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# Alchemical Catoptrics

Light, matter and methodologies of transformation in  
moving image practice

*Richard Ashrowan*

VOLUME I

*PhD Thesis*  
*Edinburgh College of Art*  
*University of Edinburgh*  
*2016*

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## PhD Abstract: Alchemical Catoptrics: light, matter and methodologies of transformation in moving image practice.

*Richard Ashrowan 2016, Edinburgh College of Art, University of Edinburgh*

The transformation of matter and the reflection of light are at the heart of filmmaking and moving image practice, exemplified by Stan Brakhage's assertion that "matter is still light. Light held in a bind."<sup>1</sup> *Catoptrics* is the use of optical devices, mirrors, crystals and lenses in the processes of focussing and directing light. *Alchemy* has a two thousand year history, commonly misunderstood as a form erroneous proto-chemistry in which people sought the *Philosopher's Stone* to transmute base metals into gold. *Alchemical catoptrics* is the place where the disciplines of alchemy and catoptrics meet, encompassing an enquiry into the fundamental properties of matter and the possibilities for its transformation, bound up in range of pre-scientific belief systems and philosophies of light, matter and cosmogenesis.

In conventional media histories, the historical antecedents of moving image practice are usually explored through the evolution of visual media technologies.<sup>2</sup> Such an approach only deals with the superficial tools of moving image practice, binding itself up in the machinery of spectacle, while remaining silent on the deeper questions of humankind's imaginative relationship with *luminous matter*. The practice of alchemical catoptrics was an experimental exploration of this relationship; between light, the phenomenal world, the deep structure of substance, imagination, belief and meaning. The current study offers a fresh historical perspective on what it means to experiment with the substance of light in a transformative, luminous, meaning-making capacity. It uncovers a *language of transformation* that speaks to the author's own practice, while offering new insights into the experimental methodologies, motives and practices of other moving image artists.

The research discusses the 13<sup>th</sup> century light philosophy of Robert Grosseteste and its referencing by Stan Brakhage and Hollis Frampton, leading into an exploration of the methodologies of historical alchemical catoptrics, citing original document translations prepared for the purpose of the thesis. Using the examples of *Man Ray* (1890–1976) and *Patrick Bokanