles, Arthur C. Vinageras, Hazel H. Adler, Alexander E. O. Munsell, Wilhelm Schmeer, Thomas

Wilfred, Richard M. Craig, Clinton W. Hough, Ernest Nanfeldt, Cecil Stokes, and Oskar Fischinger (2004). As visual devices, the majority of the instruments have inspired or may have inspired new theatrical practices.

Figure 27. Device for Producing Light Effects by Oskar Fischinger (Betancourt, 2004, p. 210) [REDACTED]

For instance, the device for producing light effects (Figure 27) by Oskar Fischinger (1900-1967) was intended for ‘public performances, as in theatres, or for reproduction by the aid of television or motion pictures’ and its method of casting shadow and revealing light utilised ‘a taut, flexible element that is preferably of rubber or other elastic material’ (Betancourt, 2004, p. 211).

Figure 28. Screenshots of Jean-Marc Aeschimann’s La Villette [from the film, Adolph Appia: Visionary of Invisible] (Source: Amazon Prime) [REDACTED]

Jean-Marc Aeschimann's choreographed and scored dance theatre piece *La Villette* can be considered in relation to the inventive concepts of Fischinger's apparatus and Craig's Stage Scenery to expand our understanding of kinetic scenery and new ways of presenting performers.

3.3.3 Thomas Wilfred's Clavilux

> Much against my wish, the Clavilux was christened "Color-Organ" by public and press.
>
> (Wilfred, 1947, p. 251)

Wilfred's patented designs were also included in Betancourt's list of the inventions for visual music. Although these were not named Clavilux, these individual designs were directly tied to or related to Clavilux and his patented design 1,749,011 from 1930 captured particularly well the essence of his Lumia practices.

Figure 29. An Illustration from Wilfred's Patent 1,749,011 Light Projection Display [Patented in 1930]

(Source: United States Patent and Trademark Office) [REDACTED]

Five of Wilfred's most significant technical advancements are identified in this patent application (Figure 29): the pulley (27), wheel (84), knob (93), platform (35) and tube (72). First, Wilfred's Clavilux installed a pulley system to adjust lighting with minimal physical interference, such as preventing the casting of hand shadows. Considering the counterweight (28), his pulley system resembled a theatre's flying system[18]. Second, Wilfred employed wheels to move elements in rotations to establish a default position for their return, and the rotating motion became the primary

[18] Theatres typically feature counterweight systems to control a fly bar(s) in order to suspend scenery and lighting equipment on stage.

style of his Lumia composition: repetitive, but also systematic by assigning different wheel diameters to vary the duration of certain segments.

This is very medium-specific, since a combination of differences/changes in individual wheels would result in a new lighting condition, as light would be affected by all the changes collectively, and the visual effect would demonstrate how those individual pieces were connected by light. This medium-specificity will be fully unpacked in the part of my exegesis (chapter 5) where I discuss my own Clavilux developments. Thirdly, he developed a little staging area (which he later dubbed the focal stage) in which to position an item (opaque to cast shadow and/or reflect light, transparent to refract light). This is an interesting feature that can be translated as minimising the role of the stage — to demonstrate how Lumia, as a new theatrical style, defocalized and equalised its elements, just as Stein and Craig achieved with their new apparatus.

On the other hand, Wilfred's design (patented in 1930) documented technical limitations and difficulties controlling forms, shapes, and colours in projected images. This was due to a reliance primarily on light's refraction and reflection. It laid bare a gap in his technical knowledge: an inability to bridge the lens-based lighting (focal stage[19]) in the lower part, and the cylinder-based lighting (reflection[20]) in the upper part, which can be further evidenced by their designated outlets (14 & 15). Wilfred's technical knowledge was insufficient to achieve a smooth transition between the two methods of lighting. As a result, in the projected scenery he introduced the Lumia through two separate projectors: focal-stage projector and reflection projector. In addition, Wilfred's last recorded

[19] Focal stage as illustrated as a Sphinx object in part 36 in Figure 29, uses an object to create a shadow and/or projection.
[20] Reflection cylinder redirects a light source(s) internally and produces reflected and refracted lighting effects.

Lumia composition, *Luccata, op.162* (1967-68) still evidences that there was no technical means to transition between his reflection and focal-stage (Figure 30).

Figure 30. An Example of an Abrupt Transition from Reflection to Focal Stage of Op. 159 Sequence in Space (1965) (Source: Trent Kim)

Wilfred's Clavilux speaks more loudly than his Lumia theory or the enclosed recorded compositions. Even the archival image of *Op.159 Sequence in Space* (1965), which could not be viewed until it was disassembled, reveals that this piece employs cylindrical reflectors only, rather than lens-based arrangements. In addition, Wilfred's motorised constructions do not display the same level of technical proficiency; rather, they suggest a reliance on unpredictability on a lack of technical mastery.

From colour music to experimental theatre and Lumia, new performance apparatus played a crucial part in fuelling new artistic practices, while also materialising progressive conceptions and documenting precisely their entire creative paradigm and the practical problems they faced.

My contextual review in chapter 2 and 3 revisited the history of Lumia and shifted the emphasis from the painting and cinematic analysis to the performance paradigm. By incorporating the method of

critical discourse analysis, I argued that the perspectives of painting and cinema dominated discussions around Lumia, and through introducing the new and retrospective contexts, I historically revisited Lumia from aestheticist and postdramatic standpoints. This helped me determine that my research focus would be prototyping for performance: as a tool to extend the aestheticism of Lumia and in order to fully adapt Wilfred's practice-based methodology of Lumia research. In the following chapter, I will describe my enhanced methodology for this practice-based historical investigation.

Chapter 4: Methodological Considerations

My research questions: What is the medium-specificity of Lumia and how does it inform contemporary lighting art and re-present Lumia within the history of art? What does prototyping Clavilux reveal about Lumia, and how so?

Through my contextual reviews, discourse analysis, and archival research, I identified the aforementioned questions and, to a certain extent, discovered answers. Due to the lack of insight into Clavilux and the inadequacy of knowledge regarding the medium-specificity of lighting, it became necessary for me to conduct my own historical research. This has been based on prototyping, in order to provide complete answers to the questions.

Based on Katie MacLeod's survey of practice-based PhD submissions in the arts, I would classify my Lumia research as MacLeod's 'type A,' which 'is concerned to position practice concerns; this positioning may be historical, cultural, contemporaneous or a combination of these' and 'the written text carries the information relevant to an exact positioning of the practice' (2000, p. 1). MacLeod exemplified type A as recontextualizing painting by Ad Reinhardt, Brice Marden, Robert Mangold, Agnes Martin et al. via Lucy Lippard's concept of 'silent painting', and suggested that the historical practice-based research reshaped and recontextualised the artist's practice (2000, p. 1).

In addition to transforming my own lighting art practice, my research repositioned and re-evaluated Lumia through the aestheticist paradigm: form as a self-reference. It utilised prototyping Clavilux as

an alternative yet extensive form of historical discourse. By doing so, my intent was to revitalise Lumia as a contemporary art practice and demonstrate the importance of making (prototyping and composition) for historical research.

Leavy argued that traditional qualitative research and arts-based research are both ‘crafts’ because ‘researchers do not simply gather and write; they compose, orchestrate, and weave’ (2020, p. 18). In addition, Leavy echoed Valerie J. Janesick's assertion that ‘the research is the instrument in qualitative research as in artistic practice … involving reflection, description, problem-formulation and problem-solving, and the ability to identify and explain intuition and creativity in the research process’ (2020, p. 18). Despite the fact that these general classifications and characteristics of practice-based and arts-based research were useful in supporting my practice-based research, the difficulty of positioning prototyping as an alternative historical technique remained.

The subsequent sections — Artist as Researcher, Artist-Bricoleur, and Prototyping as Phenomenological Research — offer essential accounts that helped me construct a firm foundation for developing my methodological design.

4.1 Artist as Researcher

As an artist, I list a combination of lighting designer, lighting artist, and Lumia artist as my occupation. Each title corresponds to a particular period in my creative career and also serves to define boundaries with others. In fact, when I describe myself as a lighting artist, I require more freedom and

authorship than as a lighting designer. Nonetheless, when I describe myself as a Lumia artist, I contextualise my work inside the Lumia context, thus defining my position in the PhD research as an artist-researcher-historian.

I utilised Foucault's phrase of subjugated knowledge earlier in the critical discourse analysis to define the positionality of the inherent knowledge within Lumia as an independent art form. In regard to this, the objective of my research is to transform its status from subjugated to subversive, in order to assert Lumia's unique position in the history of the art form. Foucault envisioned genealogy as 'the union of erudite knowledge and local memories which allows us to establish a historical knowledge of struggles and to make use of this knowledge tactically today' (1980, p. 83).

> ...a genealogy should be seen as a kind of attempt to emancipate historical knowledges from that subjection, to render them, that is, capable of opposition and of struggle against the coercion of a theoretical, unitary, formal and scientific discourse. It is based on a reactivation of local knowledges-of minor knowledges, as Deleuze might call them.
>
> (Foucault, 1980, p. 85)

The distinction between Foucault's archaeology and genealogy was extremely helpful in comprehending two unique research methods, the one being analytical and the latter being tactical and actionable.

Foucault's notion of genealogy defined my methodological intention towards subversive knowledge, whereas my literature review, discourse analysis, and archival investigation focused on determining the characteristics of current discourses (matching his description of 'archaeology'). (1980, p. 85)

The following four subsections address several approaches and actions that researchers can employ as makers.

4.1.1 Artist as Producer

First, I reflected on Walter Benjamin's definition of 'producer' (Benjamin, 1982, p. 769) in *The Author as Producer* (intended as an address at the Institute for the Study of Fascism, Paris, 27 April 1934, but not delivered). Benjamin stated that 'the tendency of a literary work can be politically correct only if it is also literally correct'. Benjamin acknowledged the distinction between literary tendency and political tendency, and stated that in order for literary tendency to be correct, it must 'produce' 'situations' (1982, p. 778) rather than to 'replace materialistic dialectics by the notion of common sense — a notion that in class terms is unquantifiable' (1982, p. 773). The artist-as-producer creates situations with the intention 'to induce other producers to produce … and to put an improved apparatus at their disposal … and to turn … readers or spectators into collaborators' (Benjamin, 1982, p. 777). What Benjamin means by the author's apparatus is 'the place of the intellectual in the class struggle', which the author recognises 'in the process of production' (1982, p. 773). Without reflecting on one's own apparatus, the authors convey their 'solidarity with the proletariat only' in their attitudes

but without producing actionable situations and Benjamin described it as ‘a counterrevolutionary function’ (1982, p. 772).

Benjamin exemplified Bertolt Brecht’s Epic Theatre as a literary work (apparatus) that produces situations, and he argued that Epic Theatre ‘is concerned less with filling the public with feelings, even seditious ones, than with alienating it in an enduring way, through thinking, from the conditions in which it lives’ (1982, p. 779).

> He [Brecht] thus succeeded in changing the functional connection between stage and public, text and performance, director and actor. Epic Theater, he declared, had to portray situations, rather than develop plots … therefore, does not reproduce situations; rather, it discovers them.
>
> (Benjamin, 1982, p. 779)

By rejecting dramatic illusion, Epic Theatre brought about a new dramatic impact (alienation effect) intended to separate the audience from the drama on stage. Therefore, it revealed ‘the presence and consciousness of the process of representation within the represented’ (Lehmann, 2006, p. 33). I would argue that Epic Theatre shifted the centre of discourse from the stage to the liminal space between the stage and the audience in order to debate what is epic about their relationality.

Political tendency, literary tendency, the author's apparatus (old), and situations are essential components for formulating a creative and productive apparatus (new) that not only challenges the

social conditions resulting from class struggles, but also the author's apparatus as determined by the current process of production, which is typically associated with modes of dissemination and reception.

From the perspective of a practice-based arts researcher, Benjamin's theory was of significant help in comprehending and highlighting the function of the artist as a historian who focuses on status quo and creates situations through one's own new creative apparatus. Wilfred pursuing Lumia as an independent art form against all odds, was a historically significant movement, but the fact that Lumia continues to inspire new Lumia artists and practices suggests that we as individual artists, collectively inherit the role of producer to crystallise Lumia as a new apparatus and potentially paradigm for performance.

4.1.2 Artist as Media Archaeologist

Second, the influence of Foucault on my critical paradigm in the literature review and on my research interest in developing Clavilux led me naturally to the field of media archaeology. According to Jussi Parikka, media archaeology is the study of ‘new media cultures through insights from past new media, often with an emphasis on the forgotten, the quirky, the non-obvious apparatuses, practices and inventions’, and can be categorised by four key themes: (1) Modernity, (2) Cinema, (3) Histories of the Present, and (4) Alternative Histories (2012, p. 2).

First, researchers examine the concept of modernity and ‘how new scientific and technological innovations contribute to our social conditions’ (Parikka, 2012, p. 11). Second, with reference to cinema, researchers critically broaden the medium by re-examining its early and peripheral developments in order to rediscover the works and theorise aspects of spectatorship. Third, via histories of the present, media archaeology asks ‘what is our present moment in its objects, discourses and practices, and how did it come to be perceived as reality?’ It also emphasises ‘the relativity of the new’ in technology and critiques ‘the hegemony of the new’ (Parikka, 2012, p. 11). Finally, media archaeology explores alternative histories and by doing so, responds to ‘a need for new ways of understanding media cultures outside the mainstream’ (Parikka, 2012, p. 14).

Media archaeology strives to shed light on hidden and/or alternative histories ‘on the fuzzy borders of art/science/technology’ (Parikka, 2012, p. 14). Using Foucault's terminology, I believe the discipline reveals the clear domination of archaeology over genealogy, or Benjamin’s concept of production. However, with regard to what Parikka calls ‘media-archaeological art’, he suggests that ‘what these artists and projects flag is the need to dig deeper than textual analysis’. However, he does not necessarily conclude that researchers must ‘become engineers to say and do anything interesting and accurate about current media culture’ (Parikka, 2012, p. 155).

Yet, I perceive a relationship between Parikka's definition of media-archaeological art as the move from ‘consumption’ to ‘production’ (2012, p. 156) and Benjamin's concept of production. The six following media archaeological art techniques were observed by Parikka and the list categorises different ways that artist contribute to media archaeology:

(1) Artistic works that visually engage with historical themes [Lynn Hershman Leeson, Patrick Jean]

(2) Invoking alternative histories, which are able to offer critical insights in the assumed-natural stage of digitality — whether technological or social — through the art piece that goes against the grain in terms of the materials it uses, or the narratives of use [Zoe Beloff, Paul DeMarinis]

(3) Art of/from obsolescence: pieces and practice that use obsolescent materials and solutions to engage with emerging media cultures, or just investigate the potential in re-using and hacking electronic media [Vuk Cosic, Alexei Shulgin, Bernie Lubell]

(4) Imaginary media that are constructed and not just imagined: devices that are dead, or were never built, being reconstructed and re-employed, for their curiosity value but also to investigate the nature of progress, change and the novelty-obsessed technological culture that is still, however, embedded in (planned) obsolescence [Gebhard Sengmüller, Paul DeMarinis, Julien Maire, Bruce Sterling]

(5) Media-archaeological art that draws from concrete archives — in other words, artistic practice informed by archival work and historical materials; a direct way of working like a historian but for artistic ends [Sven Spieker, Gustav Deutsch, Bill Morrison, Sarah Angliss, David Link]

(6) Media-archaeological art methods that not only dig into the past, but also inside the machine, that address the present (but technically 'archaeological') buried conditions of our media culture [The Institute for Algorhythmics and Microresearch Lab in Berlin, Rosa Menkman, Matthias Fitz, Cory Arcangel]

(Parikka, 2012, pp. 139-140)

My prototyping of Clavilux falls under Parikka's fourth type: imaginary media. The example of Julien Maire's ‘fascination in re-inventing past apparatuses, but modified in creative ways’ (Parikka, 2012, p. 140) resonates with my methodological interest. In *Man at Work*, for instance, Maire constructed a new slide projector that replaced film slides with a series of transparent stereolithography (3D printing) figures, by taking advantage of the transparency of 3D printed figures, but also the stereolithography’s automated mode of production. This can be argued as a new materialist discourse between sculpture and film. However, with regard to Benjamin’s apparatus, it is uncertain whether Parikka recognised the basic distinction between ordinary media archaeology scholars and artist-researchers.

Kluitenberg further suggested that myth is ‘strategic’ since it ‘appears 'natural'' but is ‘never neutral’; therefore, myth can ‘superimpose’ and ‘hide’ (2007, p. 181). Neither Parikka nor Kluitenberg's observation reflects the viewpoint of artist-technologists whose practices involuntarily fuse technology, art, invention, and imagination. In addition, it fails to acknowledge that, for artist-technologists, imaginary machines can be self-referential artworks, making them ontological as well as epistemological.

Abstract art pursues ‘opposition to the natural’ by ‘knowledge of the spirit’ and becomes ‘truly religious’ (Mondrian, 1986, p. 50). In other words, not only do the artists continue challenging assumptions, but also need to truly believe to gain the insight hence, the process inevitably becomes autoethnographic and strategically mythical. I further develop this argument in subsection 4.1.3 Artist

as Historian and Ethnographer and 4.2 Artist-Bricoleur. Possibly, media archaeology is incompatible with my research, or my research should articulate another category for media archaeological art: technical prototypes for the history of art; technology for the purpose of art where the phase of speculation in archaeology and artist's embodiment becomes the primary methodology through materialist interpretation and imagination. There are artists who respond creatively to the theme of speculative archaeology, such as Allan Wexler and Bruce Reynolds, but the focus of my take on the idea of archaeological speculation is to re-enact the technological innovation to excavate the lived and potential experiences in the process through the lens of artist-bricoleur (see section 4.2).

4.1.3 Artist as Historian and Ethnographer

Third, I examined *The Artist as Historian* (2007) by Mark Godfrey and *The Artist as Ethnographer* (1996) by Hal Foster, to understand the challenges that being an artist provides for historical research.

> Until recently, it might have seemed that historical representation, which in the mid-nineteenth-century was considered the most serious role of art, had only peripheral importance in contemporary practice. We were taught that the abstraction of modernist painting prevented artists from addressing history and that when Pop art banished abstraction it was only to address itself to the present.
>
> (Godfrey, 2007, p. 141)

Godfrey stated, using the examples of On Kawara and Gerhard Richter, that beginning in the 1960s, artists began to 'rethink and reinvigorate the legacy of history painting' (2007, p. 141). The emergence of photography in conceptual art prompted artists to engage with archival images; nevertheless, the artists frequently appropriated and altered the images to distance viewers from the role of historical representation generally assumed in archival photographs. For instance, according to Douglas, the 'rephotography' work, *Hitler asleep in his Mercedes* (1932), by Brauntuch did not reveal any historical knowledge but suggested 'our distance from the history' that resulted in the work (2007, p. 142).

Since 1979, historical research has gained prominence in contemporary art, and now an increasing number of artists begin their creative practice with archival research. According to Godfrey, this process results in artworks that 'invite viewers to think about the past; to make connections between events, characters, and objects; to join together in memory; and to reconsider the ways in which the past is presented in the wider culture' (2007, p. 143).

Many of these works also acknowledged the unreliability of archival materials and devised a variety of solutions: depicting historical sites; searching for additional details behind archival images; constructing a discursive site using multiple sources, including their own; and using their personal narratives to further investigate the past. As they investigated the Lebanese wars, the Atlas Group (including photographer Walid Raad) argued for the necessity of fiction in achieving an adequate depiction of a historical event.

Godfrey claimed, specifically after analysing the works of Matthew Buckingham, that the artist as historian possesses two traits. First, the artist as historian is ‘concerned with a particular historical subject’ (Godfrey, 2007, p. 168). Second, the artist as historian exercises ‘methodological freedom and creativity without sacrificing rigor’, while approaching ‘historical representation outside’ the context of academic history, and being ‘aware of the critiques made of this discipline’ (Godfrey, 2007, pp. 169-170).

Foster commented on the *Artist as Ethnographer* and identified probable concerns and challenges in response to Benjamin's *The Artist as Producer*. First, ‘the outsideness’ is assumed in those inquiries, but ‘a pure outside can no longer be presupposed’ in a global society; hence, the inquiries tend to focus more on ‘our post-colonial situation than a romantic proposal of simple opposition’ (Foster, 1996, p. 304).

Second, projecting the otherness ‘may be to "other" the self more than to "selve" the other’ and leads to ‘self-absorption,’ which could become ‘philosophical narcissism’ (Foster, 1996, p. 304). Third, consider this common scenario: a curator contacts an artist regarding a site-specific work. The artist travels to engage with the community chosen by the curator’s institution. The project’s structure does not, however, provide for sufficient engagement with the community. Often, in this process, ‘the artist is not decentered so much as the other is fashioned in artistic guise’ (Foster, 1996, p. 306).

Foster's concerns should be viewed as cautions rather than inevitable problems, and returning to Benjamin's concept of recognising one's apparatus in order to ‘think, to reflect on his [one’s] position in the process of production’ (1982, p. 779) can minimise the likelihood. For instance, it is essential to

acknowledge that the post-colonial perspective is as crucial as the Marxist framework that prompted these conversations in the first place, and that it reflects appropriately the field of eurocentric ethnography and creative research. In addition, establishing one's positionality can reduce the likelihood of self-othering.

However, the absence of a creative strategy — to make a situation in which participants and spectators would have become collaborators — hinders the quality of the ethnographic outcome.

4.1.4 Artist as Curator

Fourth, I reviewed *On Practice* (1975) by Mel Ramsden and *Art without Artists* (2010) by Anton Vidokle to consider the role of artist's perspectives in framing historical and contemporary discourse, which forms a key component in my research. Further, I acknowledged the shared responsibility between artists and curators while distinguishing an artist's curation as themselves being part of the genealogy of art practice itself. In other words, the artist as curator situates their own practice within the genealogy, and the curation affects their own practice simultaneously. For instance, in my research, the genealogical placement of my own Lumia practice justified my research rationale as well as provided me with methodological inspirations such as connecting, categorising, and extrapolating different methods by Lumia artists as critical cases of demonstrating how Lumia artists continue to reveal the medium specificity of lighting (see subsection 4.3.3).

Vidokle (2010) observed that the scope of contemporary curatorial practice goes beyond the logistical management of an art exhibition; it rather acts ‘as intermediaries between producers of art and the power structure of our society’ so that such curatorial practice poses a risk of undermining the artist’s perspectives over ‘illustrating curatorial concepts.’

Yet, I would argue that curation as a whole should not solely rely on the job of curator(s); it should be regarded as a collective responsibility shared between organisers, funders, curators, and artists. Still, the curators play a leading role in mediating between them, as Vidokle stated, but also between artists across generations.

Vidokle (2010) described artists as ‘a historically disobedient group’ and curators as ‘a disciplined contingent trained to obey authority', and Ramsden referred to curators alongside critics, commissioners, and gallery staff as ‘bureaucrats’ and argued that creative freedom was treated as a type of individual indulgence that represented a part of ‘bourgeois ideology’ (1975, p. 66).

The problem with treating creativity as an escape from the real world is that, consequently, it legitimises what would be assumed to be real, and artistic freedom exists outside of it rather than for art challenging the assumption and illusion of reality. Therefore, it avoids confronting the paradox between art and politics that neither can fully satisfy the other, ignores art’s own reality (medium specificity), and expects art to become complicit in ‘Modern Art’s internal complexity’ where it merely illustrates conceptual ideas (Ramsden, p. 68).

However, I argue that the paradox is the result of two unique historical perspectives: genealogy of art as creative strategies and the archaeology of art as human objects. Earlier discussed, Foucault's comparison between genealogy (tactical and actionable) and archaeology (analytical) can be applied to distinguishing the two historical perspectives in curatorial practices.

The value of archaeological curation is undeniably important, as it makes art broadly relevant and relatable to social and human conditions, but I also believe that this type of curatorial practice is a form of interpretive and responsive art in its own right. For instance, the exhibition of the *Degree Zero Archive* toured across 18 different venues between 2003 and 2008 and displayed pieces of exhibition documentation to represent contemporary curatorial practices retrospectively. Therefore, I would argue that this exhibition celebrates the genealogy of curatorial practices.

Curatorial practice as a whole should not solely rely on the job of curator(s); it is a collective responsibility shared between organisers, funders, curators, artists, technicians, and visitors, even though the curators act as primary mediators. Especially as I recognise artists as a historically tactical and actionable group, artists' contribution of genealogical knowledge in framing the exhibition is vital.

The problem that exists in contemporary curatorial practices is not the paradox between art and politics, but the lack of engagement with the tension that exists between curator's art and artist's art. The tension is where this thesis begins by critiquing the analytical literature on Lumia, and my research methodology firmly reflects a genealogical historical stance. The thesis also serves as a form of curatorial practice in that it establishes connections between individual Lumia artists and their

unique yet interconnected practices in order to examine the ongoing historical evolution of Lumia as an independent art form. Additionally, it incorporates my own practices, which my genealogical research influenced.

For my final exhibition (see 5.3 Preface to LUMIA: PERFORMING LIGHT exhibition), as an artist and curator, I displayed Pernuit's analytical exhibition foreword and a collective conversation with Joshua White, George Stadnik, and me side by side. The collective conversation shared tactical and actionable knowledge of Lumia from the individual artists' perspective, and I would refer to such knowledge as materialist dialectics, which I further discuss in 4.2 The Artist-Bricoleur.

The artist as producer, media archaeologist, historian, ethnographer, or curator faces particular problems and challenges but also makes distinctive contributions to artist-led research. The most fundamental quality that all positions share, however, is the methodological freedom that allows artists to combine their inventiveness and imagination to produce situations, yet none of their stances fully privileges the perspective of the artist-bricoleur.

4.2 The Artist-Bricoleur

This section explores how the concept of the bricoleur, developed by structuralist anthropologist Claude Lévi-Strauss in *The Savage Mind*, might be used to study being an artist in materialist dialectics.

> ...in our own time, the 'bricoleur' is still someone who works with his hands and uses devious means compared to those of a craftsman. The characteristic feature of mythical thought is that it expresses itself by means of a heterogeneous repertoire which, even if extensive, is nevertheless limited.
>
> (Lévi-Strauss, 1966, p. 11)

Lévi-Strauss claims that there are two types of scientific thought: 'neolithic' and 'modern' (1966, p. 15). The subject of the book, as suggested by its title, was associated with the neolithic science, which is often considered 'primitive,' and Lévi-Strauss contends that such scientific thought should be considered 'prior' (1966, p. 16). He reminded readers that the scientific achievements of the neolithic period were the 'mastery of the great arts of civilization — of pottery, weaving, agriculture, and domestication of animals' (Lévi-Strauss, 1966, p. 13).

The modern science is 'based on a distinction between levels' and relies on 'exhaustive observation and the systematic cataloguing of relations and connections' (Lévi-Strauss, 1966, p. 11) to conclude its scientific results, whereas the neolithic science relies on 'perception' and 'imagination' (Lévi-Strauss, 1966, p. 15) and could be associated with 'the unconscious apprehension of the truth of determinism' (Lévi-Strauss, 1966, p. 11) observed in the practices of magic, myths, and rituals.

Contrasted with the 'engineer' by Lévi-Strauss, the 'bricoleur' still practises the neolithic science he termed 'science of the concrete' (1966, p. 16). The bricoleur makes 'structures by fitting together events, or rather the remains of events', whereas the engineer makes discoveries through a

methodical event driven by ‘hypotheses and theories’ (Lévi-Strauss, 1966, p. 22). In other words, the bricoleur connects signs that reveal the truth of determinism. In contrast, the engineer works with concepts to investigate ‘the universe’ (Lévi-Strauss, 1966, p. 19).

By making the case, Lévi-Strauss adopted the definition of ‘sign’ from the structural linguistics pioneered by Ferdinand de Saussure (1857-1913) and distinguished the ‘sign’ of the bricoleur from the ‘concept’ of the engineer (1966, p. 20). Because signs are ‘an intermediary between images and concepts’ (Lévi-Strauss, 1966, p. 18), they remain relational (or structural), whereas concepts are abstract, transcendental, and independent. Thus, Lévi-Strauss fundamentally switched the focus of anthropological research from natural scientific observation and categorisation to structural analysis in order to discover how human perception and imagination form signs. This is the logic underlying his claim that neolithic science is not primitive but prior, as outlined earlier.

4.2.1 The Concept of Centre

The concept of the bricoleur [person] and bricolage [action] was adopted by scholars such as Gérard Genette, Jacques Derrida, Gilles Deleuze, Félix Guattari, Deena and Michael Weinstein, Cary Nelson, Paula Treichler, and Lawrence Grossberg. The central concept — to ‘produce a complete picture from whatever intellectual resources are currently available’ — inspired new methodological designs (Hammersley, 2008, p. 65).

In the chapter, ‘Structure, Sign, and Play in the Discourse of the Human Sciences’, Derrida (1967, p. 367) incorporated poststructuralist criticism to demonstrate that Lévi-Strauss's structural knowledge,

derived from bricolage's handling of signs, is governed by linguistic operations such as the 'overabundance of the signifier [image]'. Thus, according to Derrida (1967, pp. 364-365), the original signifier (image) acts 'as a surplus, a supplement'.

I would argue that Derrida's remark reflects the concept of intertextuality (Allen, 2000, p. 3) 'employed by poststructuralist theories and critics … to disrupt notions of stable meaning and objective interpretation', but erroneously equates structural anthropology and structural linguistics. In other words, Derrida's remark overlooks the intermediality between text and other types of anthropological artefacts that linguistics cannot fully comprehend, such as — and precisely in relation to this thesis — visual artefacts and technical machines. In addition, Derrida (1967, p. 19) ignores the fact that the bricoleur 'addresses himself [the self] to a collection of oddments left over from human endeavours' and therefore bricolage exists as a form of materialistic dialectics; the bricoleur inherits not only the linguistic structure but the structures of all media that can be found in a collection. Hence, for Lumia, it needs to be investigated beyond the realm of language, but across media including different languages and other art forms where it is complexly situated as illustrated in Figure 31.

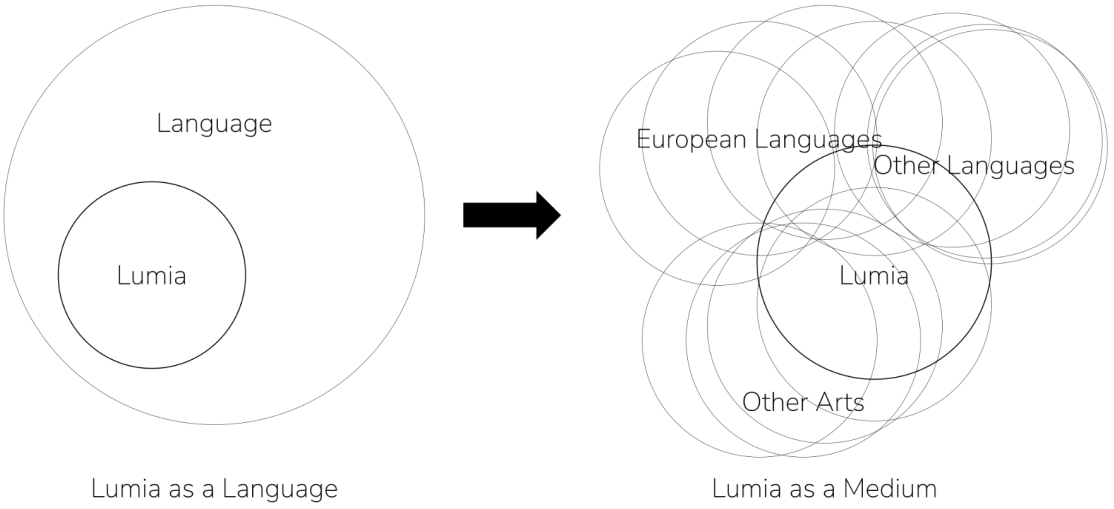


Figure 31. Visualisation of the Distinction between Lumia as a Language and a Medium (Source: Trent Kim)

The distinction between Derrida and Lévi-Strauss, in my view, is due to the different medium-specificities of language and bricolage. In other words, for Derrida, the concept of bricolage belongs to linguistics, yet for Lévi-Strauss, it explains found evidence of mythical thought; hence, by logical extension, anthropologists not only recognise the role of the bricoleur but become bricoleurs themselves. This critical distinction helps us regard Lumia as a distinct medium rather than a form of language governed by linguistics. Lévi-Strauss said that 'the artist is both a scientist and a 'bricoleur'' (Lévi-Strauss, 1966, p. 22), and I believe that Lumia, as an art medium, is materially bound while maintaining the deterministic truth that it is complete and independent.

4.2.2 Play as Materialist Imagination

Derrida introduces the notion of ‘play’ to extend his critique of Lévi-Strauss's bricolage, focusing on its implications for history and presence (1967, pp. 368-369). He asserts that history is ‘the movement of a resumption of history’ that oscillates between ‘the appropriation of truth in presence and self-presence’ and ‘knowledge in consciousness-of-self’ (Derrida, 1967, p. 368). I interpret his statement to mean that the ontology of history exists between metaphysical and material truths. Particularly with the principle of structuralism, the investigation of which ends in structural analysis, it may appear contradictory to conclude a historical structure, such as Lévi-Strauss’s myths. Derrida thinks that language is the ‘structure of structures’ (1967, p. 369) and assumes the structural analysis as a metaphysical theory rather than an exegesis of historical artefacts.

Derrida's use of the term play pertains to linguistics and not to another non-linguistic medium. Derrida is correct in stating that ‘the concepts of chance and discontinuity are indispensable’ (1967, p. 368) in structural historical analysis; hence, the meaning of play must also be modified to reflect the medium-specificity of bricolage. Lévi-Strauss's comparison between the bricoleur and the engineer, in my opinion, already prepares readers for this type of linguistic assumption. The bricoleur does not adhere to the intended functions of things, but rather maintains that things ‘may always come in handy’ (Lévi-Strauss, 1966, p. 18). As a result, the bricoleur looks for potential plays of things that can be viewed — from an engineer's perspective — as misbehaviours of those things. I would like to relate this concept of play with the loose joints of a chair or the deformed metal hinges of a door that can reveal new physical possibilities, and I would say that play can therefore remain materialist, and that the materiality refined by play serves as its permanent centre. To an extent, an assumed

malfunction can become a function for a different task and the process and scope of this exploration determines the degree of play. For instance, Ai Weiwei's *Table with Three Legs* (2010) turned the missing leg of a table to create a new form of chair, and Ryoji Ikeda initiated his own experiment of noise music by exploring audio-visual playfulness of digital communication in *Test Pattern* (2008).

The concepts of centre and play brought up by Derrida in relation to Lévi-Strauss's idea of the bricoleur are crucial and necessary in recognising similarities and differences between language and other media, and are particularly applicable to designing practice-based and arts-based research, where researchers are likely to become bricoleurs and address materialistic limitations and opportunities, such as my prototyping-based research.

Further, exploring these crucial concepts surrounding the bricoleur allowed me to hypothesise that Wilfred's theory of Lumia, and his Clavilux and other prototypes, were the results of two different scientific paradigms (modern and neolithic) and diminished his credibility by inadvertently disconnecting them, and his credibility has been diminished over time because successive critics and commentators have disconnected the two.

4.3 Prototyping as Phenomenological Research

In this last section of my methodology chapter, I address how concepts of phenomenological paradigm by Maurice Merleau-Ponty influenced the creation of my own approach in relation to prototyping Clavilux for the purpose of extending knowledge of Lumia's aestheticism.

> Art does not reflect what is seen, rather it makes the hidden visible.
>
> (Klee, 1958)

Klee believed that art reveals the unseen. It is important to note that what is not visible is not necessarily invisible, but it is not visible without intervention. As mentioned in section 3.1, what is not seen may be thought of as structures that are obscured by our common ways of seeing, which in Edmund Husserl's phenomenology could be considered as 'natural attitude' (1911, p. 1) In fact, Lévi-Strauss remarked briefly on Husserl's notion of ‘bracketing’ — the intentional reduction of the habitual and conditioned attitude in revealing structures (1966, p. 18). Through bracketing, we put aside the assumptions and familiar patterns of thought we bring to bear on our perceptions and hence see things as they really are, albeit those perceptions are, in effect, meaningless at the point of discovery.

The connection between structuralism and phenomenology is not established directly, but my reading of *Phenomenology of Perception* prompted me to consider the role of the bricoleur in Merleau-Ponty's phenomenological paradigm.

4.3.1 Internal Structure

> Our own body is in the world as the heart is in the organism: it keeps the visible spectacle constantly alive, it breathes life into it and sustains it inwardly, and it forms a system.
>
> (Merleau-Ponty, 1945, p. 235)

Similar to the positionality of the bricoleur, Merleau-Ponty's phenomenology attributes the perception of discovering a system to the body. However, Merleau-Ponty elaborates on how imagination and perception collaborate in this regard. Lévi-Strauss suggested the belief in deterministic truth as the instrument to unite imagination and perception. In contrast, Merleau-Ponty stated that 'by conceiving my [his] body itself as a mobile object' he would be able to 'interpret perceptual appearance and construct … the unity of object' that is 'conceived, not experienced as the correlate of our body's unity' (1945, p. 236).

This concept of the body as a mobile object can, in my opinion, explain how one's perception of the body can be used to overcome the restrictions imposed by human bodies and to disclose the hidden yet objective system. Merleau-Ponty explained this process as follows: 'one emerges from blind, symbolic thought only by perceiving the particular spatial unity which bears these predicates all together' (1945, p. 236). In order to disclose a cube, for instance, 'we take up a position in space, now on its surface, now in it, now outside it, and from that moment we see it in perspective' (Merleau-Ponty, 1945, pp. 236-237).

Merleau-Ponty questions the modern scientific method of thought, which he defines as 'analytical reflection … asserting that the object is in itself, or absolutely, without wondering what it is' (1945, p. 237). From a phenomenological standpoint, the analytical reflection observes an object from 'no point of view', and so 'destroys the object's internal structure' (Merleau-Ponty, 1945, p. 237). In contrast, phenomenological thought allows one to find 'the thickness of the world by perceptual experience'

and ‘express the material presence … before my eyes, under my hands, in its perceptual self evidence’ (Merleau-Ponty, 1945, p. 237).

With Merleau-Ponty's internal structure, my methodological investigation completes a full cycle to Walter Pater's internal order of aestheticism, and the two paradigms appear to be intimately related within the context of my research — where historical speculation relies on my own experience of prototyping and focuses on the medium-specificity of Lumia.

4.3.2 Body Schema

In order to reveal the unseen, several phenomena — ‘different perspectives’, ‘geometrized projection, ‘the true form of the object’, and ‘the new appearance … compounded … with the lived-through movement’ — need to work together (Merleau-Ponty, 1945, p. 237). By this collaboration, one can rediscover the unseen: phenomena that exist beyond the realm of an objective perspective (for instance, geometrical). It is essential to note that in Merleau-Ponty's phenomenology, what constitutes perception is not merely a collection of subjective experiences, but rather ’body schema’-oriented knowledge (Merleau-Ponty, 1945, p. 239).

Mark Johnson's idea of ‘image schemata and metaphoric projections’ (1987, p. xiv) amplifies the phenomenological paradigm of Merleau-Ponty and identifies types of embodiments: ‘a recurring, dynamic pattern of our perceptual interactions and motor programs’, the embodied image provides ‘coherence and structure to our experience’ (Johnson, 1987, pp. xiv-xv).

‘Container, balance, compulsion, blockage, counterforce, restraint removal, enablement, attraction, mass-count, path, link, center-periphery, cycle, near-far, scale, part-whole, merging, splitting, full-empty, matching, superimposition, iteration, contact, process, surface, object, collection’ are examples of image schemata (Johnson, 1987, p. 126). The body is a ‘living’ subject in these situations, and its relationship to an object governs perception; for example, ‘the distance from me to the object is not a size which increases or decreases, but a tension which fluctuates round a norm’ (Merleau-Ponty, 1945, p. 352).

Merleau-Ponty suggests in the chapter, ‘The Thing and the Natural World’, that ‘the lighting is neither colour nor, in itself, even light, it is anterior to the distinction between colours and luminosities’, and that its appearance to us is neutral and ‘natural that it is no longer even perceived as penumbra’ (1945, p. 362). Moreover, he introduces a ‘logic’ and ‘synthesis’ of lighting, but only as an extension of the image's logic rather than as an independent logic (Merleau-Ponty, 1945, p. 364). Merleau-Ponty, for instance, classifies lighting as ‘internal lighting’ within a painting and ‘prevailing lighting’ of the gallery (1945, p. 364), and shortly replaces his discussion of lighting with discussion of colour, as do the majority of art historians reviewed in my literature review, who associate Lumia with colour and its abstract expression.

Lévi-Strauss argues that the bricoleur ‘speaks … through the medium of things’ as well as ‘with things’ (1966, p. 21), and that through these, the bricoleur may not achieve the own goal, but reflects the self into it: this is the bricoleur's poetry.

This poetry, which reflects the self, resonates with the previously mentioned notion of the body as a mobile object, and ties to Marshall McLuhan's notion that 'our human senses, of which all media are extensions, are also fixed charges on our personal energies' (1964, p. 21).

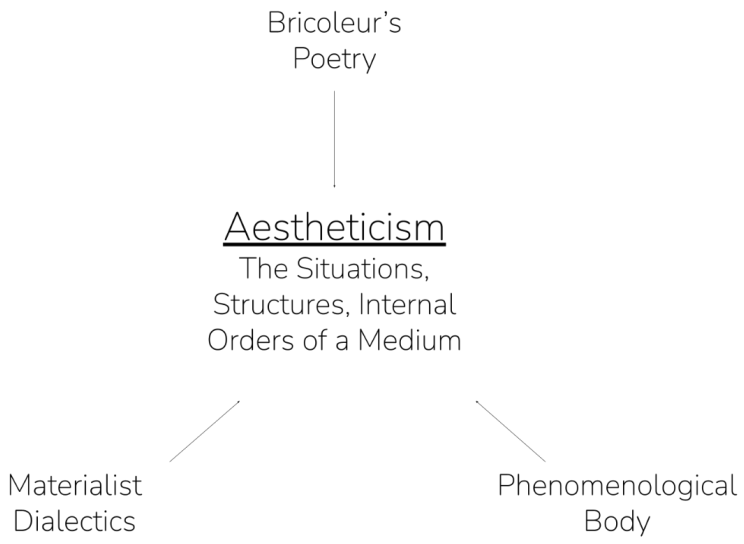


Figure 32. Technologically Extended Aestheticism [TEA] (Source: Trent Kim)

Therefore, a specific type of bricolage, that of prototyping a new apparatus: situation, structure and internal order that I named Technologically Extended Aestheticism (TEA), must continue to broaden our phenomenological experience and uncover more of the internal orders of our perceptual being; it represents the lens of artist-bricoleur that is concurrently materialist, phenomenological and poetic.

4.3.3 Lumia Experiments after Thomas Wilfred (Genealogy of Lumia)

In this final subsection, I review the artistic practices of other contemporary Lumia artists who contributed to the Lumia symposium that I organised in 2017 and 2018. In addition, I have read a selection of journal articles, primarily published by Leonardo (the complete list is included under 'The Collection of Sources' in the LUMIA Digital Archive (Kim, 2022)), as well as digitally accessible archival materials of Earl Reiback and a home-made documentary, *A History of Lumia* (1993) by acclaimed Lumia artist Christian Sidenius. By doing so, I will be able to contextualise my three creative strategies in prototyping: manualisation, simulation and subversion.

Figure 33. Programmes of LUMIA | Symposium 2017 and 2018 (Source: Trent Kim)

LUMIA | Symposium featured seventeen papers and eighteen artworks between 2017 and 2018. The first symposium was held at the Royal College of Art in South Kensington, London, and the second at the London campus of the University of the West of Scotland.

The majority of speakers and performers were based in the United States, therefore I introduced hybrid options for the conference. In 2017, in-person and pre-recorded video presentations were offered and the Q&A sessions were hosted through Skype, allowing remote presenters to participate. In 2018, the symposium had both forms of presentations, but the entire event was live-streamed on YouTube in a 360-degree format.

The majority of the paper presentations (for which I obtained permission in line with RCA's ethics policy) and all of the screenings are archived in the *LUMIA Digital Archive* (Kim, 2022). I have added video chapters to a selection of the recordings to provide additional information and bookmark important discussions for my research, as I do with other video materials.

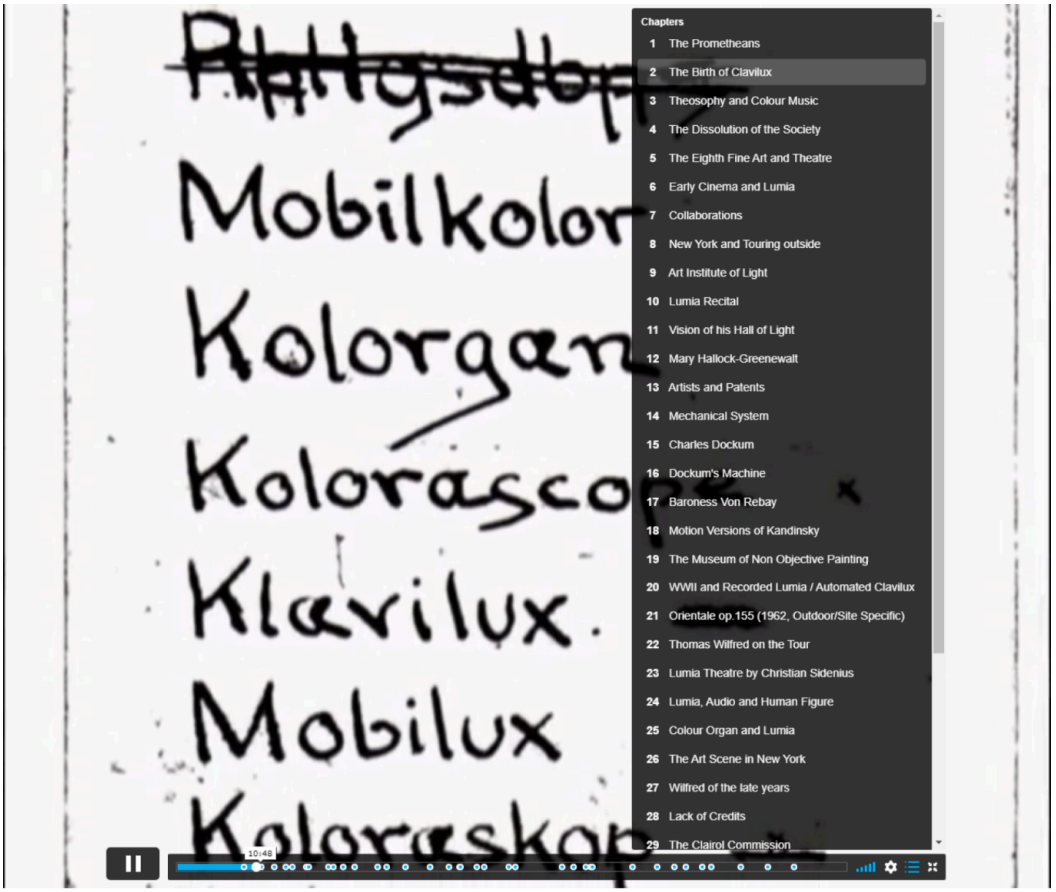


Figure 34. An Example of Video Chapters as Research Notes (Source: Trent Kim)

The most difficult aspect of Lumia research is locating material on contemporary practices that have been influenced by Thomas Wilfred, even though it has been argued that numerous artists[21] have been influenced by his Lumia works. I contacted Eugene Epstein, the primary art collector of Thomas Wilfred's works, via email as part of my study and also joined the Psychedelic Light Show Preservation Society on Facebook. The Psychedelic Light Show Preservation Society was founded on 14 February 2012, has 5,652 members (at 18 April 2021), and its group information declared, 'An

[21](In alphabetical order) James Baldocchi & Dennis Keefe, Stephen Beck, Jordan Belson, Louis M. Brill, Mary Ellen Bute, Jackie Cassen & Rudi Stern, Fred Collopy, Dick Cook, Jim Davis, AJ Epstein, Laurent Fort, Paul Friedlander, David Hull, Richard I. Land, Kathleen Laqziza, Frank Malina, Nam June Paik, Dave Payling, Earl Reiback, William Rockwell, Thomas Shoesmith, Christian Sidenius, Brian Skalak, George Stadnik, Gregg Stephens, James Turrell, and Joshua White (Zinman, no date; Malina, 1974; Keefer and Mondloch, 2015)

Artist's network dedicated to continuing the tradition of Visual Music. ESPECIALLY MULTI-IMAGE SHOW pioneers' (Psychedelic Light Show Preservation Society, no date).

Reviewing the existing Lumia-related postings was helpful in understanding the term's common meaning. Lumia can be argued as a technique that can be implemented into artists' live audio-visual performances within the context of psychedelic light art (most commonly connected with liquid light show). Thomas Shoesmith, for instance, repurposed and redesigned Lumia for his light shows.

Figure 35. Thomas Shoesmith of the Joshua Light Show Demonstrating Lumia Effects at Fillmore East in 1969 (Source: Global Image Works) [REDACTED]

It was also clear that there was a historical interest in Thomas Wilfred's art and background. However, Lumia seems to refer mostly to a form of projected image created by light reflection and refraction that was typically discovered by accident.

> Hello I'm Christian Sidenius, and this is Lumia, the theatre of light. We are videotaping a history of light as a performance art, and we will come back to the history, Lumia sequences, and we will demonstrate various techniques used to produce the imagery.
>
> (Sidenius, 1993)

This was the introduction of Christian Sidenius's home-made video, *A History of Lumia* (1993), which covered a brief history of Wilfred's Lumia and a series of his own Lumia experiments. In particular, he displayed his own Clavilux (Figure 36), a prototype closely modelled on Wilfred's early model, possibly models A and B (which were captured in Wilfred's patent design 1,749,011 detailed in subsection 3.3.3.

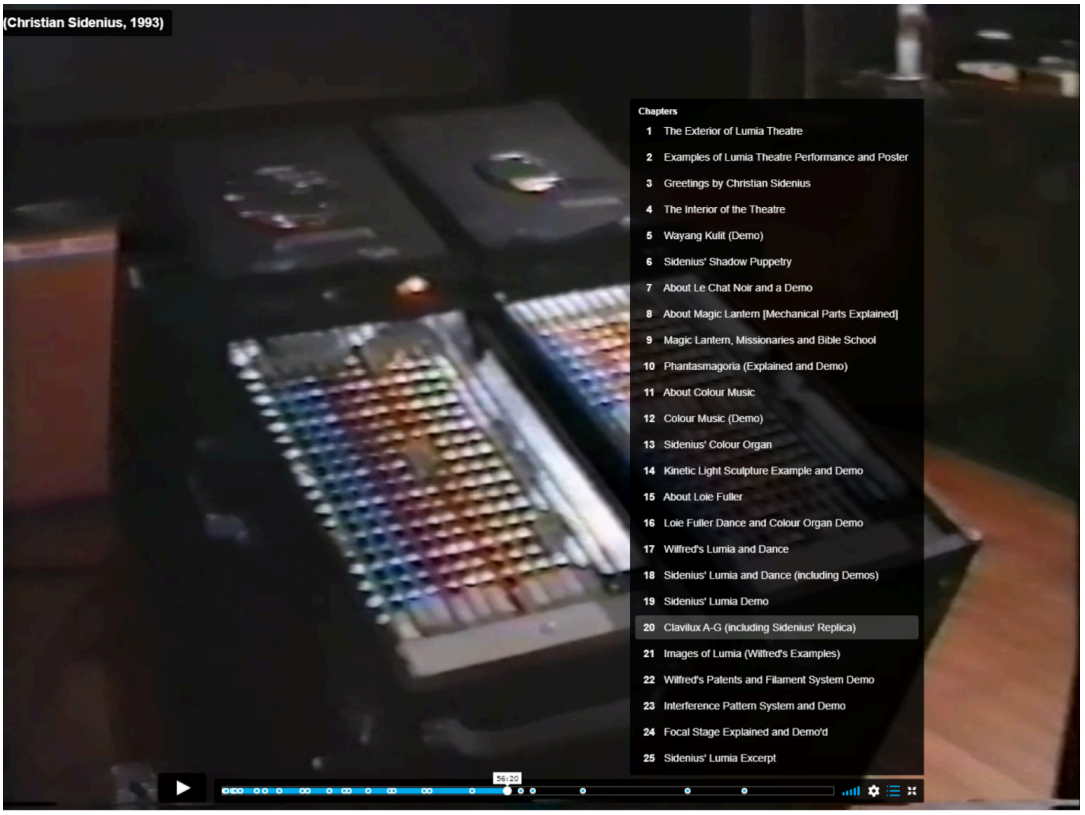


Figure 36. My Video Chapters for A History of Lumia and the image of Sidenius's Own Clavilux (Source: Trent Kim)

In a perfect scenario, other current Lumia artists would have documented and explained their own techniques and how the legacy of Lumia influenced them, but there were other ways to obtain this information.

The Psychedelic Light Show Preservation Society Facebook group archived numerous discussions about Lumia, although they were largely generic and repetitive. However, I was able to identify artists who were specifically interested in Lumia and contacted them via the platform. In addition to Christian Sidenius's film, the materials and observations I gathered during my 2017 visit to Yale University were of great assistance to my research. There I accessed the *Thomas Wilfred Papers (MS 1375)*

(New Haven, Manuscripts and Archives, Yale University Library) and attended the *Lumia: Thomas Wilfred and the Art of Light* exhibition (17 February 2017 - 23 July 2017) in the university's art gallery.

The Thomas Wilfred Papers (MS 1375) (New Haven, Manuscripts and Archives, Yale University Library) were compiled in January 1984, mostly from donations made by Thomas Wilfred's son, and the collection's general classification shows room for improvement and expansion. *Lumia: Thomas Wilfred and the Art of Light* (17 February 2017–23 July 23 2017), curated by Keely Orgemen, the Alice and Allan Kaplan Associate Curator of American Paintings and Sculpture at Yale University Art Gallery, resembled the curatorial narrative of the *Thomas Wilfred: Lumia* - retrospective exhibition (1971); however, its efforts in art conservation and restoration, as well as its predominantly academic yet contemporary contexts, resulted in new aspects for the show.

First, the exhibition catalogue included photos and descriptions about the mechanical components of Wilfred's recorded compositions, and visitors to the exhibition were able to view the mechanical reconstruction of *Lumia Suite, Op. 158*.

Second, the exhibition featured the live performance *After Wilfred: The Contemporary Lumia Experience*, curated and performed by Joshua White, the founder and artist of the Joshua Light Show. Six Lumia artists, including Joshua White, George Stadnik, Laurent Fort, David Hull, William Rockwell, and myself were invited to contribute to this performance. Even though it was a one-time performance, the compilation of the artists' works revealed their individual innovations and

imaginations and contributed something new to Lumia's history. Particularly exciting and motivating was the manner in which the artists prototyped their own instruments, expanding from or regardless of Wilfred's mechanical design.

Figure 37. The Official Event Information of After Wilfred: The Contemporary Lumia Experience (Source: Yale University Art Gallery) [REDACTED]

The field trip to Yale provided me with access to archive materials, as well as networking opportunities with other Lumia researchers and artists, and it inspired me to organise the first Lumia conference, the *LUMIA | Symposium*. There was no keynote speaker at the *LUMIA | Symposium*; all participants, whether academics, practitioners, or both, contributed equally. By doing so, the 2017 and 2018 programmes appeared to establish a good balance between theory and practice, similar to exemplary practice-based art conferences such as *Seeing Sound* at Bath Spa University and *Sound / Image* at University of Greenwich. The practice reviews of contemporary Lumia artists' works — through the field trip, group show, and *LUMIA | Symposium* in 2017 and 2018 — helped me to learn about the distinct praxes of Lumia, and persuaded me to revisit Thomas Wilfred in search of a form of Lumia's genealogy (Figure 38).

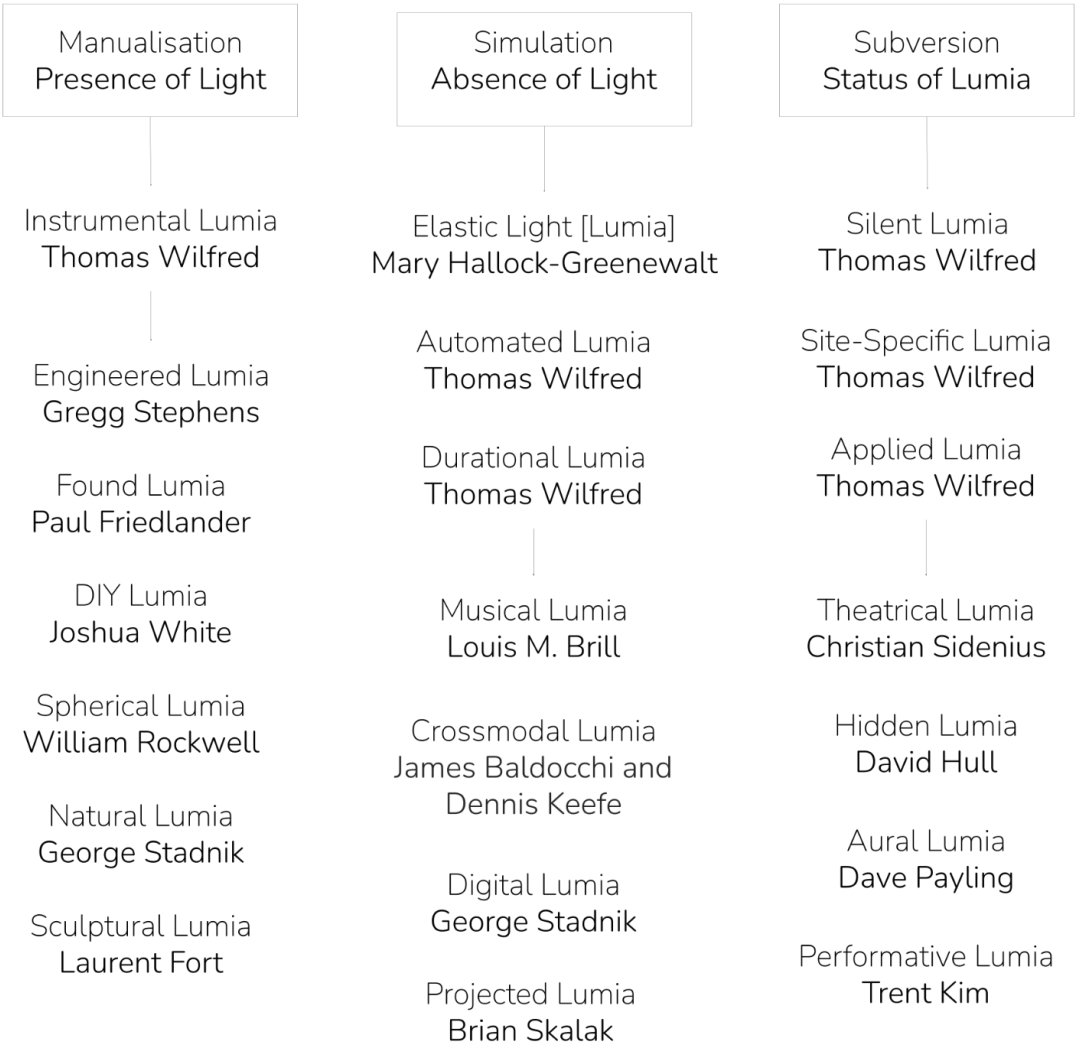


Figure 38. A Genealogy of Lumia Praxes (Source: Trent Kim)

After identifying keywords to identify the individual praxes, I organised across two generations of Lumia artists to reflect how contemporary Lumia artists are directly influenced by Thomas Wilfred. In addition, I worked out common themes that can group three collections of the praxes.

Firstly, manualisation recognises the efforts in embodying the presence of light through crafts and analogue engineering. As the medium of lighting deals with the physical properties of light, the

theme effectively represents those individual praxes. In this, George Stadnik's natural Lumia which makes use of the flow of air created by spectators' movements, expresses how Lumia is part of material reality and how one begins to recognise and embody it.

Secondly, simulation questions visualising Lumia, whether through digital visualisations or, more conventionally, by cross-modality — to link between light and sound. Brian Skalak's use of pre-recorded Lumia clips to create an interactive art was particularly interesting in terms of the aspect of live performance that has been reassigned to the spectators. In addition, this particular genealogical thread features Mary Hallock-Greenewalt (1871-1950), another visionary light artist-bricoleur who founded Nourathar as a fine art form of lighting and gained a series of innovative patents related to the art. In the patent 1481132 document (1924) on *Method of and Means for Associating Light and Music*, Hallock-Greenewalt used the word 'elastic' to refer to detailed controlling of light and subtle qualities of light, and considering the patent 1385944 on *Notation for Indicating Lighting Effects* (1921) that resembled western musical notation, the level of elasticity might have been metaphorically imagined based on the artist's own musical sensitivities as professional pianist. This demonstrates that the genealogy of Lumia practices can be further researched prior to Wilfred's Lumia practices and outside of the officially titled Lumia practices.

Thirdly, subversion emphasises Lumia's performative efforts in challenging our assumptions about light but also Lumia as an art form. For instance, Thomas Wilfred's silence condition of Lumia rejected the musical dominance in colour music and Dave Payling (2018) adapted the three basic factors of Lumia proposed by Wilfred (see Figure 9): colour, form and motion, explored them as primary focuses

independently but also in combinations for his audio-visual works, hence, establishing the paradigm of Lumia as the structural dominance. I would classify my Lumia as performative under this theme, which focuses on presenting the aestheticist paradigm to evoke new ways of perceiving objects through lighting, based on the outputs of this PhD research and my artistic interest afterwards.

This classification was influenced by Gille Deleuze's *The Fold* on Leibniz and the Baroque, because it was a key text in 2017, as evidenced by my research talk, 'LUMIA: the Art of Folding Light', at Yale University on 16 February 2017 (invited by the head of Projection Design at Yale School of Drama) and my conference paper (of the same title) at the *LUMIA | Symposium in 2017*.

Deleuze's explanation of the contrasts between 'organism' and 'machine' was particularly motivating; organism is characterised by 'its ability to fold its own parts and to unfold them, not to infinity, but to a degree of development assigned to each species. Thus an organism is enveloped by organisms, one within another (interlocking of germinal matter), like Russian dolls'. In contrast, 'a part of a machine is still a machine' but 'the smaller unit is not the same as the whole' (Deleuze, 1993, pp. 8-9).

What validates 'organism' in Deleuze's framework — resonating the situations, structures, and internal ordering of a medium, as well as his two following concepts ('pleats of matter' and 'folds of the soul') — bolstered my research trajectory. It reminded me of the significance of the whole-part issue and increased my critical confidence in exploring Clavilux as an instrument (apparatus) as well as an organism/structure (apparatus) that exposes the internal order.

For example, notions like ‘pleats of matter’ (material inquiries) and ‘folds of the soul’ (conceptual inquiries) encouraged me to see essential orders behind the distinctive praxes of Lumia. According to Deleuze, the Baroque understood 'fold' in two ways: first, as ‘elastic forces’ in ‘pleats of matter’ and second, as ‘plastic forces’ in ‘folds of the soul’ (Deleuze, 1993, pp. 3-13).

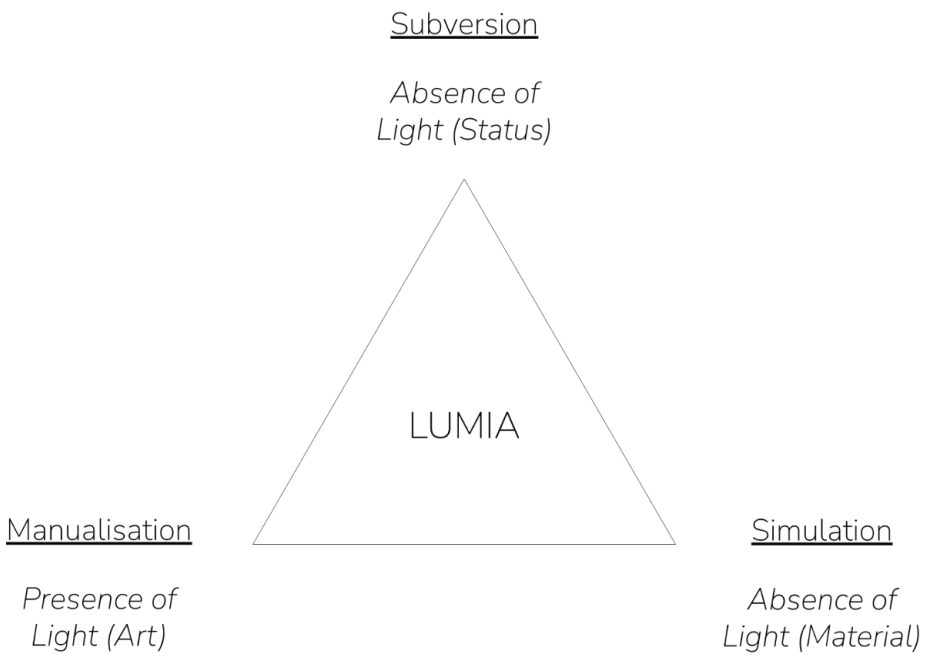


Figure 39. Three Themes to Categorise Lumia Praxes (Source: Trent Kim)

By a logical extension, I was able to see manualisation → simulation by overcoming the absence of material using the concept of plastic forces. For instance, unlike manualisation where the elastic forces set the boundaries of exploration, simulation is framed by the theoretical foundation based on plastic forces. Therefore, the absence of light becomes not an invalidated condition but a new condition for exploring the medium-specificity of lighting such as digital and intermedia conditions. I was also reminded of Merleau-Ponty’s concept of the body as a mobile object in recognising simulation as a materialist expansion. Then I questioned the concept of materialism through the

Benjaminian concept of apparatus, which represented not only physical material but also social materiality. Thus I added the theme of subversion; for instance, treating the medium-specificity of lighting as the source of aesthetic creations against lighting's assumed function of mimesis subverts a new order (similar to how Wilde imagined painting to prescribe human life in *The Picture of Dorian Gray*).

Chapter 5: Exegesis on my Clavilux Prototypes

The aim of this exegesis is to demonstrate how I centred my practice on prototyping my own Clavilux models and using them to create artworks, and how I improved my research through observation, imagination, innovation and feedforward. This furthers the core purpose of my PhD research, which is to recover the forgotten and unrealised past in order to enlighten and inspire contemporary art practices, everyday practices and new critical concepts. Consequently, it is crucial to recognise that this distinguishes it from Foucauldian media archaeology and establishes phenomenological study through the aestheticist paradigm in extending the knowledge of Lumia's specificity.

It is crucial to understand my experiments and prototypes in this chapter as methodological demonstrations (case studies of practice as research) rather than illustrating external concepts; therefore, my concepts proposed later in this chapter will be discussed in terms of how practice challenges and informs external theories in reverse. I would argue that for practice-based artist research, themes and concepts both aim to inspire artworks and manifest as artworks, and the difference in specificity (concept being more abstract and theme being more specific) represents different phases of one's creative process.

In the context of Lumia, where lighting is an independent art form, light is not merely an element of a visual art, but a methodology that offers a new way of seeing. In other words, lighting connects dots through reflection and reveals its own spacetime: void axis (see subsection 5.2.3). Through the void

axis, Lumia offers not only a new and specific method of live animation and performance but also a new critical perspective to think about art and life through lighting.

The entire research has been a journey of prototyping what has been unseen (section 5.2), situating Lumia within art historical and contemporary art contexts (subsection 5.3.2), spotting Lumia in our everyday practices (subsection 5.3.3), moulding light with hands-on experimentation (subsection 5.3.4), collaborating with other artists (subsection 5.3.5), simulating Lumia as technological interventions (subsection 5.3.6), performing Lumia to subvert conventional hierarchies/perspectives that light was overlooked (subsection 5.3.7), and elucidating the medium-specificity of lighting (subsection 5.3.8) — from Lumia as a mere aesthetic style to a new way of seeing.

Section 5.3 serves as the preface to the latest exhibition, *LUMIA: PERFORMING LIGHT*[22], and I have created a 'takeaway' version (a printed leaflet with QR codes to access all the artworks and exhibition guides) (see Appendix B) of the exhibition utilising a web-based augmented reality platform called MyWebAR. The primary objective of the takeaway version was to provide a guided and embodied walkthrough experience to share my Lumia journey with my readers and visitors. I structured the exhibitions into eight zones to exemplify different strategies to fully experience lighting: prototyping, situating, spotting, moulding, collaborating, simulating, performing, and elucidating. In addition, there was a station at the exit where visitors filled out two surveys designed by the exhibition's creative producer. One of the surveys asked respondents to give feedback using texts and drawings (see

[22] *LUMIA: PERFORMING LIGHT*, at The Art Department, Paisley, opened on 12 April 2022, and ran until 17 April 2022.

Appendix D). The submitted drawings were posted on the gallery wall during the exhibition. I consider this part as conversing.

The following sections should be considered as a detailed documentation of my prototype experiments to share my practice-based research. Both documentation and research led to the creation of the exhibited work (and other pieces not shown). The *Lumia Digital Archive* (Kim, 2022) contains the complete collection of my Lumia composition works, indexed by Opt. (Optics to stress the condition of lighting) numbered from 1 to 25.

5.1 Lens Experiments

While the other activities (as indicated by the subsection titles) were limited to specific phases of my research, prototyping continued throughout and served as a holding area for the others and for prototyping itself. Throughout this research, I have developed and experimented with techniques and systems. I have also adapted Wilfred's term, Clavilux, in order to make my own creative outputs comparable to Wilfred's and other Lumia artists' medium-specific experiments and systems. Clavilux was an instrument for Wilfred's Lumia recitals, and he also used the term to refer to his projected scenery system. As discussed in chapter 2, he differentiated it from his gallery automatons. Clavilux is, in my opinion, a system that investigates and manipulates lighting conditions — that are revealed and reaffirmed by its technical phenomena. Thus, it devises and defines a system that enables such creative acts.

This chapter will focus on three Clavilux systems, each of which has taken a distinct critical stance: Clavilux I (Void Axis), Clavilux J (Technological Voyeurism), and Clavilux K ('Un-site'-Specificity). In addition, by examining a selection of my own Lumia artworks, this chapter will demonstrate how Lumia has influenced contemporary and everyday lighting practices as well as new critical concepts outside of lighting.

5.1.1 Early Experiments - Learning to remould the void and release light

In my first year of study, I began prototyping the lighting technique of Lumia and I identified and experimented with potential substances that light can penetrate and reflect on. To create images reminiscent of Thomas Wilfred's Lumia, I experimented with various types of light sources, including incandescent, LED, laser, and LCD projectors, on various solid, liquid, opaque, transparent, and reflective objects and surfaces.

As much as I was interested in imitating Wilfred's lighting style in my own Lumia, I was more intrigued by the underlying principle beneath it. His style delivers a unique type of animation. Lumia alters the lighting condition that is defined by the relationship between light sources, objects, surfaces, their container, and an exit for a beam of light to leave the container for a projection screen. This contrasts to the technique of frame by frame animation that relies on still illustrations to produce motion, as the animation of Lumia is the visual information of the relationality between light, space and perspective.

Nonetheless, the overall purpose of the contained structure was to manipulate light in real time, and the individual parts that were connected to the operator represented an abstract marionette system that sculpted the void to enable light to perform rather than making the parts reveal themselves.

My early experiments were mostly material exploration intended, firstly, to comprehend the concept of containing light; second, to construct a mobile using strings; and third, to investigate the concept of moulding the void and releasing light (by attempting to create my own lenses).

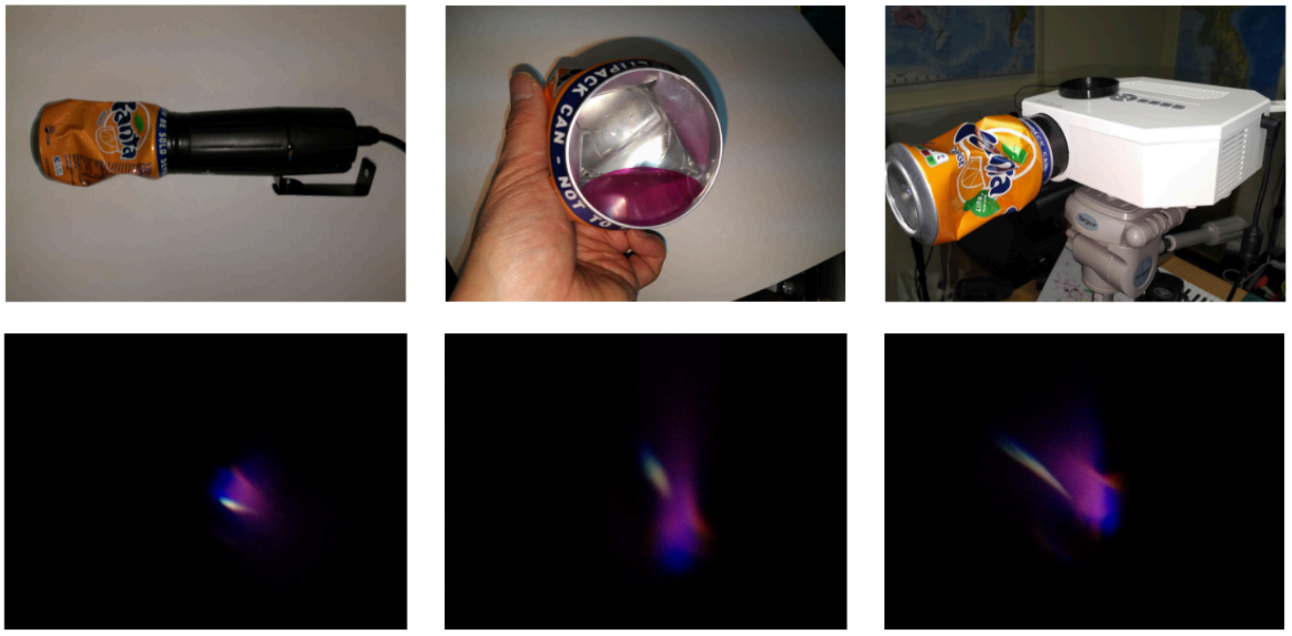


Figure 40. The Construction and Images of Fanta Clavilux (Source: Trent Kim)

My habit of crushing empty cans led me to discover Fanta Clavilux when I picked up a few crushed cans on my desk. The concept of moulding the void and releasing light seemed pertinent to this experiment, but I had very low expectations for the outcome. In contrast to other experiments at the

time, such as the Lumia mobile and homemade lenses, which were much more planned out, this one was largely unplanned.

By shining a bluish LED light from the projector onto the crushed can, a convex lens and a colour filter enabled the beam to reflect, relay, and overlap, before exiting through a pinhole onto a white wall on the other side. It was a simple experiment that relied on randomly generated aesthetics created by crushing the can further and rotating it to adjust the zoom/focus of the projector's lens. This experiment enabled me to discover a tactile connection between moulding the void (consequently, also moulding light) and crushing a can.

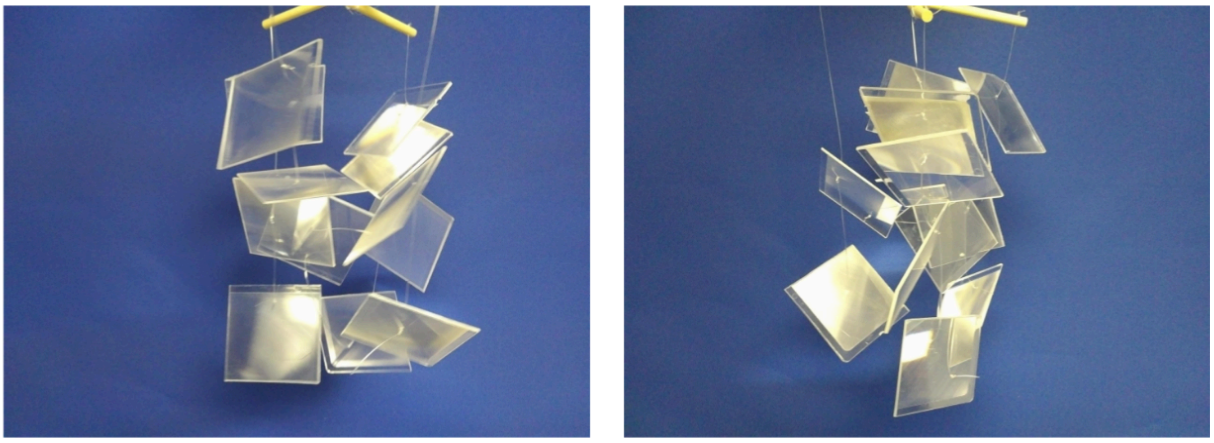


Figure 41. Lumia Mobile Construction (Source: Trent Kim)

Another early experiment involved the development of a mobile for Lumia. The purpose of this experiment was to consider what would happen if a two-dimensional lens were deconstructed by being cut into pieces and then reassembled through the use of an invisible thread. Prior to this experiment, I visited *Alexander Calder: Performing Sculpture* at Tate Modern, and I now wonder, after

all these years, if Calder's exhibition title subconsciously influenced my decision to name my most recent exhibition *LUMIA: PERFORMING LIGHT*. Calder famously remarked that Mondrian believed physical movement to be unnecessary in his art, and reading about this at the exhibition made me realise that Calder's abstract art exists in a different physical context (medium) than Mondrian's art. The concept of motion should not be generalised but interpreted medium-specifically. I would argue that Calder's art relied on elastic forces while Mondrian's art relied on plastic forces in exploring motion. At the time, I was reading articles on both Lumia and abstract film, and this visit helped me to understand where Lumia exists: in a three-dimensional space that is almost the polar opposite of Calder's sculptural space. As opposed to illuminating the world for our eyes, the purpose of these parts is to redirect the light that represents how light reveals the world.

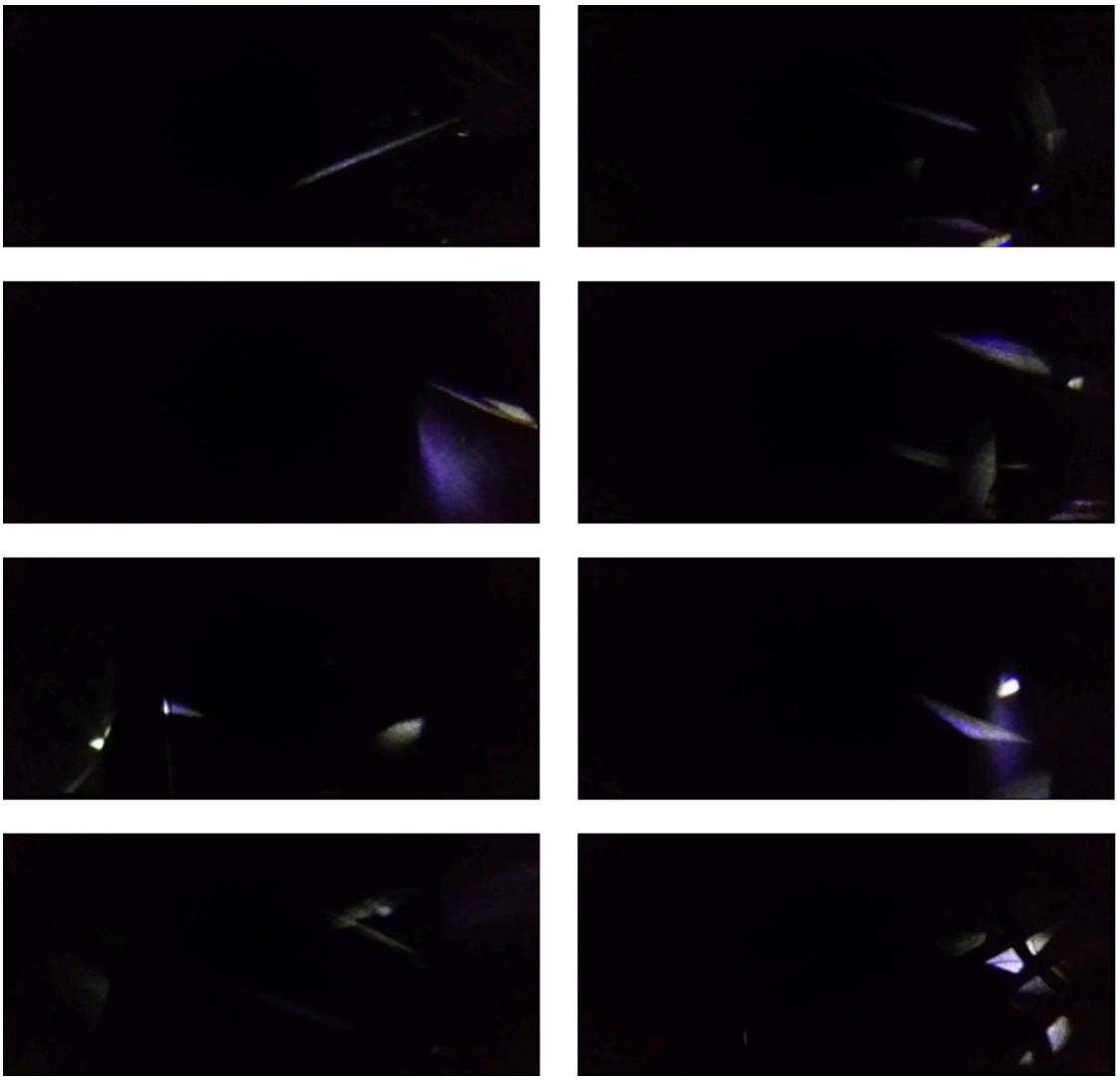


Figure 42. Images from the Lumia Mobile (Source: Trent Kim)

After Fanta Clavilux and the mobile experiment, I conducted additional tests with handmade lenses. My aim in using lenses was mainly to disperse light rays rather than concentrating them, and by doing so, I develop methods of directly redirecting light in order to affect the condition of lighting (the void). Fibre optics, epoxy resin, and water are among the materials I utilised.

Figure 43. Different Materials for Homemade Lenses (Source: Trent Kim)

Despite the fact that the selection of materials was based solely on their transparency, I quickly realised that their differing densities determined how easily they could be reshaped and maintain their shape. Although fibre optics could completely control the path of light, it was either too rigid or too difficult to maintain its shape. From one form to another, fibre optics lacked continuity in practical terms of manually operating lenses.

Two difficulties rendered fibre optics unsuitable for the production of my Lumia lenses. First, they lacked natural curves, and second, they were difficult to shape by hand. Therefore, I decided to utilise epoxy resin to achieve smooth surfaces and silicone egg poachers to devise curvature.

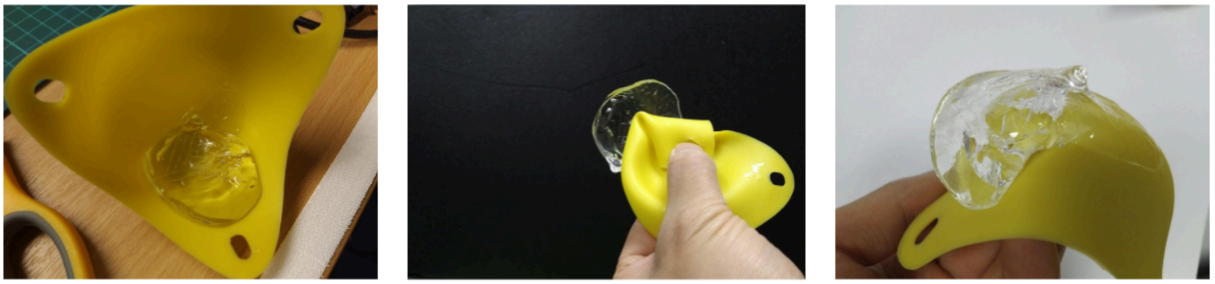


Figure 44. Epoxy Resin Lens Experiment (Source: Trent Kim)

Then, I discovered that the middle curing stage of epoxy resin offers optimal clarity and density, allowing me to easily remould it. Using a battery-powered 5mw red laser pen, I maintained excellent control over the Lumia and was able to observe and study the behaviour of light through a complex and remoulding lens. There was, however, no way to stop the curing process.

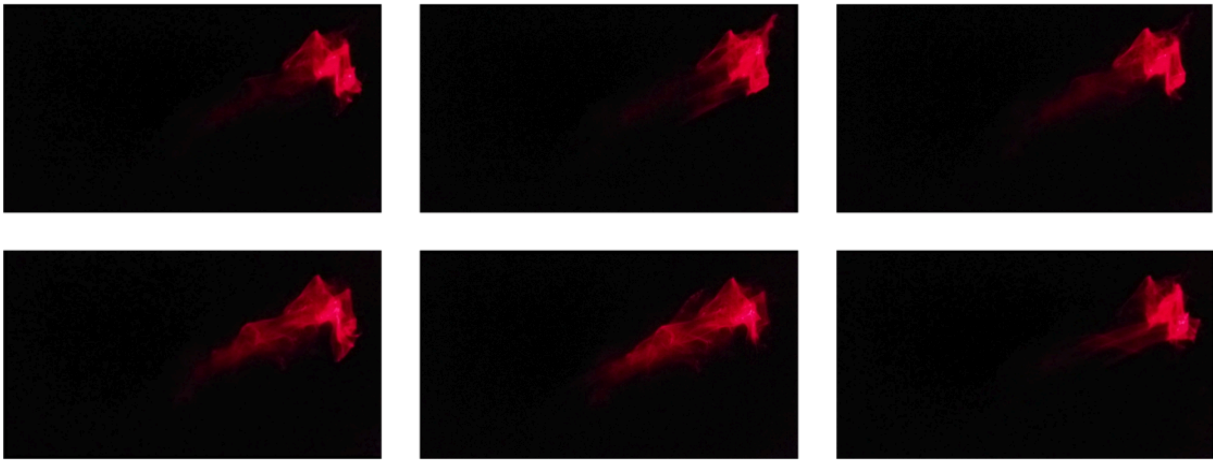


Figure 45. Images from the Epoxy Resin Lens (Source: Trent Kim)

Commingled Containers (1996) by Stan Brakhage inspired me to experiment with water when I was looking for a new medium to work with. I was tasked with containing and controlling water, using a

transparent plastic bag to alter the shape of the lens. In the film, the camera traversed between underwater and water surface, and mingled between inhabitable and uninhabitable spaces. It contrasted fast (water waves) and slow (refracted light) visual tempos and invoked the sense of meditation underwater while expressing the sense of suffocation near the water surface.

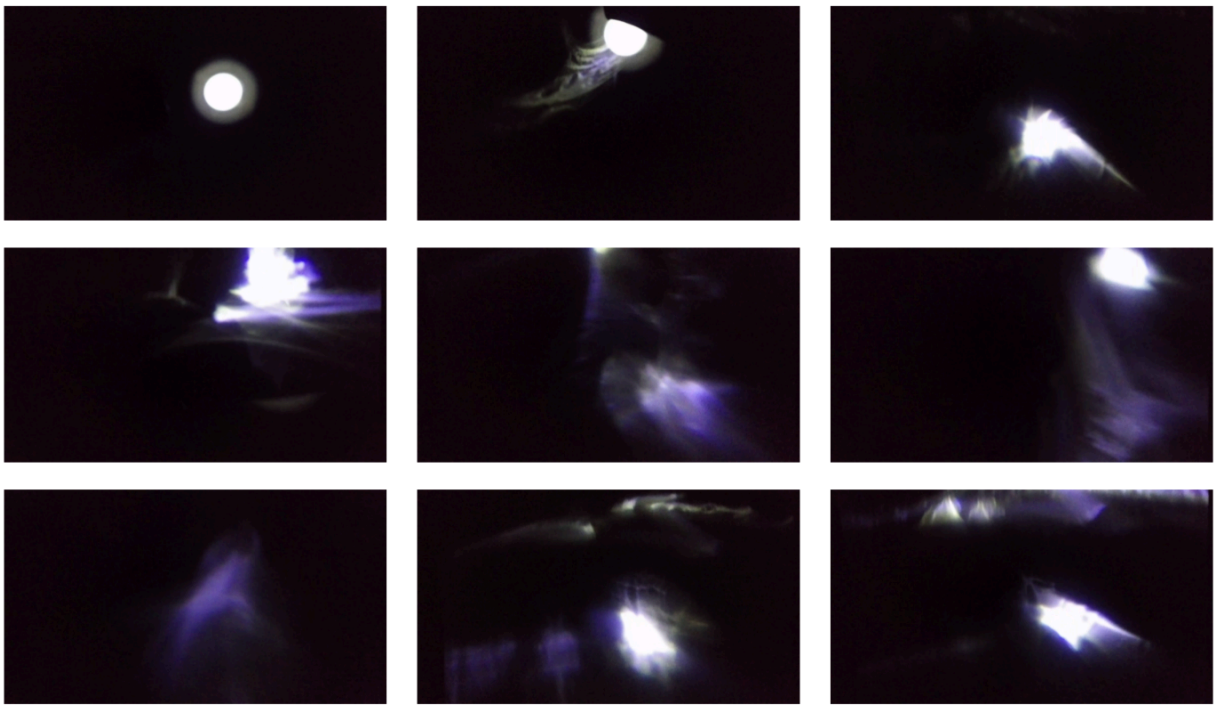


Figure 46. Images from the Water Bag Lens (Source: Trent Kim)

Through observing the results of my water lens experiment, I was able to recall the emotional connection that I had when watching *Commingled Containers*, and I quickly realised that it was connected to my recollection of seeing a fuzzy image caused by my uncontrollable sobbing as a child. There, my entire vision was overtaken by tears like the light from the water bag lens.

5.1.2 Early Experiments - Circular Time and Linear Time

My understanding of lenses in the context of Lumia has become a means of reconfiguring the physical space of light. A chair in a room is an addition to the space, but a lens in a container of light is an organic characteristic of the space. The lens, like a moving refracted light on the ocean's surface, can represent the space of light (the condition of lighting) itself.

Figure 47. Caustics on the Ocean's Surface and on a Boat (Lynch and Livingston 1995, pp. 87-88) [REDACTED]

Some light is refracted, and some light is reflected by the surface of water, land and solid objects (see Figure 47). This is a common occurrence on boats on sunny days. This type of confined, reflected, and refracted light is referred to as caustics, and the image of caustics is merely derivative, indicating a lighting condition. Lumia's art is founded on the principle that lenses are a portion of the space of light but not the entirety of it, and its craft is the reconfiguration of lighting conditions based on this principle.

Despite being a live performance, Lumia was frequently used as an example of early cinema. This could be justified by the fact that many of the earliest experimental abstract films utilised simpler

stop-motion from a fixed position (it is still widely used), that could be reimagined as a puppet theatre where the strings on marionettes were replaced by the succession of film frames. A glass multiplane stop-motion animation, for instance, shares the same illusion of perspective as the Baroque mechanical theatre. Although we cannot see the thread, its forces are tangible. Consequently, I contend that Lumia is not a form of cinema, but rather an experimental form of theatre in which light replaces actors and lenses and surfaces replace props, sets, and theatre walls. This type of contrast and subversion between different art forms has been helpful in this research. For instance, contrasting the importance of entirety to the partial and disconnected spaces of cinema, Lumia can be — must be — differentiated from film. And Lumia's subversive nature of prioritising lighting over sets, props, and performers (as the subject matter) places Lumia next to another performance genre like music, that centres not on human performers but on pure media such as light and sound.

This is a form of intermedia discourse recognising that media are ontologically related, but I would argue that this makes it possible to demarcate the boundaries between media. Here are two distinct examples of genre classifications, as well as Wilfred's own. Wilfred vehemently rejected any physical analogy between colour and music to liberate Lumia from colour music, but then misrepresented Lumia as a form of painterly practice (including painting, illustration and motion graphics) by employing formal visual analysis. I would argue that the visual analysis of Lumia undermines Lumia as an independent art form because it emphasises what is seen (visual analysis) rather than how it should be seen (medium-specificity) as evidenced by the main factors of Lumia in Wilfred’s theory: colour, form and motion. I would argue that the screen in Lumia is a translucent wall to share a restricted view and keep viewers separate from the condition of lighting — as with the Brechtian

fourth wall. This is where I object to Wilfred's theoretical analysis of Lumia's visible three dimensionality, and proposes a performance paradigm. Switching the focus from visual analysis to medium-specificity recognises Lumia as a methodology of seeing rather than a method of visual composition. In fact, due to the elaborate style of abstraction and the constant shifts of motion commonly found in Lumia, it is questionable how feasible Wilfred's theoretical framework would have been.

In fact, when creating Lumia, I was influenced more by abstract sculptures and structural films, in which light already has a physical presence.

Figure 48. Screenshots from One11 with 103 (Left) and The Making of One11 (Right) (Source: UbuWeb)

[REDACTED]

One11 (1992) by John Cage was not a structuralist film, but it was an excellent example of how cameras documented pure light. Nonetheless, in my opinion, it is a film and not Lumia. This is because the condition of lighting is not the subject of this film. Cage's use of close-ups and partial illumination prevents viewers from perceiving the actual space and its relationship to light, resulting

in an abstract moving image devoid of spatial reference. In reality, the lighting condition is static and extremely generic; light here serves merely as an abstract brush for chance aesthetics.

Examining the boundaries between Lumia and film, specifically abstract film, was the purpose of one of my acetate roll experiments. I was initially intrigued by the prospect of composing a Lumia piece using a film reel. I experimented with a glue gun, coloured gels and reflectors.

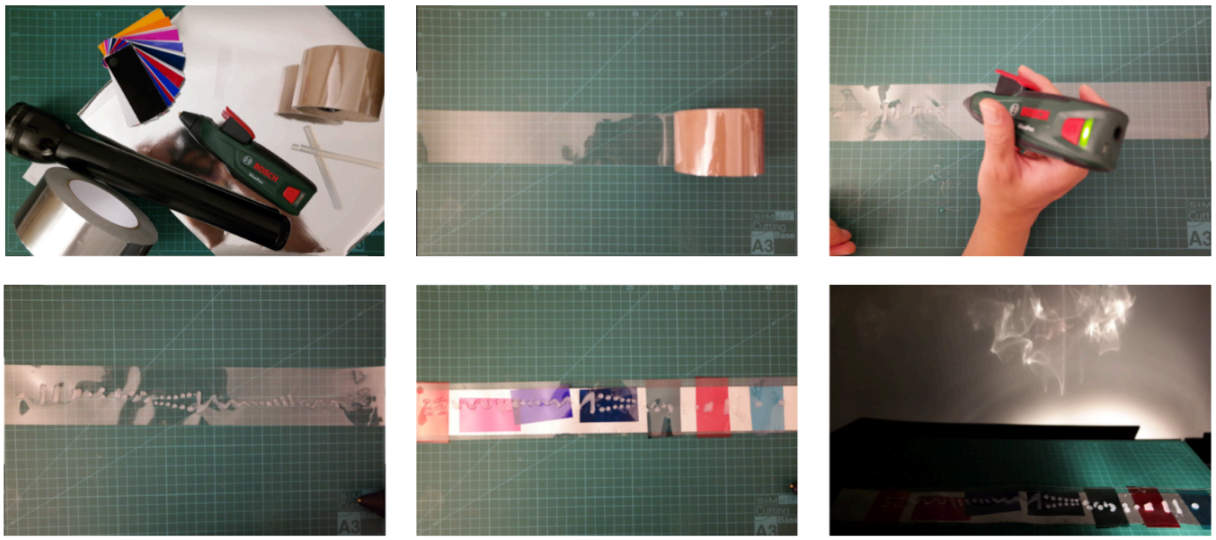


Figure 49. Glue Gun Experiment (Source: Trent Kim)

As light does not project, but rather refracts through and reflects on a portion of the roll, the continuity of the animation resulting by moving the light across the acetate strip lengthways is never determined by the repetition of a visible pattern, but rather is always ensured by the light itself. In other words, these glue gun dots, reflectors, and coloured gels collectively constitute the condition of lighting, so the image is not an optical illusion of motion created by rapidly succeeding frames.

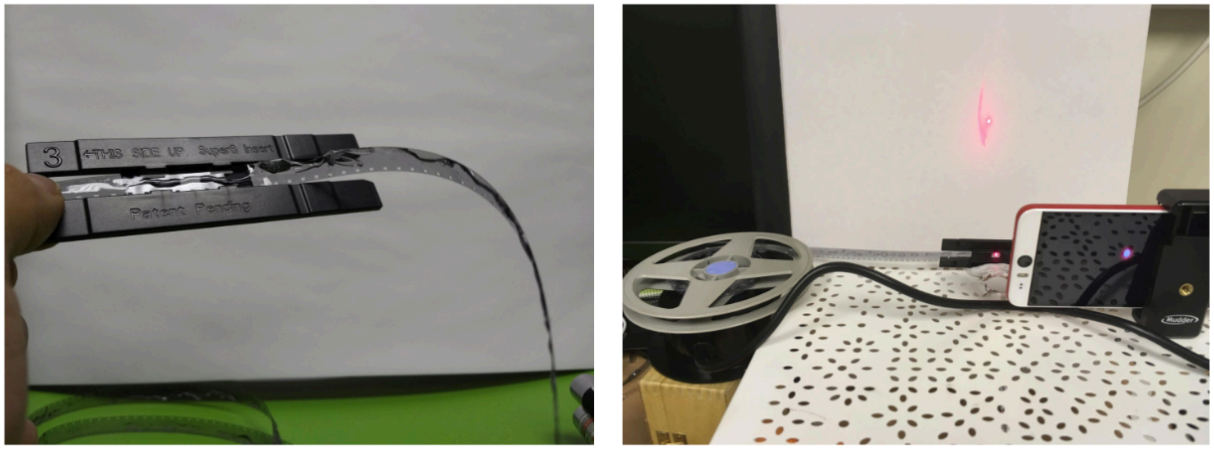


Figure 50. Super8 Experiment (Source: Trent Kim)

Experimenting with Lumia on Super 8 film forced me to reconsider what Lumia is and how it differs from cinema, and the line of epoxy resin across the reel represents the varying lighting condition. I retracted the film using a combination of the reel and a slow-rotating mirror ball rotator and observed a continuously transforming image of lighting. This could be considered a three-dimensional mark as I drew a continuous lens to project the transformative lighting space.

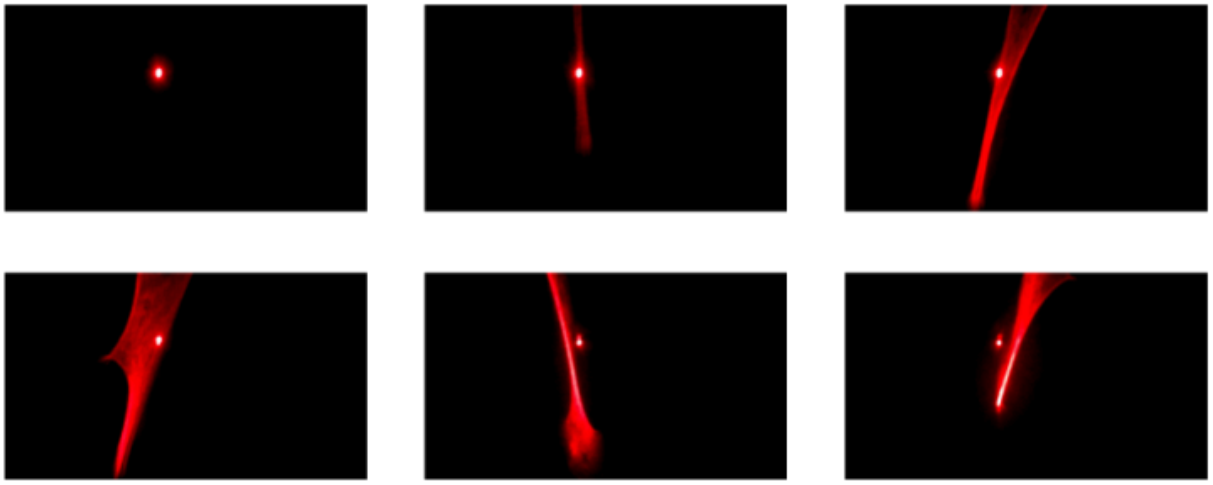


Figure 51. Images from the Super8 Experiment (Source: Trent Kim)

Principally, the condition of lighting is determined by the relationship between the light source and its container. As my early experiments demonstrated, the container comes in various forms, but it must also transform into a time-based Lumia.

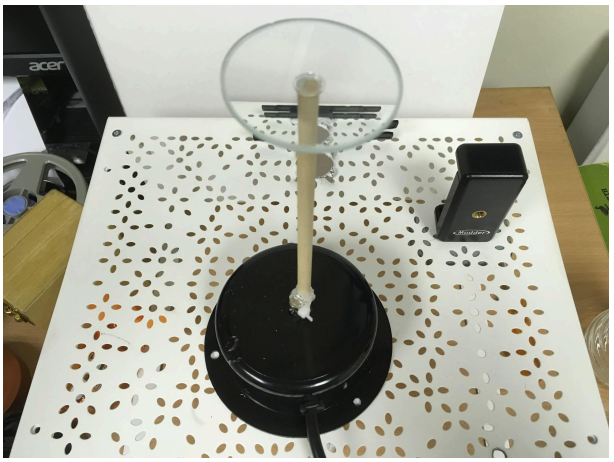


Figure 52. Set-Up for Clear Mint Experiment (Source: Trent Kim)

For the apparatus shown in Figure 52, I pulverised a clear mint sugar candy into fractured pieces and placed them onto a lens, while using the same motor from the previous experiment to create a rotating platform. The animation and performance of Lumia in this instance exist in circular time, and the platform's rotation simulates the circulation of light which is then anchored toward the lens's centre. When experimenting with homemade lenses, I continued questioning the relationship between time and motion. I felt that there was motion in circular time (the duration of rotation), and another motion in linear time.

This circular lens that rotates and loops to complete its survey reveals a static space for lighting (void), in contrast to my experiment with a Super 8 film reel, in which linear time dominated my creative process. Since this experiment, I have created two distinct forms of time: first, circular time to survey a moment as if it were a literal animation of the time captured in a Cubist painting; and second, linear time to represent the changes occurring.

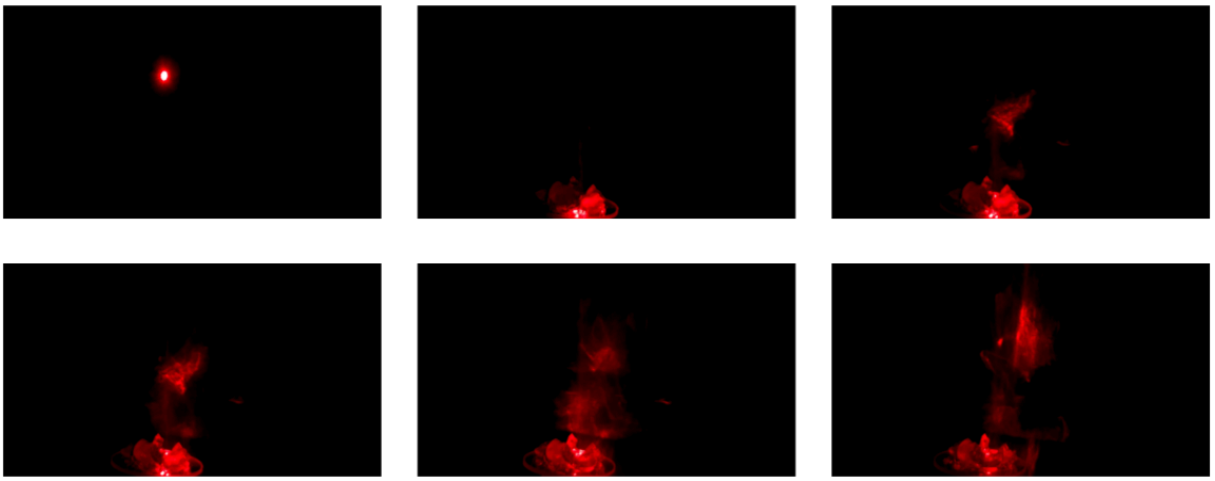


Figure 53. Images from the Clear Mint Experiment (Source: Trent Kim)

My experience of working as a theatre lighting designer gives me an understanding of conceptual parallels between the circular time of Lumia and a scene in a play, and between the linear time of Lumia and an act within a play. A scene occurs at a specific time and place, whereas an act, which typically comprises multiple scenes, conveys a transition.

It was unclear how Wilfred conceptualised time in his compositions, but based on his writing and instrument design, I believe that in his Lumia recitals he composed a linear time for the projected images created by his Clavilux-like animation, and in his recorded compositions he determined a

collection of 'the circular time' of individual moving parts and estimated the total duration by identifying the common multiple of each circular time. For example, if a colour wheel takes two minutes to rotate and a reflective glass sculpture takes three minutes to rotate, and these are the only moving parts with a fixed light, the duration of the entire work would be six minutes. Despite the fact that some of Wilfred's compositions have, technically, a very long duration (in some cases spanning multiple years) due to the recognisable short loops of certain parts, it is difficult to accept that the technical duration represents not only a piece, but also an advanced aesthetic structure.

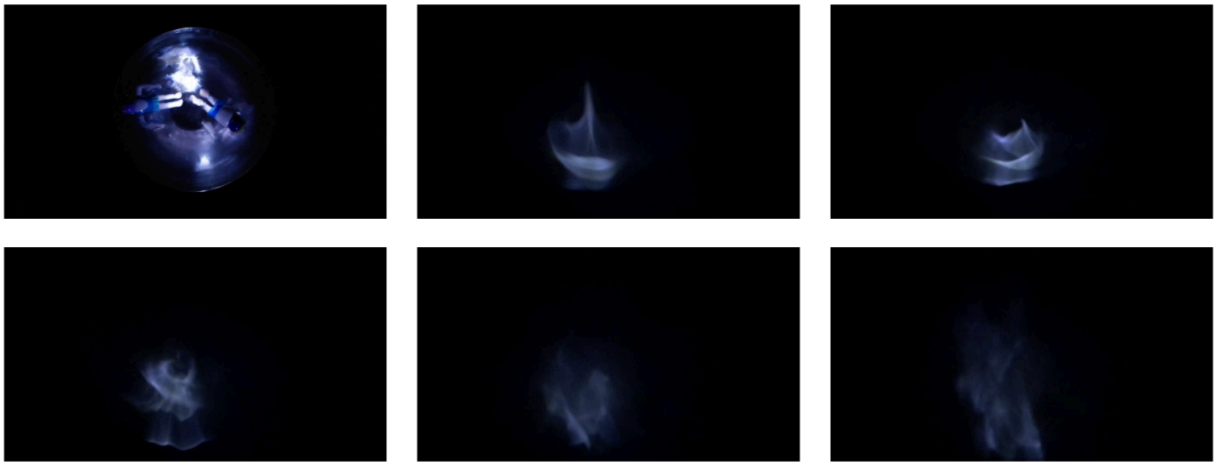


Figure 54. Water Lens Experiment I (Toy Swimmers) (Source: Trent Kim)

What, then, is Lumia's linear time compared to film? Here are two small experiments that I conducted to advance my research. As a continuation of my water lens experiment, I used a bowl of reflective water and toy swimmers to create a rudimentary adaptation of dramatic theatre in Lumia. Even though the light was fixed and no rotation was added, the toy swimmers altered the lighting rather than observing the fixed moment. If it were a play, it would be a scene.

Figure 55. Water Lens Experiment II (Audiovisual) (Source: Trent Kim)

In the subsequent study, the aluminium bowl was replaced with a singing bowl, and the toy swimmers were replaced with the singing bowl's mallet. I pondered how the concept of time would function if sound were introduced. A circular motion outside the bowl's rim generated a vibration that reconfigured the lighting condition and, as I was able to repeat the same motion, it felt like a circular time of Lumia and music. When different types of circular motions were successful, however, the condition of lighting and sound simultaneously changed, and both acquired a shared linear time. It almost resembled constructing spiral time for both parties.

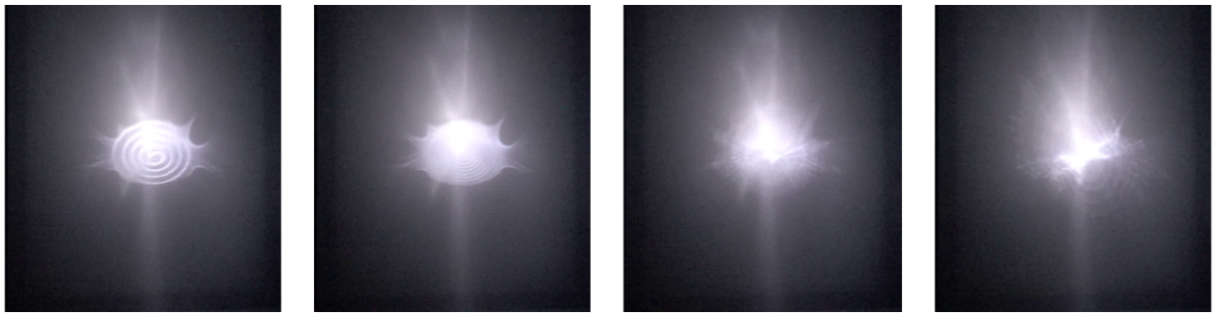


Figure 56. Water Lens Experiment III (Digitised) (Source: Trent Kim)

After that, I positioned a subwoofer beneath an aluminium bowl and played various audio frequencies to generate various patterns. Due to the fact that the input was digital, I was able to maintain and return to specific patterns in order to use water as a mouldable lens, as well as replicate the same

transition from one pattern to the next. Although my particular focus was a lens experiment to reflect and refract light, technically it overlaps with a liquid based method of cymatics where patterns on the surface by vibration are observed.

5.2 New Clavilux Prototypes

Early prototyping of different methods to reconfigure the condition of lighting revealed a number of medium-specificities of lighting, but through the prototyping of my own Clavilux models, I began to comprehend the artistic conditions of Lumia. Thomas Wilfred distinguished Clavilux from recorded compositions (automaton artwork). I would argue that this is determined not only by the live manual control, but also by how the light container is defined.

A comparison of Clavilux B (left), Clavilux G (centre left), Lumia Suite (centre right), and Horizontal Recorded Composition (right) in Figure 57, illustrates the evolution of lighting direction over time. First, the direction of lighting in Clavilux B is outwards, from the instrument to the external screen, second, the direction of lighting in Clavilux G is still outwards, but the Lumia operator (also known as Lumianist) physically enters the instrument and conceptually confronts the audience. Third, Lumia Suite no longer requires a manual operation but the emphasis is shifted towards the automated performance, and finally, the recorded composition miniaturises the essence of lighting and therefore became its own theatre as a whole.

Figure 57. Clavilux B, Clavilux G, Lumia Suite, Horizontal Recorded Composition

(Source: Thomas Wilfred Papers and Yale University Art Gallery) [REDACTED]

As I discussed in subsection 3.3.3, the mechanical principles found in the patented Clavilux design (1930) were also found in Wilfred's last recorded composition, *Op.162 Luccata* (1967-68). However, the way Wilfred ordered modules of his Clavilux model is linear and hierarchical. For instance, placing the colour scrollers as the final stage undermines the influence of refraction on colour. In contrast, the function of the screen in his recorded compositions was an opaque window to observe the space of light. Therefore, I wanted to move away from the way Wilfred defined Clavilux as a tool and his recorded composition as a simulation, but instead took inspiration from Wilfred's Clavilux as a linear space of lighting, and his recorded composition as an interconnected space of lighting. What I mean by an interconnected space of lighting is: a complete containment.

To honour Wilfred's last Clavilux H (performed between 1947 and 1966), I named my first Clavilux as Clavilux I. I did not wish to call any of my early experiments Clavilux as they mainly functioned as sketches to gain first-hand experience of Lumia and brainstorm my own Clavilux designs. Model I Tube was my first Clavilux model, aiming to design a linear version of Clavilux to project Lumia onto an external surface; not to treat it as a projection lighting fixture but to enable me to decide steps of intervention in the condition of lighting.

The design of Clavilux I Tube emerged over time, and I returned to it, adding more elements. The inspiration of the tube shape came from the cylinder-shaped part of Wilfred's Clavilux design but also, my experience of '무지개터널' (translated as 'rainbow tunnel' in English) installed between Pangyo station and Cheonggyesan station on Shinbundang Line (Seoul's subway). As the name

suggests, it is a multicolour installation that covers 200m using LED lights. Like the subway tunnels, I wanted to work with curved routes, and ducting came to my mind.

Straight and flexible pipes and elbow bends are used in my design, and I combined them with magnets — which I was experimenting with at that time after visiting Takis's exhibition at Tate Modern in 2019.

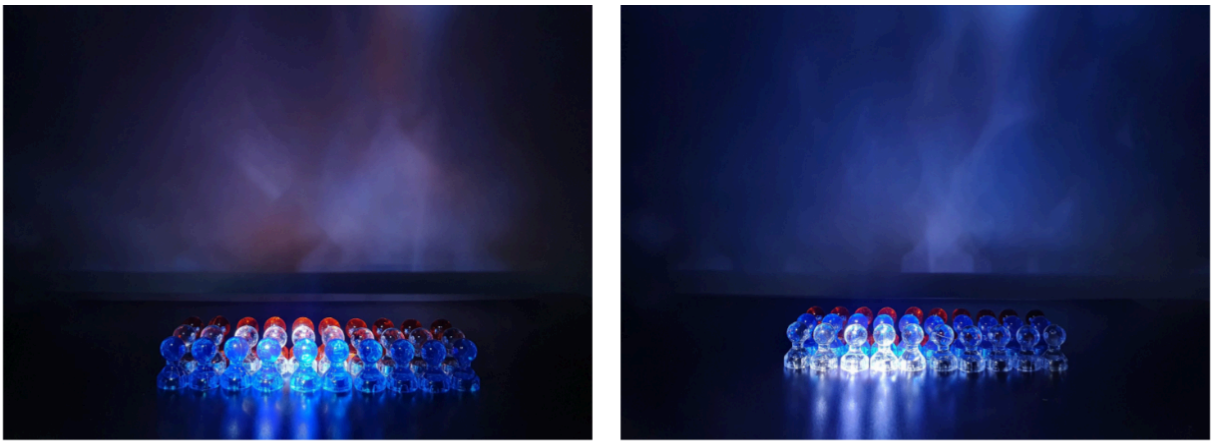


Figure 58. Acrylic Pins Experiment (Source: Trent Kim)

Figure 58 shows one of my magnet experiments. I used acrylic magnetic pins in different colours to think about what digital RGB pixels mean to an analogue Lumia work. In this set up, I used thin cardboard to place those pins, and magnets underneath to move and reorganise the pins to craft the light.

The following is my mock document, using an old-fashioned patent document template that Wilfred and other artist-bricoleurs (such as Edward Gordon Craig and Oskar Fischinger) employed. Due to the

fact that such documents were intended to communicate with the patent office and ultimately the general public, they introduced their apparatus from various perspectives. Considering those perspectives was beneficial in systematically documenting all my apparatus for analyses. For instance, from Wilfred's patent 1,749,011 (1930) document, I have extracted the following phrases to indicate key aspects of the invention discussed:

- 'This invention relates to…' (Wilfred, 1930 p. 1) — relevant fields
- 'A particular object of the present invention is to…' (Wilfred, 1930 p. 1) — objectives
- 'In the accompanying drawings…' (Wilfred, 1930 p. 1) — descriptions of parts
- '…feature of improvement in this present invention…' (Wilfred, 1930 p. 2) — improvements
- '…maybe controlled by … rather than…' (Wilfred, 1930 p. 3) — adaptability
- 'What is claimed is…' (Wilfred, 1930 p. 5) — functions (reiteration)

Understanding the key aspects of his design presentation helped me address essential questions for my Clavilux design, but also make my designs historically comparable. In addition, it enables researchers to compare Wilfred's prototypes to other similar creative prototypes. Specifically, compared to Wilfred's, Edward Gordon Craig's stage scenery patent statements better expressed their rationale (non-illusionism, poetic drama) and context (experimental scenography). Therefore, while adapting the avant-garde artist-inventor style patent template in documenting my Clavilux I Tube & Cube manualisation, Clavilux J Simulation, and Clavilux K Subversion, I have consciously made additional efforts to articulate all the aspects (relevant fields, objectives, descriptions of parts,

improvements, adaptability, and functions) with a strong focus on the objectives — to advance my research.

It is also important to mention that this specific form of patent template has stimulated my phenomenological and aestheticist mode of thought by requiring me to study lighting internally, externally, embodied, disembodied, operationally, mechanically, and conceptually.

5.2.1 Clavilux Model I Tube Prototype

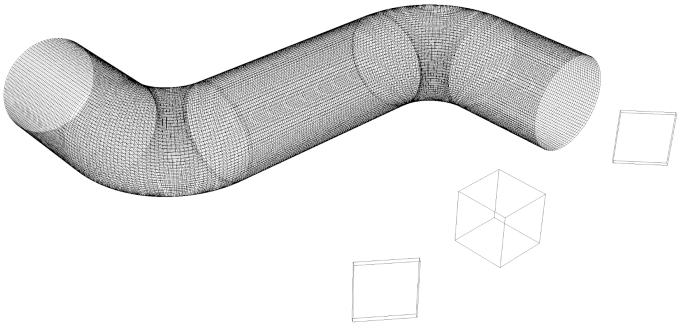


Figure 59. Components of Clavilux I Tube

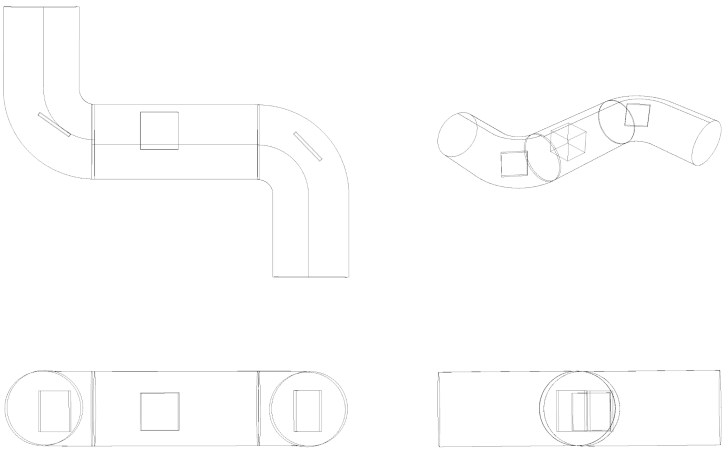


Figure 60. Multi-Perspective View of Clavilux I Tube

To all whom it may concern[23]*:*

Be it known that I, Trent Kim, residing at Glasgow, in Scotland, have invented a new model in Lighting Performance Apparatus, of which the following is a specification, reference, being had therein to the accompanying drawing.

This invention relates to Lumia, the art of lighting but also theatre lighting design practices where Lumia emerged as an independent art form within. Clavilux is a term coined by Danish-born US artist Thomas Wilfred (1889-1968) that refers to a performance instrument of Lumia.

[Relevant Fields]

The idea of lighting being an independent art form has been associated with primary elements of abstract art: colour, form, and motion, and this logic of painting with light has inspired various practices in colour art, optical art, kinetic art, liquid light shows, and Lumia.

[Objectives]

In contrast to painting with light, this invention aims to help artists explore composing the condition of lighting; how light travels in the different conditions of void. By doing so, it demonstrates what Lumia can uniquely offer rather than what Lumia shares with other light-inspired visual art practices.

There are other independent art forms that work with void, like music and dance, and this commonality may offer collaborative opportunities, but this commonality is merely metaphoric while each art form is unique by its medium-specificity (as opposed to medium-commonality like colour, form and motion). For instance, the speed of light enables us to see from the beginning to the end of a light beam in a continuum, unlike how dance is strictly linear and how a partial decay of sound can be experienced in music.

This invention features a modular design that forms an overall tube construction consisting of lights, mainboard, pipes, connectors, bend elbows, magnets, reflectors, other modifiers, and a front projection screen or surface.

This is not a miniature replication of the condition of natural light, but an enclosed system that envelopes the void and facilitates the four key medium-specific factors for the condition of lighting as an art form: decay, orientation, mapping, and animation. (see subsection 5.3.8)

[Descriptions of Parts]

There is no fixed shape, but the artist's choice of parts devises the shape and it allows material 'play' in various parts. It is important

[23] Historically, this type of document was addressed to the patent office, but in this context I imagine the addressee to be contemporary Lumia researchers and practitioners who recognise the value of experiencing the historical context of the presentation of ideas by artist-bricoleurs.

to note the definition of 'play' from an instrumentalist's perspective: the predetermined range of transformations.

The first 'play-able' part is the arrangement of pipes. Different lengths and types of pipes are available including solid, flexible and/or custom-made pipes. Using connectors, pipes can be lengthened to secure additional space to modify and reroute light. And, using a flexible pipe, the total length of the tube can be modified, but also it allows rerouting by introducing a curvature to result in reflection. Also, to advance this, custom-made pipes such as the flexible mirror pipe can further modify and/or reroute light. This part is mainly associated with 'decay' and 'orientation' in Lumia.

The second 'play-able' part is the implementation of reflectors and bend elbows. Different angles of reflectors against the inner surface of bend elbows directly affects how light is relayed and decayed from one pipe to another. In addition, bend elbows can freely rotate to transform the relationship between pipes. In this part, reflectors and bend elbows are strictly interdependent with one another. This part is mainly associated with 'orientation' and 'animation', to illustrate how the condition of light and the condition of void are independent but also collectively affect the condition of lighting.

The third 'play-able' part is the movable sets of magnets and modifiers. If the first two parts were mainly focused on the macro level of lighting, this part would focus on the micro level of lighting. In other words, the formers are external changes to the beam of light and this is about internal changes to it. Unlike image-based art forms, Lumia is governed by external and internal factors to the basic form of light: a cone shaped beam. Different positions of magnets affect hierarchies of elements in the condition of light, and different strengths of magnets affect characteristics of animation. And, types of modifiers such as colour filters, micro reflectors, translucent/opaque objects, and refractors can interrupt and override the macro parts. Potentially, micro parts could become super-macro for the macro parts.

[Improvements]

The improvements that this invention achieves in comparison to the previous Clavilux models by Thomas Wilfred, are the following:

1. Clavilux I Tube offers a new definition of 'macro' and 'micro' by focusing on the beam of light rather than on the element of image — like Wilfred's Clavilux separating the cylinder projector to produce abstract image (micro) by refraction and the lens projector to produce form and shadow of image (macro).
2. Clavilux I Tube is accessible, self-explanatory and educational. By focusing on the medium-specificity of lighting, this invention connects what is playable and what is spatialisable. If Wilfred removed/automated the play-able mechanisms from his Clavilux to record his Lumia

compositions (resulting in presenting an inaccessible and multi-layered space of lighting) Clavilux I Tube identified the tube as a distinctive type of space for lighting, and introduced natural methods of affecting the condition of lighting to offer play-abilities. Therefore, it is both a miniature and instrument of the space of lighting.

3. Clavilux I Tube is more than easily expandable and transformable. By abandoning the idea of an exterior/casing, Clavilux I Tube is expandable to support different levels of Lumia compositions and in addition, the flexibility in relocating modifiers transforms the condition of lighting with ease. This improvement is a clear advantage of this invention against Wilfred's Clavilux.

[Adaptability]

The use of lighting is diverse in creative practices particularly across theatre and moving image. Its changeable design makes Clavilux I Tube a flexible instrument for Lumia. By breaking the boundary between instrument and miniature space, Clavilux I Tube offers a greater adaptability for other creative practices to implement Lumia. For instance, it could inspire architectural designs by foregrounding the condition of lighting, sculptural installation that actively incorporates its non-sculptural space (the void) or stage design to hypothesise a new type of immersive scenography.

[Functions]

Here is the summary of the key functions of Clavilux I Tube.

- Clavilux I Tube is a creative instrument that encourages artists to spatialise and play the condition of lighting.
- Clavilux I Tube is an accessible design that artists can use to build their own, using affordable materials introduced in this document.
- Clavilux I Tube is a historically-informed design that continues the history of Lumia.
- Clavilux I Tube is a materialised discourse that helps artists and other users advance their knowledge of the medium-specificity of lighting and its creative potentials.

5.2.2 Clavilux Model I Cube Prototype

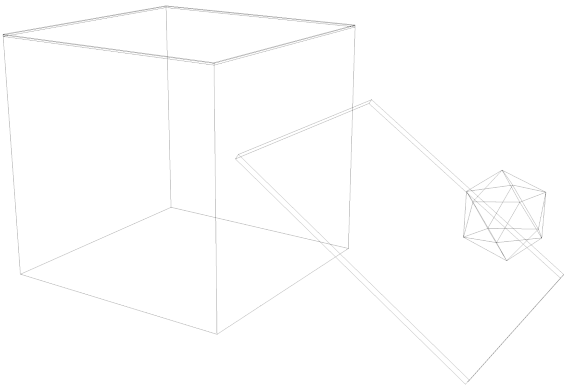


Figure 61. Components of Clavilux I (Cube) (Source: Trent Kim)

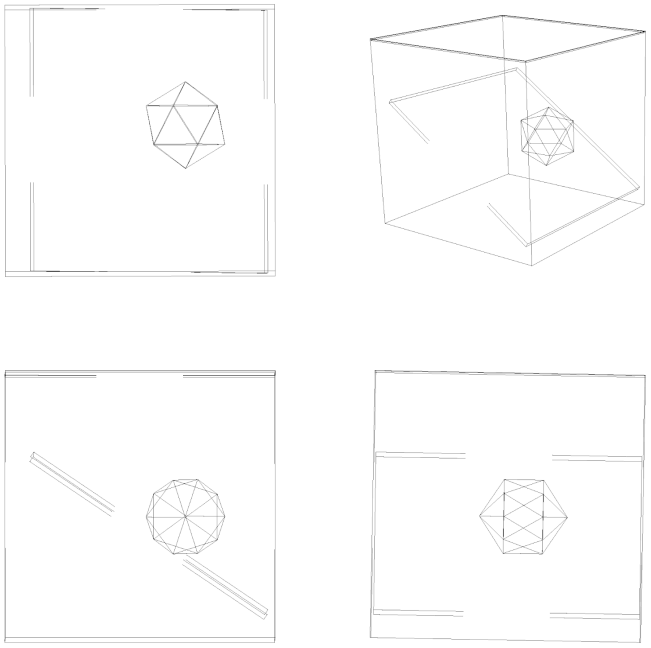


Figure 62. Multi-Perspective View of Clavilux I Cube (Source: Trent Kim)

To all whom it may concern:

Be it known that I, Trent Kim, residing at Glasgow, in Scotland, have invented a new model in Lighting Performance Apparatus, of which the following is a specification, reference, being had therein to the accompanying drawing.

This invention relates to Lumia, the art of lighting but also theatre lighting design practices where Lumia emerged as an independent art form within. Clavilux is a term coined by Danish-born US artist Thomas Wilfred (1889-1968) that refers to a performance instrument of Lumia.

[Relevant Fields]

The idea of lighting being an independent art form has been associated with primary elements of abstract art: colour, form and motion, and this logic of painting with light, has inspired various practices in colour art, optical art, kinetic art, liquid light show and Lumia.

[Objectives]

In contrast to painting with light, this invention aims to help artists explore composing the condition of lighting; how light travels in the different conditions of void. By doing so, it demonstrates what Lumia can uniquely offer rather than what Lumia shares with other light-inspired visual art practices.

It is important to note that this invention is a complement to Clavilux Model I Tube (a modular design focused on modifying light) by offering a different set of functions, while its primary objective is to observe and embody lighting three-dimensionally. It features a spatial design that forms a cube construction consisting of two-way mirrors, acrylic hinges, reflectors, other modifiers and rear projection screen material.

This is a miniature replication of the condition of artificial lighting that visually presents the complex presence of light to help artists explore its aesthetic potentials. The architecture of this invention represents the shape of void and facilitates the four key medium-specific factors for the condition of lighting as an independent art form: decay, orientation, mapping and animation.

[Descriptions of Parts]

There is a basic cube shape to represent the x, y, and z axes, but it ultimately reveals the void axis through demonstrating how lighting materially enables 'embodiment' between light, surfaces, and the void in a three-dimensionally enveloped and viewable construction. It is important to note the definition of 'embodiment' from a spectator's perspective.

The first 'embodiment' is the A to B walkthrough between the surfaces of the two-way mirrors. Different distances and angles are achieved by the flexible acrylic hinges, but without disqualifying the basic

cube construction. The perfect parallelism between two surfaces forms a continuum of A to B and B to A until the light decays. In comparison, any angle outside the perfect parallelism results in more complex networks that involve multiple landings on different surfaces: A to B to C to D to E and so on.

Any angles outside the perfect parallelism between two surfaces allows the beam of light to diverge and form an elaborate network inside the cube. Whether it is the perfect parallelism or not, both networks commonly represent: firstly, its territory and secondly, its directionality (where it starts and how it progresses). This offers the foundational sense of walking as light.

The second 'embodiment' is related to the second function of the first embodiment: directionality. By acknowledging the directionality, it is possible to examine the progression of the beam's decay. The decay here is medium-specific to lighting which is different to, but can be compared with, the gradient in colour and the reverberation in music. The speed and intensity of decay depends on the type of surface, and as this invention uses two-way mirrors, the decay of a beam inside should be faster than the same dimensional cube of conventional mirrors. This concept of the speed/intensity of decay helps discover another temporal dimension to Lumia composition.

The third 'embodiment' is the sense of containment that reveals the liminal view of lighting. The liminal view is what is seen by the naked eye through the two-way mirror planes. Placing an intense light source such as a laser pointer results in a constellation of laser points as a form of containment of light. This view is liminal as it combines the internal and external view and by doing so, it reveals relationality between the surfaces and light. In order to extract either the external or internal view, a sheet of rear projection screen needs to be placed on the outside of one or more planes. The image seen externally on the plane(s) is the external view, and the image seen through a gap of the invention is the internal view. What this enables is an examination of the depth of lighting by the relationality between the surfaces and light — distinguishing it from a two dimensional image (the external view) that only represents a partial appearance of the lighting. Further, its internal view is self-explanatory as there are no boundaries between the instrument and performance of lighting.

The fourth 'embodiment' is the sense of interdependence between the exterior and interior of the cube. The hinges allow adjustments to what is exterior in the cube, and affects the condition of lighting. This demonstration helps an understanding that all surfaces are interdependent with one another, and the condition of lighting can redefine 'external' and 'internal' when necessary — unlike architecture or sculpture.

[Improvements]

The improvements that this invention achieves in comparison to the previous

Clavilux models by Thomas Wilfred, are the following:

1. By using two-way mirrors, Clavilux I Cube reveals the directionality and relationality between the surfaces and light as a whole, and enables the artists to examine the depth of lighting beyond the two-dimensional image analysis.
2. By adding additional planes, Clavilux I Cube folds the space of light, encouraging artists to consider shaping the void rather than designing a diorama of lights, reflectors, and motors in a box (like Wilfred's Clavilux).
3. By implementing the 360-degree hinges, Clavilux I Cube enables the artists to understand that the ambivalence is external and internal in lighting, and also helps an understanding of how the void axis is characterised by the way in which all surfaces are equally active, interdependent and connected via the void.

[Adaptability]

Like Clavilux I Tube, Clavilux I Cube is also highly adaptable due to its easily extendable design, such as adding additional surfaces and different degrees of hinges. Furthermore, by using the basic cube shape, this invention not only represents Lumia as a creative tool but also as a creative environment — where Lumia artists can further immerse themselves, and creatives from other disciplines can explore in relation to their own practices. For instance, it could be used to develop a play situated in the space of Lumia, or to study Lumia to prototype new communication designs.

[Functions]

Here is the summary of the key functions of Clavilux I Cube.

- Clavilux I Cube is a creative environment that encourages artists to immerse themselves into the condition of lighting.
- Clavilux I Cube is a relatable design due to the x, y, and z axes: artists can draw direct comparisons to our anthropocentric perspective.
- Clavilux I Cube is a historically-informed design that was inspired by Wilfred’s recorded compositions, but has been improved by replacing the solid walls with two-way mirrors, adding the hinges to reconfigure the container as the foldable void.
- Clavilux I Cube is a materialised discourse that helps artists and other users advance their knowledge of the medium-specificity of lighting and its creative potentials.

5.2.3 Concept 1: Void Axis

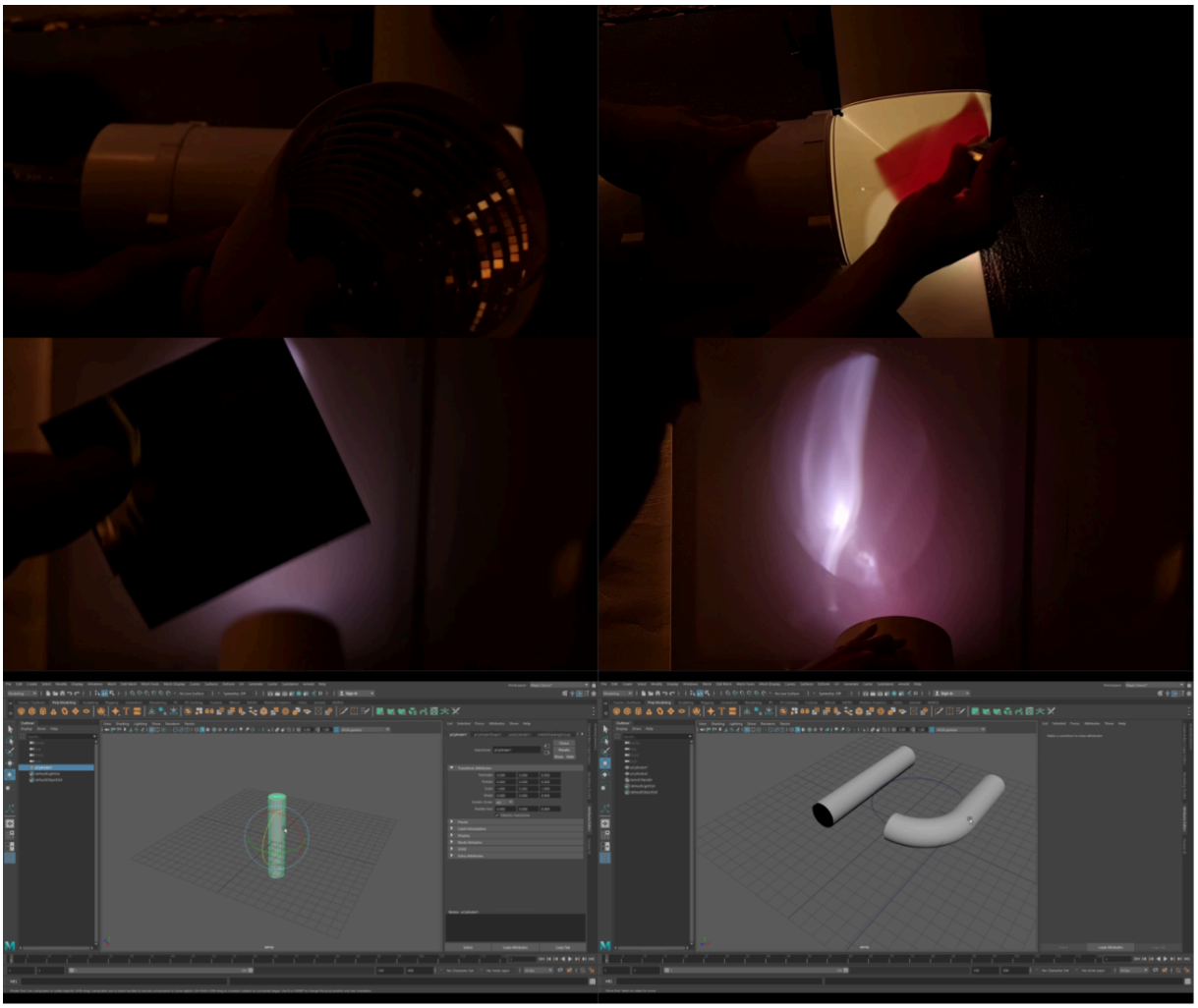


Figure 63. Operating and Digitising Clavilux I Tube (Source: Trent Kim)

Clavilux I Tube and Cube design and operation elicits distinct phenomenological observations. The tube, by virtue of its design and construction, establishes a specific sense of time passing, as light only expands and progresses. This type of lighting is best described as stretched lighting, and it differs greatly from our typical lighting practices, in which light is contained within a space.

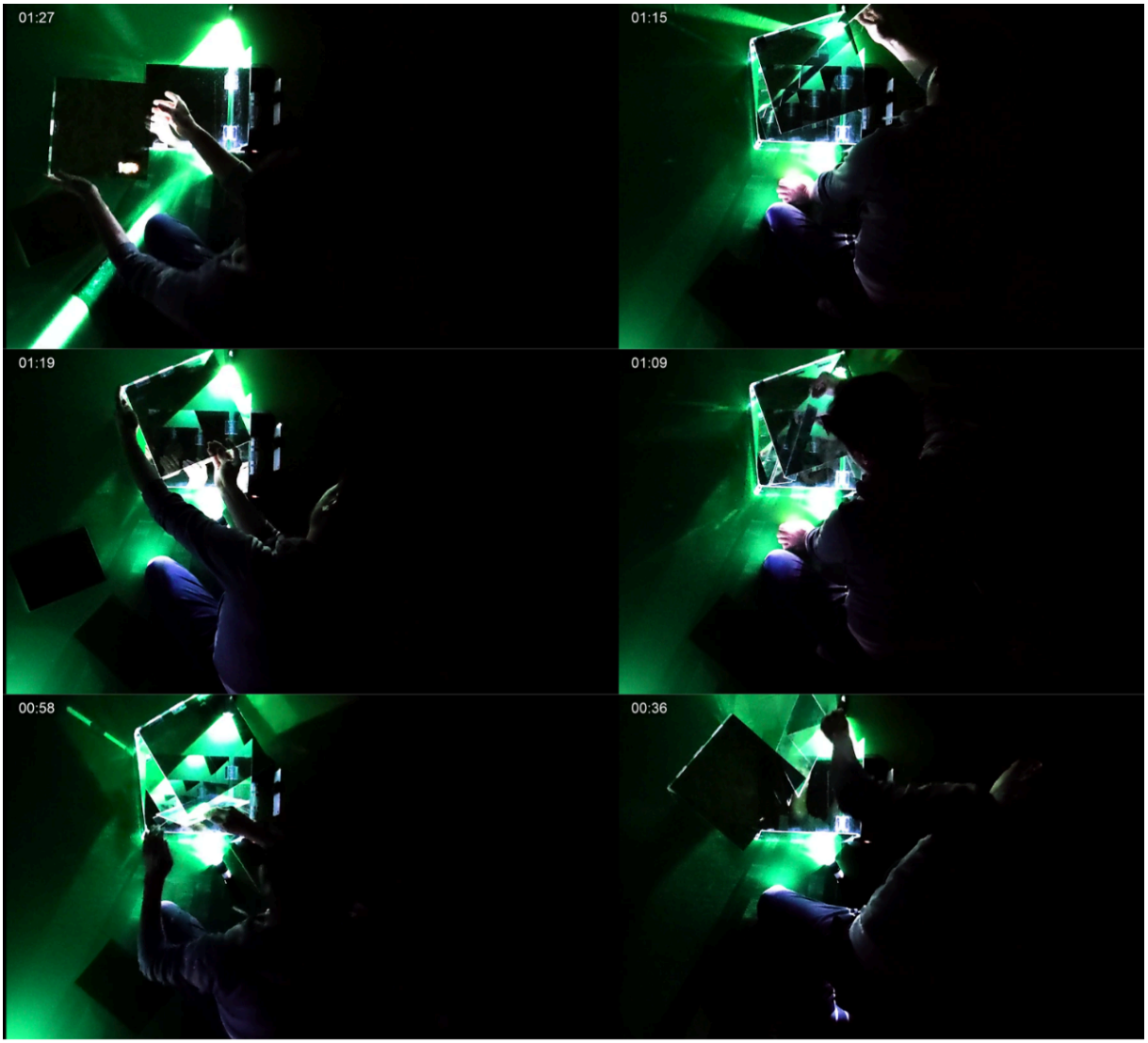


Figure 64. Photographs of Using Clavilux I Cube (Source: Trent Kim)

In contrast, the Clavilux I Cube resembles lighting in our everyday practices, which neither expands nor progresses but instead contracts. Despite an initial sense of the cube, it rejects the anthropocentric and ocularcentric x, y, and z axes on a fundamental level.

Clavilux I Tube and Cube are two distinct models of the condition of lighting and the construction of void. The former magnifies the perspective of a light beam to break down the steps of change,

whereas the latter is not synonymous with the void, but rather animates and performs with light the emptiness of the void. To be more precise, light relies on void surfaces to construct itself. In the context of Lumia, light and void are interdependent, like paint and a canvas in painting and an object and a site in sculpture.

However, the nature of dispersion in lighting — which makes it difficult to comprehend its visual entirety — and the invisibility of the void make it more difficult (than it was with the other pairs) to perceive the relationship between lighting and the void. Therefore, one must visualise their underlying structures in the mind (as opposed to their appearances); perception must remain in its transition.

The anthropological term ‘liminality’ was coined by Arnold van Gennep and is defined as the state of being in between and the necessary disorientation to define the ‘liminal phase’ (Turner, 1977, p. 94). This liminal nature found in reading the relationship between lighting and the void could be argued to be part of the medium-specificity, as it encourages artists to reveal multiple structures due to the inability to see the appearance — but to conceive and embody only one structure of lighting at a time within the structure of void. Here, I would return to Gal's notion of deep form, the 'opaque, non-semantic, and productive' symbol discussed in subsection 3.1.2, and propose that what makes such a form deep is the recognition of its liminal phase as well as its force, where seeing and embodying cannot be synchronised, yet it is possible to perceive collective structures of lighting within the void over multiple attempts. The void axis, one of Lumia's many structures,

represents the relationship between lighting and the void. It examines how the construction of the void and its transformation influence the lighting condition.

> ...few musicians regard silence as the only constant factor of their art, the only basic and never-changing point of departure, support, and return. Lumia, likewise, rests on a basic foundation — Darkness. Darkness must be established initial[ly] to any manifestation in the art of light, and only that light which the artist releases from his instrument must be permitted to fall on the screen. The end of a composition should be a moment of absolute darkness.
>
> (Wilfred, no date, p. 20)

The darkness of Wilfred's Lumia composition belongs to and determines the beginning and end of the screen, whereas the brightness belongs to the illusion of a three-dimensional space. In contrast, my understanding of ‘void’ is an immutable space with or without light, whereas the void axis is the perspective; in the context of Lumia, seeing light through the void which conditions lighting.

Figure 65. Et sic in infinitum [trans. And so on to infinity] (Source: Wikimedia Commons) [REDACTED]

The illustration in Figure 65 by occultist philosopher Robert Fludd depicts the non-material world before God as absolute darkness, which he referred to as ‘primal matter’ (Huffman, 2001, p. 62). The primal matter is ‘primordial, infinite and shapeless’ and has ‘no properties’ (Huffman, 2001, pp. 62-63) and would accord with Wilfred’s concept of darkness. In contrast, Alberto Giacometti's *Hands Holding the Void (Invisible Object)* (1934-1935) captures the sculpted void as the primary condition of being, and its phenomenological and structural multiplicities assist in describing my concept of void and void axis. However — and importantly — Giacometti's void is anthropocentric, whereas my void is light-centric; luminal.

T. KIM

5.2.4 Clavilux Model J
Digital Prototype

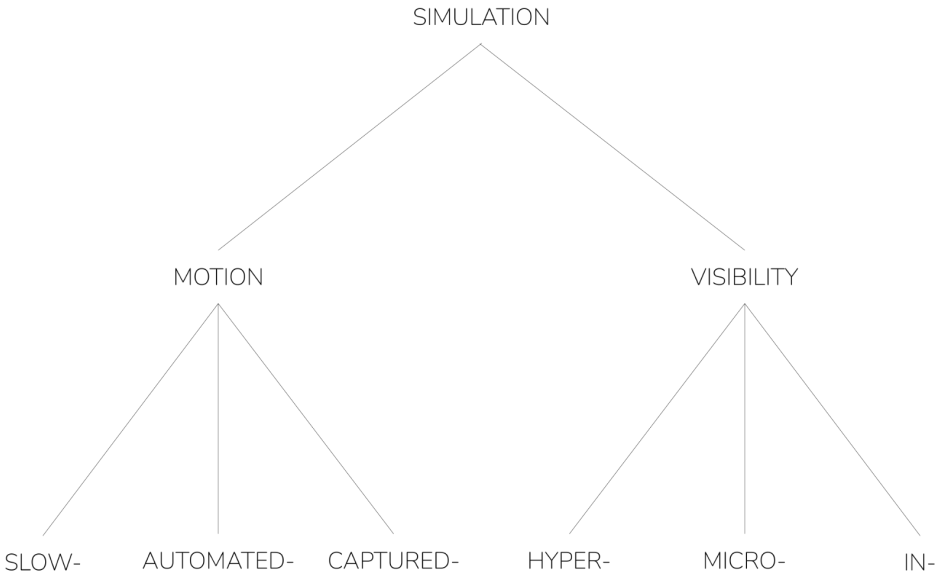


Figure 66. Digital Simulation and its Methods (Source: Trent Kim)

To all whom it may concern:

Be it known that I, Trent Kim, residing at Glasgow, in Scotland, have invented a new model in Lighting Simulation Methodology, of which the following is a specification, reference, being had therein to the accompanying diagrams.

This invention relates to Lumia, the art of lighting but also theatre lighting design practices where Lumia emerged as an independent art form within. Clavilux is a term coined by Danish-born US artist Thomas Wilfred (1889-1968) that refers to a performance instrument of Lumia.

[Relevant Fields]

The idea of lighting being an independent art form has been associated with abstract art, colour art, optical art, kinetic art, liquid light show, and Lumia. In addition, this particular invention, dealing with technology at the core, would interest other artists working between analogue and digital arts.

[Objectives]

The idea of lighting has influenced various aspects of our lives and everyday practices and digital technological advancements have rationalised our need to adopt digital technology into our creative activities of Lumia. As various digital activities have extended our own selves, our very being, we can enhance our senses and knowledge of lighting by applying digital technology to Lumia.

This invention is therefore a methodological design rather than being mechanical, and it proposes a set of key concepts that helps readers visualise this. To help visualise it further, detailed examples that have been materialised are provided in this document.

[Descriptions of Parts]

There is a technological strategy under the theme of 'simulation' in this invention, and it has three levels:

- Level 1 — Simulation
- Level 2 — Motion, Visibility
- Level 3 — Slow-Motion, Automated Motion, Captured-Motion, Hyper-Visibility, Micro-Visibility, In-Visibility

Motion and visibility represents the two primary activities in Lumia, operation and observation. Through various digital technologies, each activity was broken down into three sub-categories.

First, there are materials that are more effective to create subtle changes in the condition of lighting, whether folding, rotating or moving surfaces. However, there are physical limitations that make smooth transitions difficult, but also subtle and durational operation hard. Slow-motion is a camera technique that uses a high frame rate to capture more rapidly than the standard

frame rate (24 fps); then it is played back at the standard rate. If a one-minute long video shot at the high frame rate of 120 fps were played at 24 fps, the duration will last five minutes without any noticeable flicker (because it was played back at the standard frame rate our eyes are accustomed to). Implementing slow-motion does not necessarily make our operation smoother in real terms, but recording at the higher frame rate and playing it back at the standard frame rate makes us observe smoothness even in rapid and sudden motions[24].

Second, automation is another way to overcome our physical limitations of manual operation. There are two fundamental challenges resulting from manual operation: firstly, the difficulty to repeat the same operation; and secondly, the difficulty to monitor our own operation to finesse. An example of automation is building Arduino-based robotic arms to simulate performer's hands[25]. Wilfred used pulleys in his performance instruments and motors in his recorded compositions, but working with robotic arms that resemble our motions help artists visualise and spatialise their performance more accurately.

Third, if automation made Lumia performance more relatable, motion caption software (such as PointCloud by Brekel) allows artists to translate the role of gesture and movement as new organic kinetic surfaces. In other words, motion caption blurs the boundaries between surfaces and skins[26].

Fourth, digital technology such as virtual reality and spherical filming, extends our ability to see. It can be 'hyper' by providing the 360-degree view, where one can observe the condition of lighting from inside[27] or experience a spherical view of Lumia composition[28] by making the projected screen surround the spectators. Through such digital technology, Lumia can gain hyper-visibility by not only extending our view but also overcoming our internal and external presence to Lumia.

Fifth, lighting exists on a micro scale that is invisible to the naked eye. But a lensless photography called refractography uses a piece of glassware to refract and reflect a pin light source towards the camera. This is effectively a lens experiment to reroute a light source towards the camera sensor. This can also be performed by choreographing the orientation of the focal object[29]. The idea of micro-visibility extends the scope of artists' creative exploration so that we become aware of the presence of light.

Last, digital technology can visualise what is impossible to physically visualise. For instance, combining the AI-powered motion caption software (RADiCAL) and 3D simulation software (Maya), a person from an archival video can become a three

[24] See *Opt. 12 Lighthouse*
[25] See *Opt. 7 Artificial Choreography*
[26] See *Opt. 8 Tallis's VR*
[27] See *Opt. 2 Luminal Pit II*
[28] See *Opt. 14 Corona Blue*
[29] See *Opt. 10 Abyss*

dimensional character, but also the person's body can be simulated as a kinetic lens[30]. In addition, by using a distance sensor (HC-SR04) and Servo motors attached to a stretchy projection screen, it would be possible to remould the screen in response to the spectator's real time motion to materialise the kinetic void[31].

[Improvements]

This invention is a critical development to recognise the role of technological interventions in advancing Lumia. As it is a digital version of Clavilux, it is more effective as a design methodology rather than a singular digital application.

[Adaptability]

This invention is a methodological strategy to use digital technology to encourage Lumia practices. However, those key concepts identified in this could be applicable to other technological-aesthetic inquiries using different digital platforms.

[Functions]

Here is the summary of the key functions of Clavilux J Digital.

- Clavilux J Digital is a methodological design that encourages artists to experiment with various digital technologies.
- Clavilux J Digital provides workable strategies based on the medium -specificity of Lumia, so artists can repurpose existing digital technologies for Lumia.
- Clavilux J Digital reveals new territories of Lumia that were undiscovered and therefore impossible to discuss in relation to the traditional Clavilux and recorded compositions alone.

[30] See *Opt. 18 Lucky's Speech*
[31] See *Opt. 25 4Paisley*

5.2.5 Concept 2: Technological Voyeurism

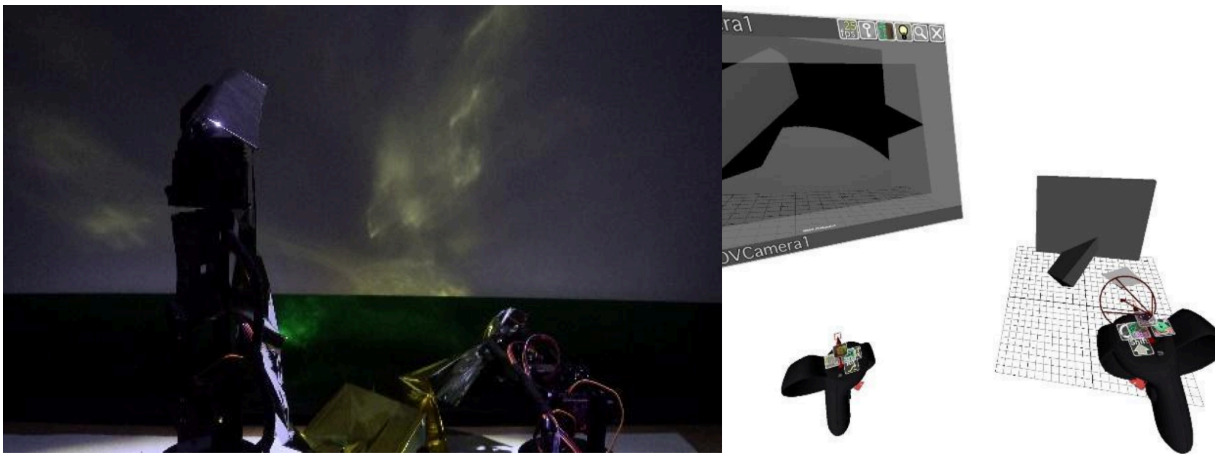


Figure 67. Robotic Arms Rehearsals for Opt. 7 Artificial Choreography (Left) and Live Motion Simulation Experiment (Right) (Source: Trent Kim)

Clavilux J Digital extends the embodiment focus of Clavilux I Cube via digital technologies; it simulates hand motion. First, programmable (Arduino) robotic arms (left) replaced the performer's hands, and second, a motion-controlled (Oculus S Rift + Maya + Mental Ray) digital simulation mirrored the hands in realtime.

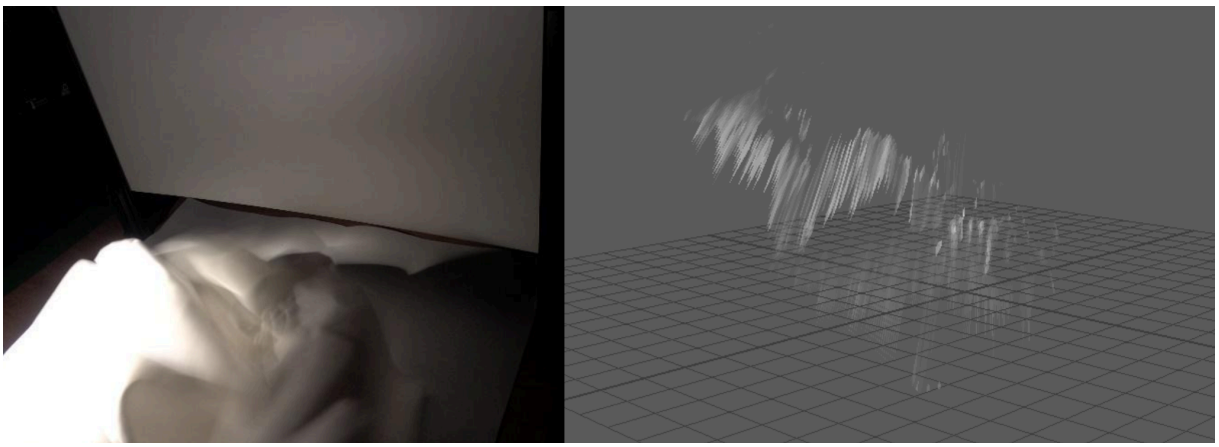


Figure 68. Point Cloud Motion Caption for Opt. 8 Tallis's VR (Source: Trent Kim)

In addition, a complicated motion of a kinetic surface was saved as a three-dimensional kinetic object (OBJ file) by Brekel PointCloud and imported into Maya by Brekel PointCloud.

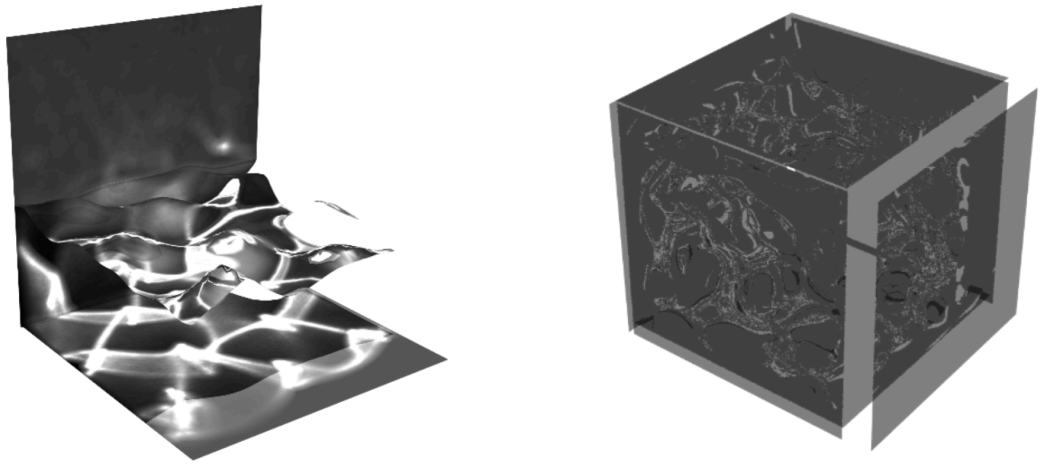


Figure 69. 3D Simulation Experiment (Left) and 3D Design for Opt. 14 Corona Blue (Source: Trent Kim)

Moreover, complicated kinetic objects can transform into liquid lenses within the three-dimensional simulation interface and can be layered to produce a 360-degree digital Lumia composition, such as *Opt. 14 Corona Blue*.

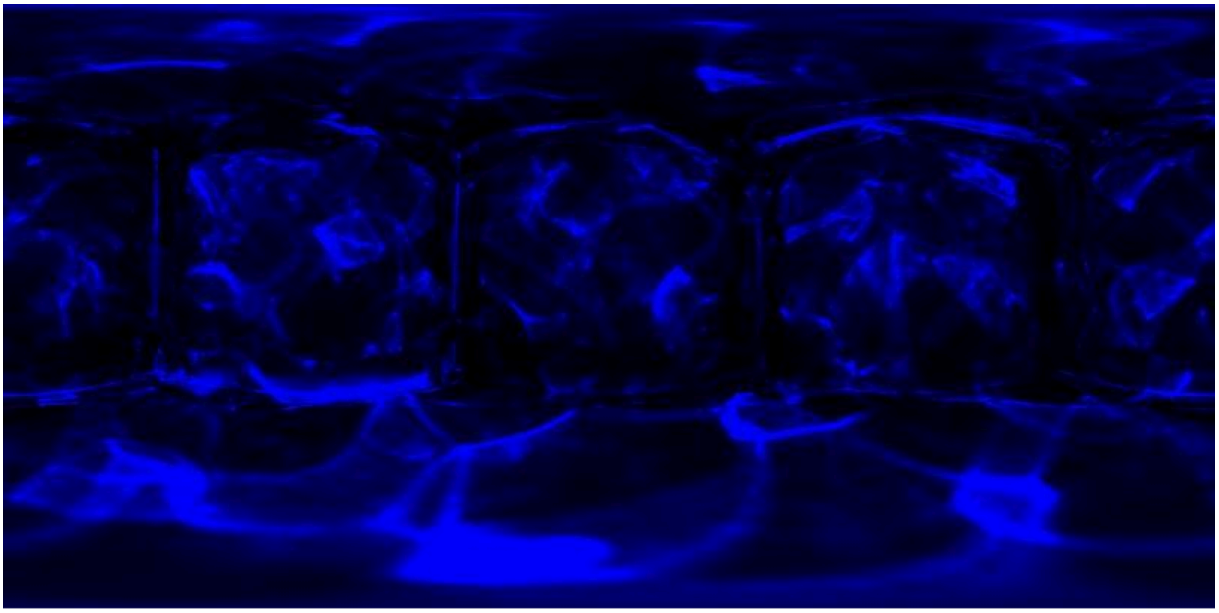


Figure 70. Equirectangular View of Opt. 14 Corona Blue (Source: Trent Kim)

While expanding its perceptual territories of lighting, Clavilux J Digital maintains the original reference within the medium of lighting, and the technological interventions (effectively intermedia) provided opportunities to expand and refine the medium without sacrificing its identity. This aspect can be considered in distinguishing between Lumia and projection art as projection art projects an image of an external reference other than light itself.

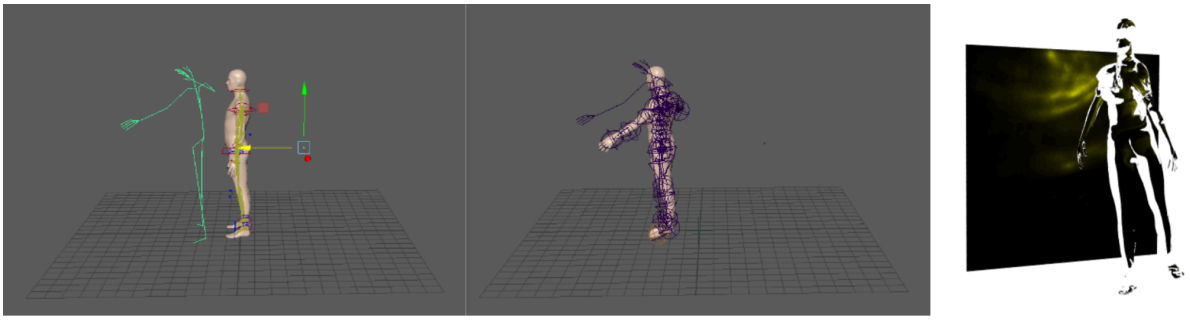


Figure 71. The Process of Motion Rigging (Left and Middle) and Material Change (Right) for Opt. 18 Lucky's Speech (Source: Trent Kim)

Using RADiCAL (2D to 3D motion digitisation platform), *Opt. 18 Lucky's Speech* was created by extracting the motion data of the character Lucky (performed by Alan Mendell) and importing it into Maya. By placing Lucky's monologue within the medium of lighting, the emphasis of lighting in the final product is not a representation of light, but an extended and intensified monologue through Lumia.

Jean Baudrillard argued that 'simulation threatens the difference between "true" and "false", between "real" and "imaginary"' (1983, p. 5) and, particularly, representations via image 'absorb simulation by interpreting it [image] as false representation' (1983, p. 11). In other words, the true purpose of

imagery representation is to simulate reality while presenting itself as reality in its own right (simulacrum).

Baudrillard's analysis of image as hyperreal argues the following four ‘successive phases’ listed below:

- It is the reflection of a basic reality.
- It masks and perverts a basic reality.
- It masks the absence of a basic reality.
- It bears no relation to any reality whatever: it is its own pure simulacrum.

(Baudrillard, 1983, p. 11)

Clavilux J Digital, on the other hand, demonstrates how imagery representation can extend material reality by adhering to medium-specificity from the perspective of an artist (also possibly an active spectator who tries to see it from the creator’s perspective). Therefore, even in the absence of the physical presence of the real, the simulation retains its original reference, resulting in reality's extension. In other words, it contributes to an extended reality that affects the perception of the material reality — without being physically present and while being digitally present — and the medium specificity is still recognised and influences the artist’s creative embodiment. This is because the conception of the simulation materialises a new order without resulting in a physical output. Hence, it materially changes the original material reality. The driving force behind this is: locating the original reference and utilising lighting to reveal new perspectives. I would argue that this reaffirms that Lumia is an independent art form, aligned with abstract art: it is its own, non-mimetic reality, which generates its own aesthetic effects.

I would classify this type of simulation as technological voyeurism because it reveals new views, but also repeats ephemeral views. The latter point will be discussed in the remainder of this subsection, but it is important to keep in mind that simulation, in the manner that I technologically explored, yields views rather than images, thus revealing more of the original reference.

Peggy Phelan discusses the meaning of repetition, and questions how 'reproductions of representations' affect 'the ontology of performance' by suggesting that the repetition of a performance violates 'the ontology of subjectivity … becomes itself through disappearance' (1993, p. 146). For instance, Sophie Calle produced *Last Seen* at the galleries of the Isabella Stewart Gardner Museum in response to the stolen paintings; Calle's works were based on materials from interviews with museum visitors and staff to 'describe the stolen paintings' (Phelan, 1993, p. 146). Phelan argued that the paintings' 'descriptions and memories' reinstated their 'presence' despite their absence (1993, p. 146). From the perspective of technological simulation, particularly automation, one can revisit Craig's Über-Marionette and Wilfred's recorded compositions to reconsider the repetitions of ephemerality as the works' structure, thereby invoking technological voyeurism in which one awaits the return of previous views, in addition to revealing hidden ones.

T. KIM

5.2.6 Clavilux Model K
Rebel Prototype

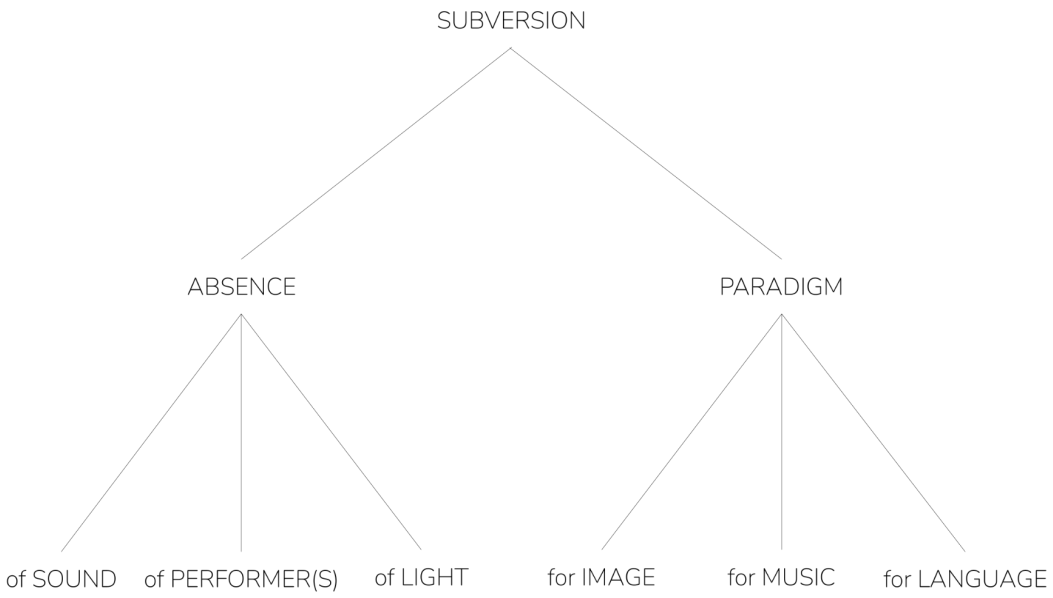


Figure 72. Subversive Intermedia Strategies (Source: Trent Kim)

To all whom it may concern:

Be it known that I, Trent Kim, residing at Glasgow, in Scotland, have invented a new model in Lighting Subversion Methodology, of which the following is a specification, reference, being had therein to the accompanying diagrams.

This invention relates to Lumia, the art of lighting but also theatre lighting design practices where Lumia emerged as an independent art form within. Clavilux is a term coined by Danish-born US artist Thomas Wilfred (1889-1968) that refers to a performance instrument of Lumia.

[Relevant Fields]

The idea of lighting being an independent art form has been associated with abstract art, colour art, optical art, kinetic art, liquid light show, and Lumia. However, this particular invention situating Lumia in a larger context of arts and humanities, would also interest artists and non-artists who wish to learn about lighting.

[Objectives]

The idea of lighting has influenced various aspects of our lives and everyday practices. Historically, Lumia emerged in the inter-war period in the US as an experimental art form of lighting, and differentiated itself from the existing art practices that were interested in light in motion such as theatre design, film and colour music. Being a silent performance of lighting, Lumia began its life as a creative rebellion to reject the intermediary function of lighting in theatre, the dominance and limitations of camera over light in film, and the sound-colour analogy drive in colour music. Much of contemporary Lumia practices exist in intermedia formats accompanying music, or assisting screen productions, yet the sense of rebellion has disappeared.

This invention is a methodological design — to propose a set of key concepts — that helps artists see how to subvert and retrieve Lumia from its intermedia formats, rather as Wilfred rescued Lumia from colour music, theatre design and cinema in the early 20th century. To help visualise it further, detailed examples that have been materialised are provided in this document.

[Descriptions of Parts]

There is a technological strategy under the theme of ‘subversion’ in this invention over three levels:

- Level 1 - Subversion
- Level 2 - Absence, Paradigm
- Level 3 - Absence of Sound, Absence of Performer, Absence of Light, Paradigm for Image, Paradigm for Music, Paradigm for Language

Absence and paradigm represent the two types of critical shifts in Lumia to reveal the essence of Lumia to pursue bracketing.

Through removal of assumed elements and displacement of its structure onto a new creative practice, the six subcategories are suggested.

First, Lumia is generally presented with music, and often responds to music in its composition for screen media whether recorded or projected. It resembles the colour music tradition, where light was used as a tool to project different parameters of colour in response to music, and that makes it part of visual music practice at large. As Wilfred demonstrated in his silent recitals of Lumia, removal of sound reinforces lighting to stand at the fore and returns to its medium-specificity to seek aesthetics within it. It could take imagery mimetics as its starting point[32], an expressive approach to rely on viewer's pareidolia[33] or structured approach to aestheticism[34].

On the other hand, the absence of sound could be temporary in a collaborative process by using Lumia as the original source for other elements to respond to. For instance, a work of Lumia can be used as a primary material to inspire choreography and music[35].

Second, as a performance genre, the absence of performer(s) shifts the focus from projecting to conditioning light on stage. The construction of Wilfred's recorded compositions, where parts collectively form an architecture rather than sequential light manipulations (to produce projected images), inspired this. But also, to an extent, this is related to the automated motion found in the Clavilux J Digital. However, the absence of performer(s) can also mean rejecting the role of performer(s)' bodies, such as becoming a screen or reflector. Therefore, it is important to acknowledge that the absence of performer(s) can be achieved by automated installation, automated performance, but also live performances where performers become non-performers. This way the role of Lumia artists becomes an architect and/or theatre director of the void.

Third, exploring Lumia without light can subvert the current assumption about what lighting does in creative practices. This opens new opportunities for Lumia to be studied on its structural level beneath its materiality. For instance, the idea of decay is a structural factor that draws attention to the process of lighting, and then the projected image, but in addition, it makes Lumia comparable to other established independent art forms such as music and dance. There are other structural factors in Lumia that can be used to subvert the current status of lighting, such as orientation, mapping, and animation (time).

Fourth, the essential form of Lumia discovered by bracketing, can propose a new hierarchy between forms by using its structure as a paradigm for other creative art forms such as theatre, music and literature. Wilfred's projected scenery could be seen as his attempt to extend Lumia onto stage design, but it was unclear how Lumia influenced the structure of performance itself.

[32] See *Opt. 21 Birds*
[33] See *Opt. 19 Genesis*
[34] See *Opt. 17 Performance*
[35] See *Opt. 3 Luminal Fold IV*

It can be only measured by whether Lumia was disposable or replaceable by other staging elements such as scenic art. For instance, Lumia could be used to visualise a performer's body as a lens or reveal a physical relationality between performers by incorporating reflective surfaces that resemble Clavilux I Cube design — to respond to images by the reflection of light. The latter is particularly interesting as lighting becomes an agency to reform the traditional perspectivism on stage rather than displaying the image of Lumia. Therefore, Lumia becomes a truly irreducible form itself on stage and provides a new paradigm for performance.

Fifth, the essential structure of Lumia can also inspire composers, and this is particularly interesting as both music and Lumia can be regarded as being immaterial and spatial. This could be used to experiment in arranging different musical parts; to observe how Lumia arranges its parts resulting in music. But also, by using an immersive audio technology (dearVR Spatial Connect) sound sources can be choreographed to map how light is reflected to how sound is relayed, and how light is refracted to how sound is reverberated in space.

Last, the essential structure of Lumia can be reflected in creative and critical writing. For instance, Hegel's dialectics was critiqued by Fanon's post-colonial reading on intersubjectivity between individuals; how the idealised notion of dialectics is only possible when everyone is equal. If Fanon's critique brought the historical, experiential and psychological dimension of human interactions, Lumia could be also seen as being performative; to destabilise the status quo by proposing seeing our surroundings through light where individuals are connected via the void and our physical blindspots are overcome.

[Improvements]

This invention is a critical development to recognise the role of subversion in establishing Lumia. It is the least stylised form of Lumia that exists in intermedia and subversion, therefore, it is more effective as a design methodology that does not prescribe technical details but proposes critical trajectories for others to contribute to and challenge as an open discourse.

[Adaptability]

This invention aims to remain as a methodology for an open discourse but the suggested concepts are practical, critical and philosophical while being true to the medium-specificity of Lumia. Therefore, it provides a necessary framework to avoid any apophenia in interpreting and adapting Lumia.

[Functions]

Here is the summary of the key functions of Clavilux K Rebel.

- Clavilux K Rebel is a methodological design that encourages artists to discover and apply the medium-specificity of Lumia on a structural level.
- Clavilux K Rebel helps situate Lumia next to other art forms.
- Clavilux K Rebel reveals performative aspects of Lumia.

5.2.7 Concept 3: Un-site-Specificity

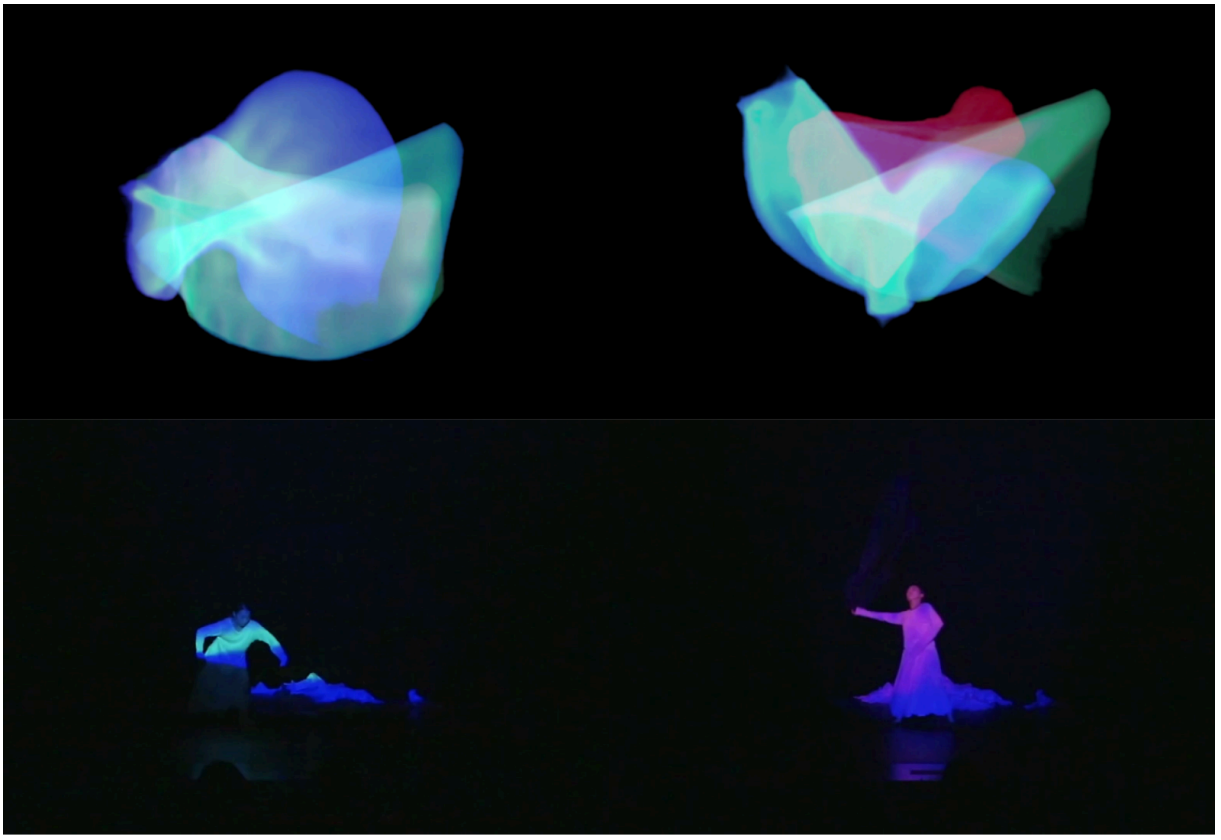


Figure 73. Luminal Fold III (Top) and Opt. 3 Luminal Fold IV (Bottom) (Source: Trent Kim)

Clavilux K Rebel criticises a social hierarchy among art forms that discourages the expansion of our senses. As Wilfred prevented any potential musical dominance by pursuing a silent lighting performance, and as the recording of my silent Lumia performance, *Luminal Fold III*, inspired the choreography by Eunju Shin in *Opt. 3 Luminal Fold VI*, subversion can be achieved by suspending the dominance (making it absent initially) in order to re-order the media.

Importantly, the reversal of the hierarchy of existing intermedia discussed here (from music-dance-lighting to lighting-dance-music) did not result in a new form of intermedia, but by

subverting the interrelational structure (the hierarchy), as evidenced by the altered order in the chain of creative production, it tested and refined the medium-specificity of lighting. Therefore, the intermedia framework should be viewed as a device for extraction as opposed to hybridisation.

I would argue that this type of intermedia experiment should be associated with the previously discussed bricoleur's poetry by utilising the available resources while assigning the dominant status to lighting.

Figure 74. Images from Pilgrim of Curiosity (Source: Trent Kim)

Further, the bricoleur's poetry (lighting as the source of performance) inspired a new materialist dialectic. For instance, in *Pilgrim of Curiosity*, the dancer's body/costume (see Figure 74) became a kinetic screen constructed as layers of bird feathers (designed and constructed by Shin Dance using Korean traditional paper(한지). During the performance, the dancer's choreography gave my lighting design new depth[36].

[36] *Pilgrim of Curiosity* (composition by Oliver Searle, lighting by Trent Kim) premiered at the Centre for Contemporary Arts in Glasgow on 26 October 2014. In 2017, in collaboration with Eunju Shin (choreography), the work transformed into an intermedia performance (music, lighting and dance). Dance was one of the newly introduced elements.

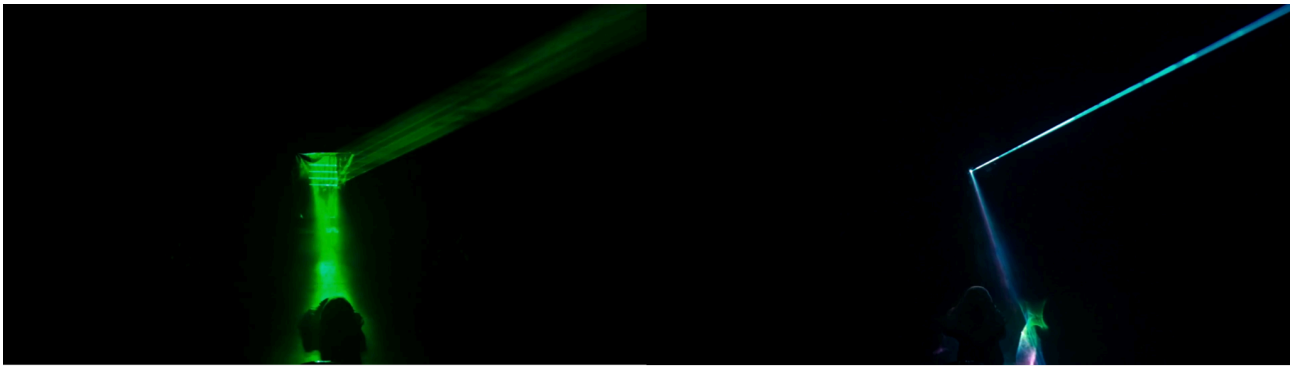


Figure 75. Images from Opt. 4 Gaze (Source: Trent Kim)

In *Opt. 4 Gaze* (lighting by Trent Kim and choreography by Eunju Shin) (see Figure 75), the conventional hierarchy between the dancer's body (subject) and lighting (illumination) was subverted, and the dancers' bodies became kinetic reflectors that revealed, animated, and performed light. In this piece, the traditional roles of dancers and light were interchanged at times and became fluid throughout.

In contrast, paradigmatic subversion suspends the physical presence of light and replaces it with another medium; parody, such as music as Lumia, plays a critical role (in the structure and medium-specificity of Lumia). Due to the fact that it necessitates a materialist suspension of light, paradigmatic subversion is also partially absence-based subversion (of light).

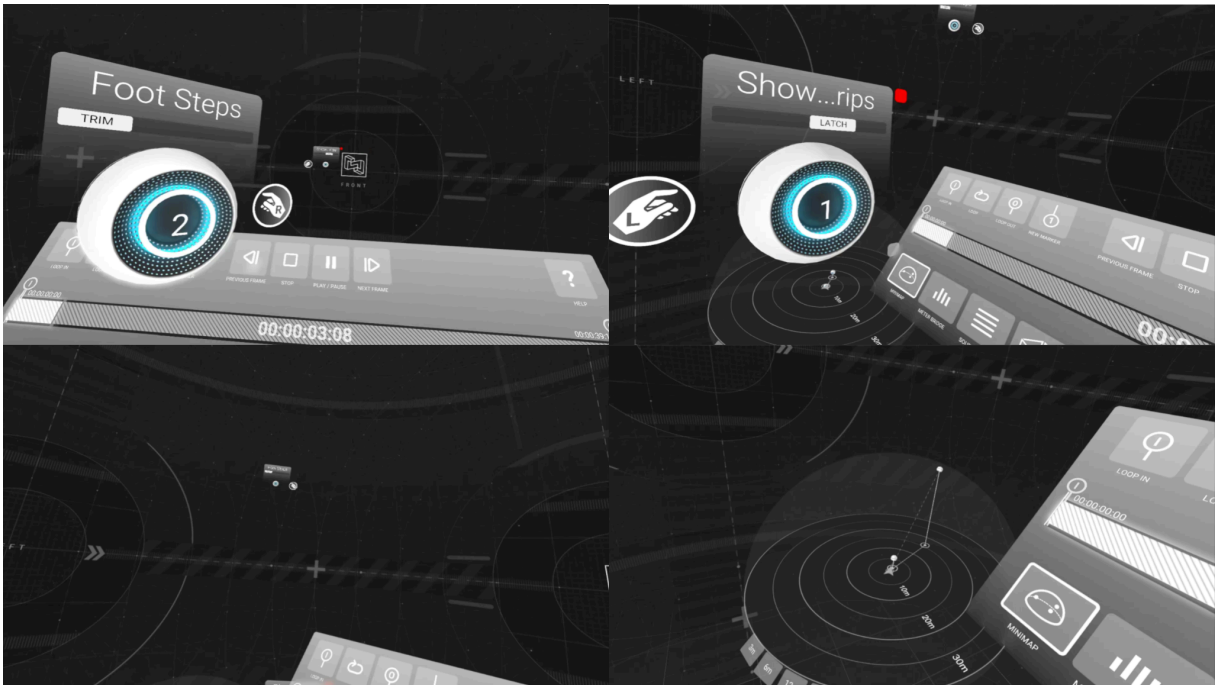


Figure 76. Images from Opt. 16 Lumia without Light (Source: Trent Kim)

The materialist suspension of light within Lumia, followed by a metaphorical mapping onto another medium, subverts the social status of lighting that conventionally normalises our senses. In *Opt. 16 Lumia without Light* (see Figure 76), key components of Clavilux for lighting were parodied for sound art; individual sounds as repeating kinetic forces, and the decay of lights inspiring the decay (reverb) of sound to reveal the void axis.

> The space/void in the art of light is not a representation of real life but a demonstration of its aesthetic perfection as an art form. As Fanon pointed out, one of the critical flaws that we inherit is the underlying problem of Hegelian dialectics … Light connects surfaces until our patience of seeing runs out. Each space that light exists in is specific but cannot be prescriptive as light occupies the void rather than illuminating the site.
>
> (Kim, 2021a)

Similarly, the structure of Lumia can be parodied into a new form of textual dialectics, as demonstrated in the following passage from *How to Perform Light* (Kim, 2021) in which the light is a self-referential object that, I would argue, could be considered an example of Gal's concept of deep form, similar to the portrait in *The Picture of Dorian Gray*.

In keeping with my phenomenological observation, I refer to the new space discovered by such subversion as un-site and its construction and characteristics as un-site-specificity.

> Un-site
>
> Verb: to see outwith an immediate site
>
> Noun: a visible space but only by subversive seeing
>
> (Kim, 2021b)

The un-site-specificity could be compared to the concept of 'conditional art' (Irwin and Simms, 2011 p. 215) proposed by *Light and Space* artist Robert Irwin. Additionally, Irwin's works were phenomenologically influenced and focused on 'being and circumstance' (Irwin and Simms, 2011 p. 215). In this manner, Irwin sought new meanings and experiences by integrating himself into the site.

In contrast, un-site-specific artworks that share the creative strategies of Clavilux K Rebel reveal new meanings and experiences through subverting the site into the un-site; introducing new materialist dialectics following the Benjaminian approach to apparatus from the perspective of absence and substitution. The materialist absence — such as sound, performer(s), and/or light

and/or paradigmatic/materialist substitution — encourages a new order of media, role swaps, parodies, and ultimately exploration of intermedia both internally and externally.

This method of uncovering new materialist dialectics (internal and external intermedia) echoes Mikhail Bakhtin's notion of the carnivalesque. In Bakhtin's analysis of the Renaissance author François Rabelais, he analysed subversive — carnivalesque and grotesque — characteristics (mainly of a human body). Carnivalesque, according to Bakhtin, was characterised by multiple voices and styles and represented 'the utopian realm of community, freedom, equality, and abundance' (1984, p. 9).

Bakhtin compared official feasts to carnival and defined carnival as 'temporary liberation from the prevailing truth and from the established order; it marked the suspension of all hierarchical rank, privileges, norms, and prohibitions' (1984, p. 10). Rabelais' novel, *Gargantua and Pantagruel*, is replete with examples of this type of communication/exchange.

Intermedia, in my opinion, provides a critical material suspension and liberation; a materialistic and conceptual carnivalesque. Through this, marginalised and subjugated forms of art such as Lumia are offered the opportunity to express themselves to their fullest extent, as well as the un-site-specificity that centres rather than subjugating them. How the subjugated subverts through absence and/or paradigm is, in short, a rebellious politics of subverting normalised sensorial and perceptual hierarchies in an intermedia environment.

5.3 Preface to LUMIA: PERFORMING LIGHT exhibition

This chapter aims to provide an introduction to my most recent exhibition, *LUMIA: PERFORMING LIGHT*. I have documented and included the takeaway version of the exhibition as well as the *LUMIA Digital Archive* (Kim, 2022).

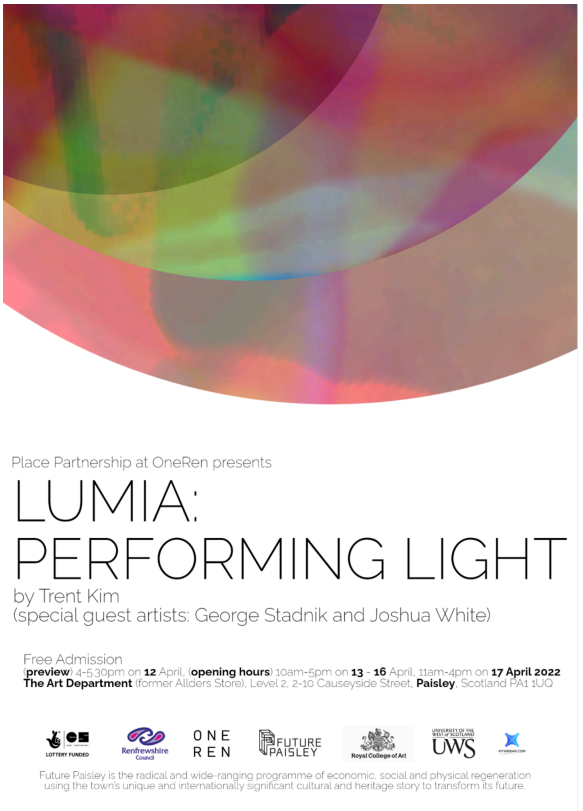


Figure 77. The Exhibition Poster for LUMIA: PERFORMING LIGHT (Source: Trent Kim)

Certain COVID-19 restrictions, such as the wearing of face coverings and hand-sanitisation requirements for an indoor public event, were in effect during the exhibition[37]. I incorporated an AR

[37]In doing so, I followed the ethics and risk assessment policies of the RCA, The Art Department (venue), Future Paisley and Renfrewshire Council.

(Augmented Reality) exhibition guide for COVID-19 as an additional safety measure. Each artwork (video) was accompanied by augmented reality (AR) markers that triggered (on visitors' smartphone web browsers) my audio commentaries, photos, and videos describing the processes and contexts depicted in the works.

Figure 78. The Takeaway Version of LUMIA: PERFORMING LIGHT (Source: Trent Kim)

The takeaway version of the exhibition, in order to reach a wider audience and to document the exhibition thoroughly, uses the AR technology platform (MyWebAR), contains all the works on display as well as a brief video tour of the exhibition;.

5.3.1 Layout and Prototyping

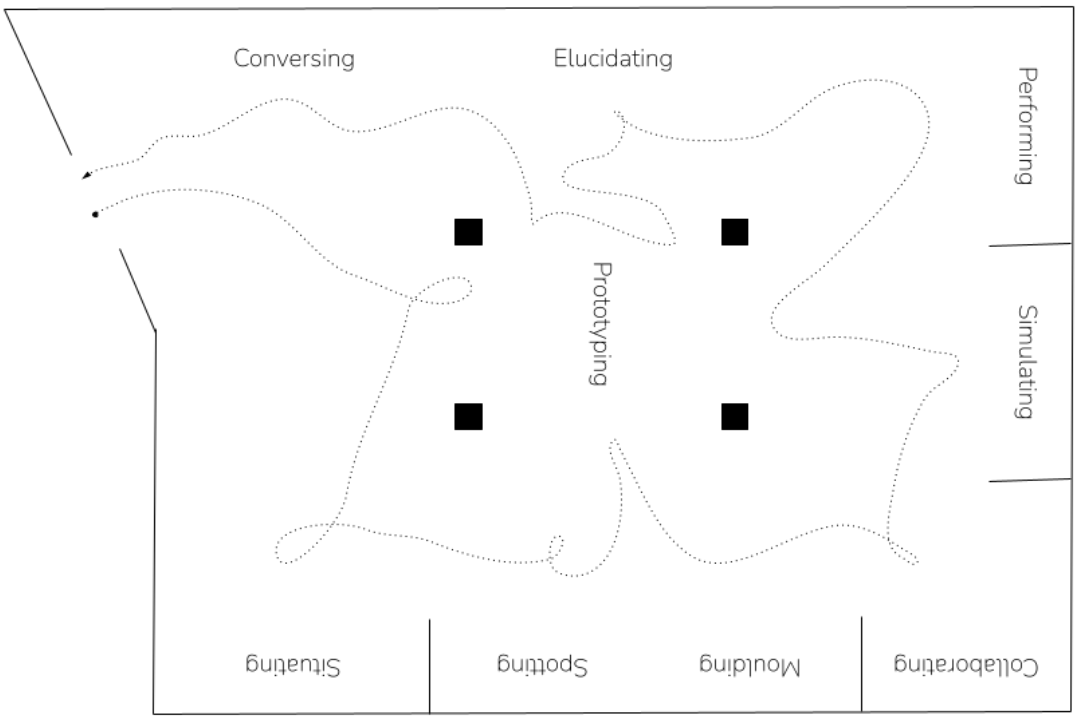


Figure 79. The Exhibition Layout of LUMIA: PERFORMING LIGHT (Source: Trent Kim)

Conforming to the layout of the exhibition, there were eight curated zones: prototyping, situating, spotting, moulding, collaborating, simulating, performing, elucidating. The prototyping zone was placed in the centre of the room to symbolise how it connects all the other stations, and due to its large glass front, it would be the first area visitors would see upon entering.

The arrowed scribble illustrates how I envisioned a visitor navigating the exhibition and experiencing the various stages of discovering light as a distinct art form.

Figure 80. Prototyping Station in LUMIA: PERFORMING LIGHT (Source: Trent Kim)

This zone featured a selection of my Clavilux I Tube and Cube prototypes as well as simpler models used to create some of the Lumia compositions on display.

5.3.2 Situating

In this zone, I included a welcome video to introduce my PhD research project, the exhibition layout, how-to guide, a foreword by Pierre J Pernuit to contextualise my practice-based Lumia research as an independent (not intermedia), spatial, performative, and phenomenological inquiry, and a short conversation between myself and the two guest Lumia artists in this exhibition, George Stadnik and

Joshua White. Comparing and contrasting our perspectives on Lumia and determining where my aestheticist paradigm fits within the contemporary context of Lumia made this conversation particularly satisfying.

5.3.3 Spotting

In this zone, I aimed to spot Lumia in our everyday environment, while also demonstrating how this everyday knowledge of Lumia can be applied to artistic practices.

Blindless Spots is based on a phone recording that was edited to include a frame to emphasise my discovery. Although Lumia is not about painting with light, the fact that one can see images of an object or person reflected in a confined and reflective space, such as inside a bus or train (especially in a tunnel), demonstrates that light travels along the void axis and diffuses the reflected images. I would argue that an awkward eye contact with a stranger through a reflection on the void axis demonstrates Lumia's materialism: such an indirect eye contact proves that we are infinitely connected through relays of lighting in a confined space, but we exercise a very reduced sensitivity under ambient light.

In *Glass Drama*, visitors are invited to observe a phenomenological experience of a water glass on a sunny day, and the work demonstrates an active observation. Additionally, *Blocking Light* blocks[38]

[38] Blocking is a task in a theatrical production to confirm positions and movements of performers.

plastic cups, notated a particular position of the cups to record a lighting condition, and rotated them to create a simple Lumia composition.

In contrast, I used my Clavilux I Cube prototype for *Moving Theatre* to investigate beyond screen/surface-based Lumia. I placed a translucent sheet on one face of the cube, but performed the cube to create a more spatial Lumia composition. The word 'moving' in the title signifies that the entire theatre moves to animate and perform lighting.

5.3.4 Moulding

This zone featured three works: *Luminal Fold II, Murmuration in Colours*, and *Memories of Rain*. This zone's purpose was to convey my lived experience of lighting as a Lumianist (the player of Clavilux).

Luminal Fold II acquired the use of acetate sheet not only to reflect a colour-changing LED light, but also to learn how to redirect/bend light, thereby gaining a basic tactility. In addition, for *Murmuration in Colours*, I filmed my simple manual performance with the stopper from a cut glass decanter and a multichannel LED wall panel to vary the spatial depths (by the distance between the source and stopper and between the stopper and screen). The term murmuration was used to emphasise the depth created by the lighting's medium-specificity. In addition, I included *Memories of Rain*, which I created using a box-shaped device to gradually pull and release sequin fabric points. The repetitive and regular placement of reflective discs on the fabric formed a lighting condition, but I also wished to

evoke the sensation of wearing lighting that contrasts with bending (*Luminal Fold II*) and merging (*Murmuration in Colours*).

5.3.5 Collaborating

In this zone, I displayed *4Paisley*, a new collaborative piece created by Joshua White, Stan Schnier, Heather Scott, and myself. I arranged and edited Heather Scott and Joshua White's Paisley-themed (archival but also psychedelic and associated with Paisley Pattern) footage, along with additional psychedelic moving image art by Stan Schnier, and then I projected the final version onto a custom-made interactive screen.

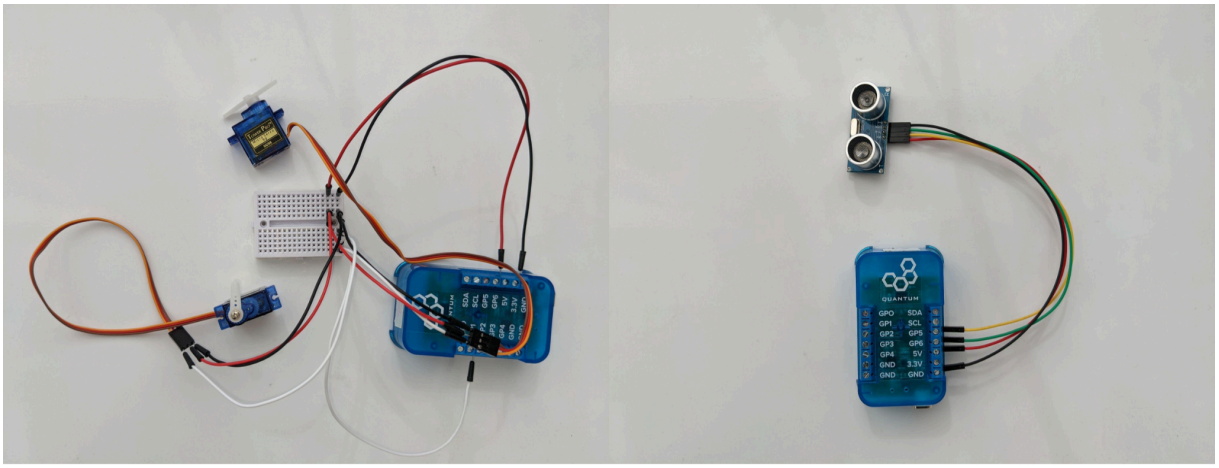


Figure 81. The Servo Motor System for the Screen in 4Paisley (Source: Trent Kim)

I programmed a simple interaction by using two servo motors to rotate its arm to convert the distance in centimetres to degrees of the motors (for example, 50 centimetres -> 50 degrees). Also included are my collaborations with Eunju Shin, *Luminal Fold* and *Gaze*. In addition, assembling and exhibiting

the Random Lumia Generator [RLG] by George Stadnik for the exhibition provided me with a unique opportunity to examine Stadnik's concept of natural Lumia and how the generative, yet natural aspects of lighting reflect his expressionist and abstract art.

5.3.6 Simulating

This zone introduced broad concepts from my exploration of Clavilux J Digital by showcasing *Artificial Choreography* (automated-motion), *Corona Blue* (hypervisibility), and *Lucky's Speech* (in-visibility). By rethinking the concept of digitising light, visitors were able to recognise it as a medium rather than a visual element.

5.3.7 Performing

This zone introduced general ideas from my Clavilux K Rebel exploration, and included *Magnetic Plastics* (Paradigm for Image), *Lumia without Light* (Absence of Light, Paradigm for Music) and *How to Perform Light* (Paradigm for Language). In this context, the word 'performing' is associated with subversion, but is used more broadly to signify the performativity of Lumia to destabilise assumptions about seeing light.

5.3.8 Elucidating

In my practice-based research, I questioned what Clavilux prototyping reveals about Lumia and how this is the case. My technologically extended aestheticism (TEA) methodology rationalised the avant-garde interpretation of prototyping and inspired my own prototypes, critical observations, and analyses.

Void axis, technological voyeurism, and un-site-specificity are the theoretical outcomes discussed in chapter 5, and each represents a distinct dimension of the medium-specificity of lighting: material, simulated, and subversive.

My research was guided by the aestheticist-formalist-technologist paradigm, but the extrapolation of this paradigm through Lumia compositions forced the research narrative into postmodernism. For example, I reflected on my Clavilux prototyping via concepts such as liminality, simulation, and subversion, which helped identify and elaborate binaries: image/void, absence/concealment, and site/un-site, respectively.

Figure 82. Krauss's Diagram of the Expanded Field (1979, p. 38) [REDACTED]

As the diagram[39] demonstrates, a similar approach to postmodern analysis can be found in Krauss's expanded areas (originated from sculpture).

As a result of these critical observations and conceptualizations, my thesis proposes to elucidate Lumia as the last subsection of my exegesis — in order to summarise the findings of this research regarding the medium-specificity of lighting. In addition, I compare my theory of Lumia to Wilfred's theory of Lumia in detail — to historically contextualise this PhD project.

[39] Krauss critically questioned whether whether the triad relationship between landscape, architecture and sculpture is still applicable in the contemporary sculptural practices led by 'Robert Morris, Robert Smithson, Michael Heizer, Richard Serra, Walter De Maria, Robert Irwin, Sol LeWitt, Bruce Nauman' (1979, p. 41).

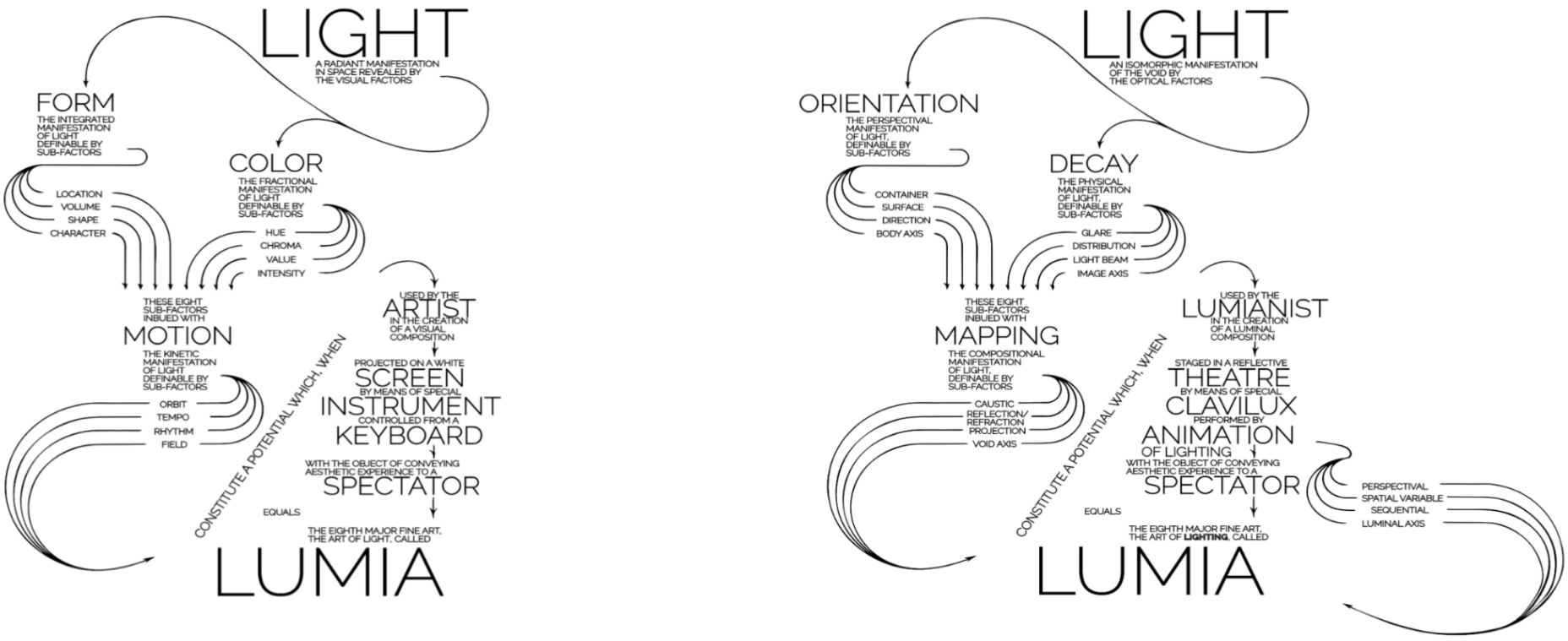


Figure 83. Theory of Lumia by Thomas Wilfred (Left) and my Theory of Lumia (Right) (Source: Trent Kim)

Both theories of Lumia are formalist in nature, but Wilfred's (left) focuses on the moving image of Lumia within the projected screen, while mine (right) focuses on the physical properties (condition) of lighting that affects our perception of image, body, void, and Luminal axis (time for lighting).

I argue that Wilfred's form, colour and motion effectively constitutes a 'motion painting' that expresses the 'kinetic urge' (Gascard 1983, p. 293) and materialises the vision by the projected image of lighting; hence it is difficult to distinguish between Wilfred's Lumia and screen-based abstract animation.

> ...the three-dimensional drama in space-is constantly before him and he strives to add, by optical means, an illusion of the missing third dimension to his flat screen image, and to perform it so convincingly in a spatial way that the screen creates the illusion of a large window opening on infinity, and the spectator imagines he is witnessing a radiant drama in deep space.
>
> (Wilfred, 1947, p. 252)

Wilfred acknowledged, but did not clarify (or fully investigate) the meaning of 'deep space' in the context of Lumia, and based his theory on what is visible and perceptible on the screen. Wilfred proposed that 'F[f]orm is present on a screen if any part of its surface can be distinguished from the remainder' (1947, p. 253) and ignored the image as a byproduct of lighting in a complex kinetic space. For example, the sub-factors of form included location, volume, shape, and character, and Wilfred suggested a typical question for each sub-factor that almost disregards the medium of lighting.

LOCATION-Where is it?

VOLUME-How big?

SHAPE-What is it?

CHARACTER-What is there about it?

(Wilfred, 1947, p. 253)

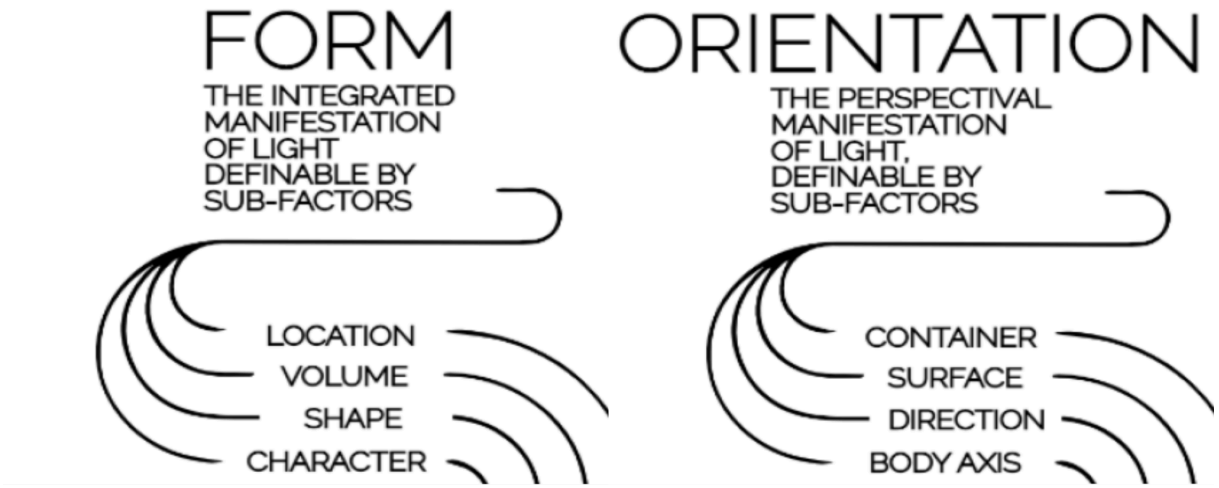


Figure 84. Wilfred's Form vs. my Orientation (Source: Trent Kim)

Instead, I proposed orientation to assist in visualising one's location (body axis - proprioception) in the space of lighting, recognising the direction of light in relation to one's perspective, identifying the surfaces for light to land and reflect upon, and reading the container as the structural organisation of the surfaces. This is the fundamental physical construction of lighting, as well as Clavilux's design. Despite the limited colour control capabilities of Wilfred's Clavilux and his recorded composition designs, Wilfred specified the hue, chroma, value, and intensity of the colour's sub-factors. As a result of the reflective and refractive nature of lighting in Lumia, I did not include colour as one of the

principal physical properties of lighting. I would argue that controlling these colour sub-factors is frequently counterproductive to controlling a form or motion, and that colours in Lumia serve primarily as visual indicators of a structural change in lighting.

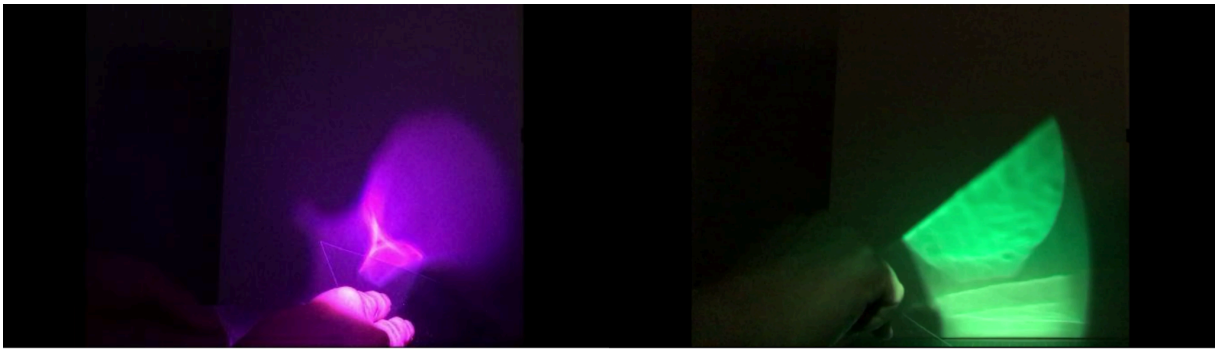


Figure 85. The Acetate Experiment for Opt. 3 Luminal Fold IV (Source: Trent Kim)

For example, the single-colour Lumia experiment (LED light and acetate sheet) demonstrates that changes in colour are governed by structural changes in lighting and indicate the condition of lighting; consequently, controlling colour properties alone in Lumia may restrict and limit lighting, similar to focusing on imagery form rather than the structural form of lighting.

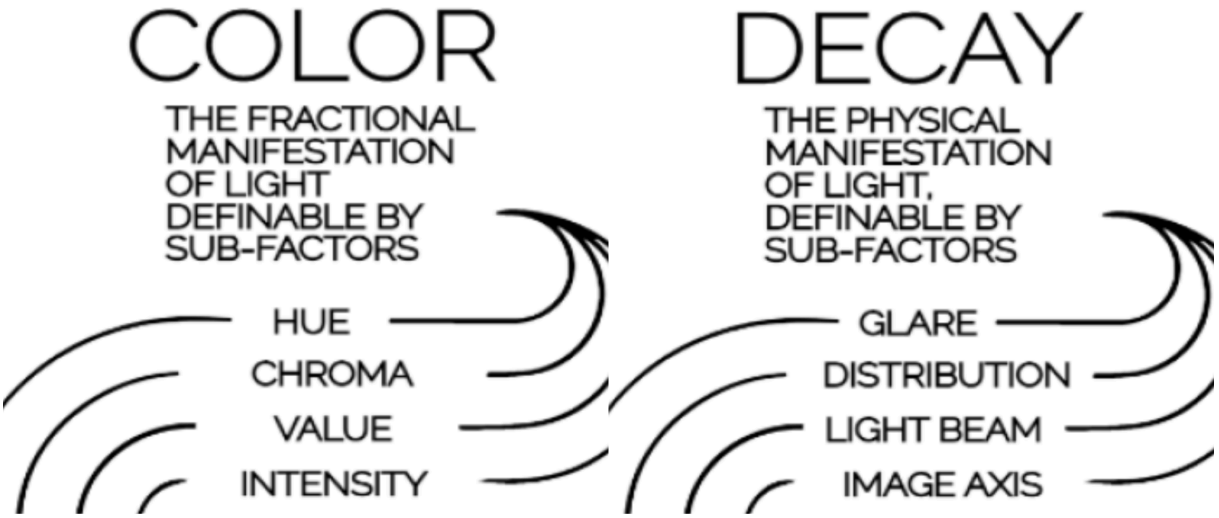


Figure 86. Wilfred's Colour vs. my Decay (Source: Trent Kim)

By contrast, I am introducing decay to help understand the image of lighting (image axis) in terms of its key characteristics, such as light beam (what the shape of the light beam is), distribution (how far and efficiently the light beam spreads in space), and glare (the texture of the light beam's appearance on the surface). Decay is the common denominator of the factors that determine the beginning and end of the appearance of lighting.

Wilfred proposed that motion animates the shape and colour of Lumia, and that the 'field' of its sub-factors suggests that the image of light is a three-dimensional, kinetic object that is frequently larger than the screen and therefore serves as a window. In fact, the curved screens on his Clavilux Jr. devices (a semi-automated home entertainment device) resemble a spaceship window. Wilfred's theoretical analysis of Lumia does not, in my opinion, represent or rationalise his Clavilux designs and Lumia compositions; rather, it appears to be more applicable to panoramic painting, stereoscoping film, hologram, spherical film, and virtual reality.

Despite this, Wilfred's insight and experience with the medium-specificity of lighting as well as his Clavilux designs are demonstrated by additional sub-factors of motion.

> ORBIT — Where is it going?
>
> TEMPO — How fast? Speeding up? Slowing down?
>
> RHYTHM — Does it repeat anything?
>
> FIELD — Is it constantly visible, or does any part of its orbit carry it beyond the range of vision?
>
> (Wilfred, 1947, p. 253)

In contrast to the image moving along the x, y, or z axis, orbit suggests that the image of light on screen has a curvature and that the movement caused by the formation of the curvature is likely to have the characteristic of an orbit. This is particularly interesting because the reason why the image of light orbits on the screen is because it is a two-dimensional byproduct of a three-dimensionally relayed light beam. Therefore, technically speaking, Wilfred's field and orbit are incompatible.

Figure 87. Images from History of Lumia (Sidenius, 1993) and from Op. 75 Study in Rising Forms (1936) (Source: Thomas Wilfred Papers (MS 1375) [REDACTED]

Sidenius's Lumia demonstration (left) and photographs of Wilfred's Lumia composition for live performance, *Op. 75 Study in Rising Forms* (right), demonstrate this aspect of curvature and orbit (see Figure 87).

Tempo is also an additional sub-factor that indicates the medium-specificity of lighting, wherein a moving image of reflected and refracted light exhibits variations in speed. This is due to the fact that reflection and refraction of light alters the distances within a light beam. As a result, the perceived speed of the localised portion of an image would change and vary from that of the other portions. *Opt. 13 Memories of Rain* is a prime example of the gradual distribution of different speeds in Lumia's composition. However, it is unclear whether Wilfred's rhythm represents perceptible repetition in a sense of motion painting or an indication of how Wilfred's Clavilux and recorded composition design mechanically incorporated repetitive elements that result in perceptible cycles.

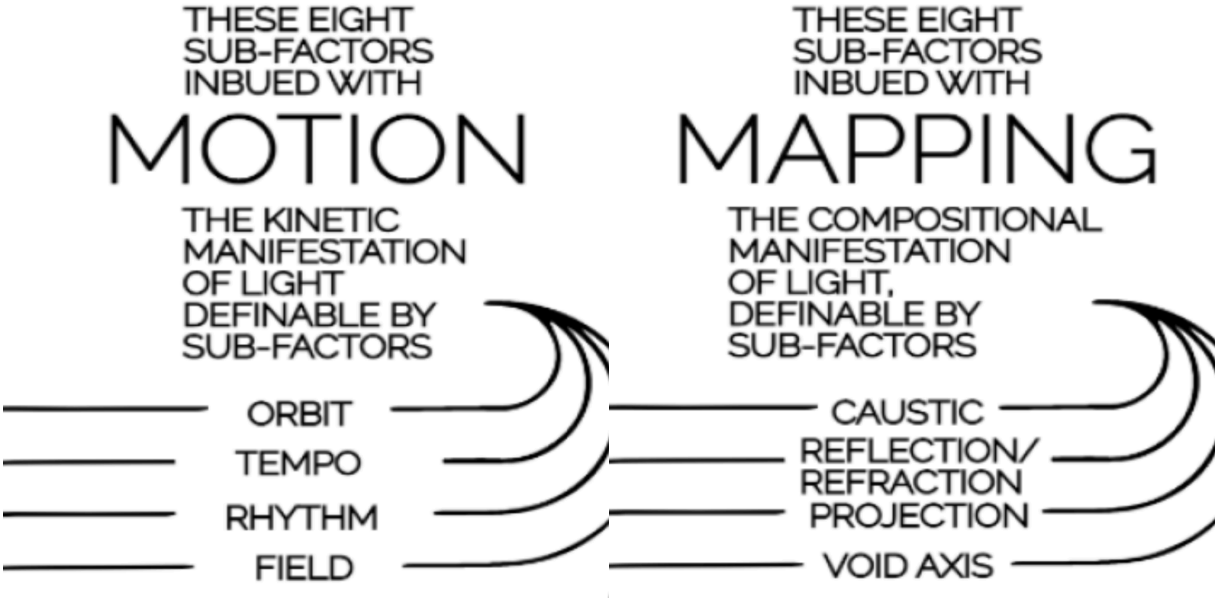


Figure 88. Wilfred's Motion vs. my Mapping (Source: Trent Kim)

In the original place of motion within the diagram, I am introducing mapping to explain how the different types of light that land on surfaces construct a space of Lumia — including projection, reflection, refraction, and caustic — and I have applied the concept of void axis to demonstrate that the condition of void directly affects the condition of lighting (see Figure 88).

Through decay, orientation, and mapping, I attempted to employ various phenomenological perspectives on lighting; firstly, as light as an image, and secondly, light in relation to our mobile body, and thirdly, light in relation to void (in our absence).

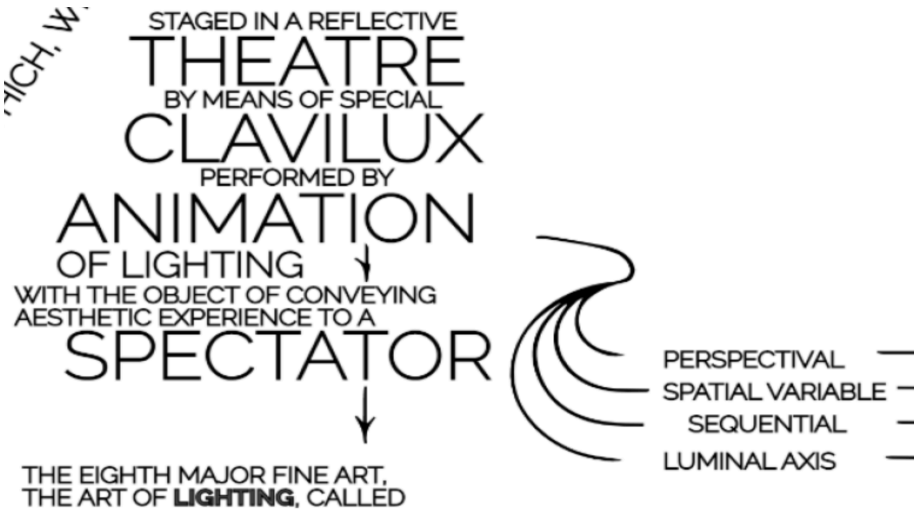


Figure 89. My Animation of Lighting (Source: Trent Kim)

I added animation as Lumia's fourth factor to share my observations on how the structures of time move light. Consequently, it is essential to emphasise that the definition of animation in this theory is the structures of time that concern lighting but also intersect the other factors of Lumia.

First, it is sequential because light is unidirectional, and even a static composition of Lumia has a temporal structure due to how light decays, how it reaches our bodies, and how it maps between the surfaces of void. Second, time is influenced by spatial variables, such as changes/reconfigurations/ transitions of surface arrangements. If a single wall had been slanted, the lighting would have been significantly altered. Third, it is perspectival, because the perspective of the observer is present within the medium of lighting, and any modifications to this would result in a different time structure for lighting. Consequently, light is animated by the individual structures of time.

Lumia is the art of lighting that strives for ‘an isomorphic manifestation of the void by optical factors[40]’, according to my phenomenological observations, and it replaces Wilfred's definition; the art of light would be described as ‘a radiant manifestation in space revealed by visual factors’.

Isomorphism is a mathematical term that describes the structural relationship between ‘two groups that are isomorphic to one another have essentially the same structure; the actual elements of one group may be quite different objects from the elements of the other, but the way in which they behave with respect to the operation is the same’ (Clapham and Nicholson, 2009, p. 436).

Isomorphism is in fact an essential principle for projected scenery which then can be expanded under projection mapping in contemporary lighting design. In projection mapping, a digital image on a computer monitor and its projected image on a curved surface, for example, are isomorphic. Because the digital image sent from the computer to the projector is the same image that is projected onto the surface. Although the image on the monitor and the image on the surface appear different, structurally, they behave identically.

Regarding Lumia, the same logic applies. However, in contrast to projection mapping, Lumia's lighting continues to populate isomorphic images via relay and decay between reflective surfaces. Consequently, the typical Lumia image is a collection of isomorphic light images projected onto a

[40] Optical factors in this context refer to the factors of optics (the physics of light) and should not be confused with ‘optical’ in the optical art that represents an optical illusion.

single surface (which Wilfred conveniently called a screen — but is fundamentally different to the cinematic definition of a screen). I would argue that the degree of isomorphism represents Lumia's depth, not Wilfred's erroneous notion of volumetric depth. Understanding the medium-specificity of lighting and the composition of Lumia enables one to perceive isomorphic individual layers within the image of Lumia, to embody and interpret their interconnection and interdependence among themselves, and to comprehend their relationship to the specific void that directly influences them.

Lumia teaches us a new way to comprehend image, cautioning that image can be isomorphic and that light exists wherever image exists. Lumia connects the surfaces of image, object, and architecture with light, as opposed to separating them through void. Light continues to reflect and distribute decaying situations, structures, and internal orders in an effort to comprehend its being.

As a result, Lumia is the logic of lighting and connects various lighting practices through its medium-specificity which, as my research demonstrated, can also be manifested in simulation and subversion.

The current lack of understanding of Lumia is the result of a lack of studies of the medium itself, as well as the common methods used in scholarly historical research on defunct art practices. This thesis, inspired by bricolage, led to the development of TEA (Technologically Extended Aesthetics). It urges connecting making, thinking, and imagining to unearth historical knowledge that is not only un-subjugated but also subversive — in order to inspire contemporary thought and practice. The genealogy of Lumia that this thesis reviewed and extended will provide an alternative historical

timeline for art historians and media archaeologists, but also an alternative historical method to investigate other technological art movements from the past. Moreover, the three distinctive methodologies established in the three Clavilux prototypes will help the study of technical inventions and structural innovations by other artist-bricoleurs and encourage contemporary artist-bricoleurs to recognise their own developments and contributions to their field. Future Lumia research could include projects that extend the genealogy of Lumia to other disciplines, new prototypes, new types of Lumia performance and also interdisciplinary applications of Lumia in architecture, health and wellbeing and communication design.

For our everyday practices, understanding the raw medium of lighting (Clavilux I), utilising digital technologies (Clavilux J), and exchanging with other media (Clavilux K), enables new ways of seeing lighting outwith formal visual analysis — and further inspires new perspectives of embodying our environments: life copies lighting.

Appendices

Appendix A. The List of Lumia Compositions Created as Part of this Research Project by Trent Kim (also in collaboration)

Opt. Number	Title	Year of Creation	Artist(s)			
1	Kinaesthesia Étude	2016	Trent Kim	Oliver Searle		
2	Luminal Pit II	2017	Trent Kim			
3	Luminal Fold VI	2018	Trent Kim	Yuji Nara	Eunju Shin	
4	Gaze	2018	Trent Kim	Oliver Searle	Eunju Shin	
5	Lightshade	2018	Trent Kim			
6	Fragments	2019	Trent Kim			
7	Artificial Choreography	2019	Trent Kim			
8	Tallis's VR	2020	Trent Kim	Clarissa Lim		
9	Magnetic Plastics	2020	Trent Kim			
10	Abyss	2020	Trent Kim			
11	Murmuration in Colours	2020	Trent Kim			
12	Lighthouse	2020	Trent Kim			
13	Memories of Rain	2020	Trent Kim			

14	Corona Blue	2020	Trent Kim			
15	3, 4	2020	Trent Kim			
16	Lumia without Light	2020	Trent Kim			
17	Performance	2020	Trent Kim			
18	Lucky's Speech	2020	Trent Kim			
19	Genesis	2021	Trent Kim			
20	Aria	2021	Trent Kim			
21	Birds	2021	Trent Kim			
22	How to Perform Light	2021	Trent Kim			
23	Blocking Light	2022	Trent Kim			
24	Moving Theatre	2022	Trent Kim			
25	4Paisley	2022	Trent Kim	Joshua Light Show	Stan Schnier	Heather Scott

Appendix B. The Takeaway Version of LUMIA: PERFORMING LIGHT

Place Partnership at OneRen presents

LUMIA: PERFORMING LIGHT

by Trent Kim
(special guest artists: George Stadnik and Joshua White)

Free Admission
(**preview**) 4-5.30pm on **12** April, (**opening hours**) 10am-5pm on **13** - **16** April, 11am-4pm on **17 April 2022**
The Art Department (former Allders Store), Level 2, 2-10 Causeyside Street, **Paisley**, Scotland PA1 1UQ

Future Paisley is the radical and wide-ranging programme of economic, social and physical regeneration using the town's unique and internationally significant cultural and heritage story to transform its future.

Figure 90. The Takeaway Version Page 1 (Source: Trent Kim)

Figure 91. The Takeaway Version Page 2 (Source: Trent Kim)

Appendix C. Foreword by Dr Pierre J Pernuit, for LUMIA: PERFORMING LIGHT, The Art Department, Paisley, 2022

In his recent work, Trent Kim revives and interrogates the visual tradition of “Lumia”. The term “Lumia” was coined by the North American artist Thomas Wilfred in the 1930s. It designates a new art form, originally described by its inventor as “the eighth art”, an art which consisted in controlling the form, the movement, and the color of electric light through interactive consoles, or in self-contained kinetic light machines.

Besides Wilfred’s œuvre, what remains of Lumia in the 21st century is a distinctive esthetic of the diffraction of light, one that may seem familiar to contemporary viewers as it has been redeployed in many visual contexts and can be found in a variety of media today: in stagecraft, light design, kinetic art, laser art, or computer imagery.

One particularly relevant aspect of Trent Kim’s work is I believe his understanding that Lumia is not just a visual effect. For Trent, the term “Lumia” refers indeed to Wilfred’s theoretical elucidations of the formal possibilities of electric light. Working from a contemporary perspective, Trent dialogues with, analyzes, but also at times critiques Wilfred’s modernist quest for Lumia’s specificity by raising several questions: What does it mean to search for the specificity of an elusive and ephemeral medium? What did it mean for Wilfred in the 20th century? What does it mean nowadays for contemporary light artists?

From the perspective of theory, of words, Lumia appears to be falling in between traditional media. Lumia is, as it were, intermedia. It is hybrid, it takes on different formats, borrows different media techniques. From Trent's practice-based perspective, however, seeking specificity means something different. It refers to a performative practice of light conceived in relation to the coordinates of the space where light travels.

This project rests on a very refreshing view over what a medium is. A medium is not just the physical, material or technical means to create or convey a given content. According to its Greek etymology, the term medium is also synonymous with space, with the environment: the concept of medium then describes a milieu, an atmosphere into which experience takes place. One of the remarkable aspects of Trent's work is his understanding of the importance of the constraints and possibilities of space in his work with light, an attention that recalls the primary meaning of "medium" as space, of what Aristotle calls the "metaxy".

For Trent, working with light involves working with or against darkness, with or against void, in accordance or in contradiction with the materials hit by light. The wonderful experiments gathered in the exhibition you are about to see share a common denominator that I think can be described as a contextual and phenomenological understanding of medium, which is another way to say that it interrogates how light can create space, how light can create a milieu to experience as viewers.

Appendix D. Exhibition Visitors' Text and Drawing Responses

What did you discover at this Lumia exhibition?

Introduction to a form of digital lights art that I had heard of but didn't know much about. Liking the use of QR codes to do an immersive dive and exploration.

I learned about light refraction and how light refracts off of different surfaces and backgrounds.
how new technologies can work together to create innovative art

Movement of light can be easy with everyday objects and how light can create soft & hard textures.

Paisley is unafraid to try to bring new + innovative artworks to the public. Not to my taste but plaudits for putting it on.

Intriguing philosophy and light show

Really interesting. Art + science + tech. Amazing images + ideas

Light has infinity. Endless possibilities. Helped my personal faith in that father god (creator) is the source of light. Wow, thank you.

Seeing things in a different light. It is a part of everyday life and is almost unnoticed with the exception of a camera in a phone. Very Interesting.

Light is like a jewel we want to possess and control.it is how we use it, explore its dimensions that is so interesting and how we immediately read in meaning. What a great show for Paisley!

Experimentation matters - more please!

A new, to me, art form. I found the exhibition interesting and varied. I Would like to see more.

Very nice surprise - interested in a lot of the technology. AR was great for the video content - when it worked. Wasn't sure about using it for the info though. Enjoyed it!

I'm interested in light as space. These investigations/ images encouraged that thinking.

How light changes and what the changes look like and affect/effect. We really enjoyed this. Lovely to speak with the artist.

I discovered the hidden and illuminating properties of light. I especially enjoyed the kinetic moving sheet that comes alive as you interacted with it and found myself coming back to it several times. Perhaps in future exhibits you could have a robotic person that comes alive as the light changes around him/her.

Magic.

What a brilliant light to bring such a show to Paisley. The people here need such inspiration! I am inspired and take with me lots of ideas and things to explore in my own work. Fabulous mix of life, art and science to see anew.

I found it interesting to consider how, although we only perceive light when it hits an object it exists in the empty space between, we only perceive it in a way that is useful to us but its existence is much broader than that.

I discovered that I need more dimensions.

AR interactivity was great! Objects interacting with light. Projection screens are more interesting when not flat!!

A compelling show, equal to anything I've seen in Glasgow. Paisley needs more of this!

Figure 92. A Collection of Exhibition Visitors' Feedback in Drawing 1 (Source: OneRen)

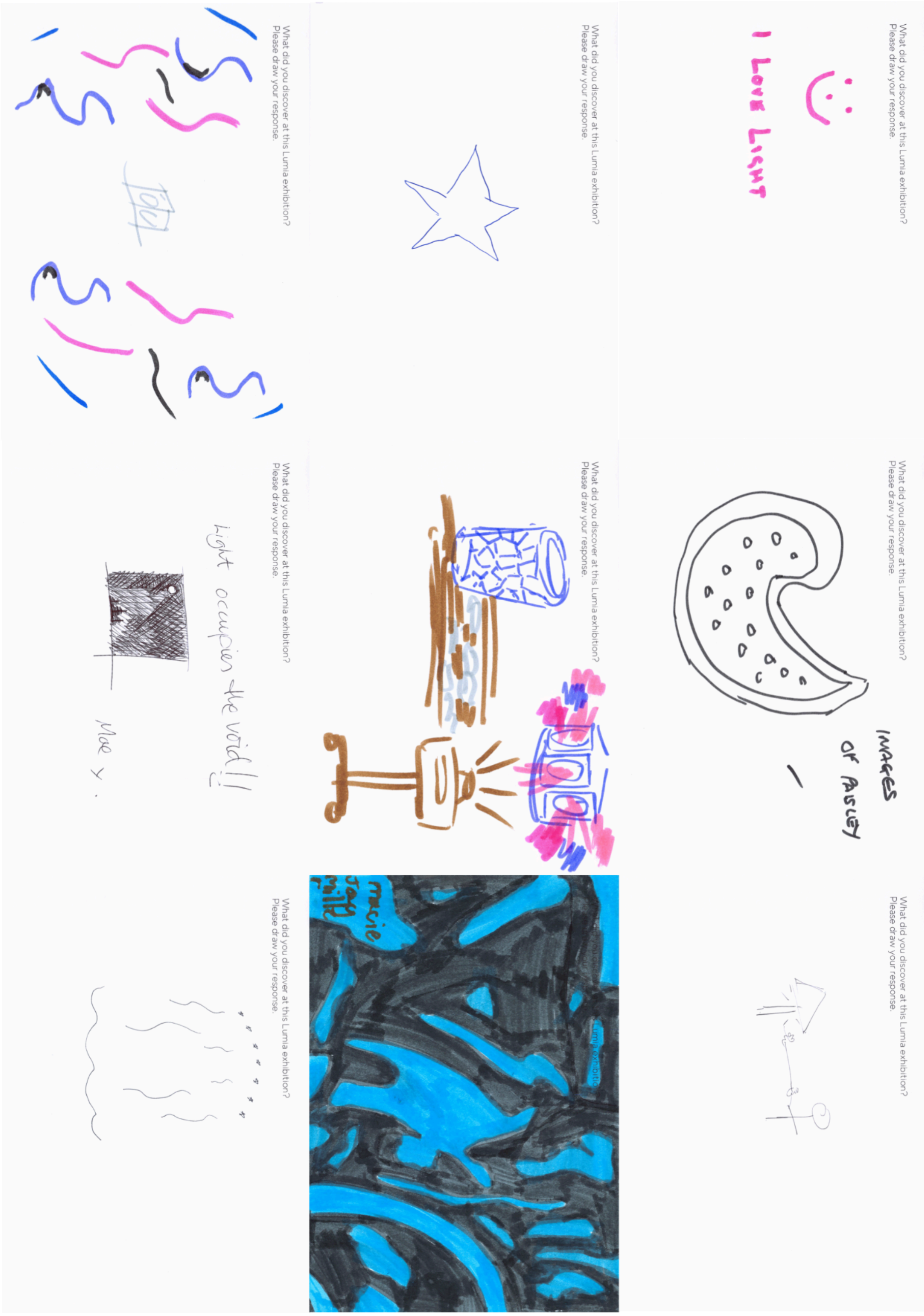


Figure 93. A Collection of Exhibition Visitors' Feedback in Drawing 2 (Source: OneRen)

Figure 94. A Collection of Exhibition Visitors' Feedback in Drawing 3 (Source: OneRen)

Appendix E. Newspaper Coverage Examples

Figure 95. A Local Newspaper Coverage 1 (Source: Paisley Daily Express) [REDACTED]

Figure 96. A Local Newspaper Coverage 2 (Source: Paisley Daily Express) [REDACTED]

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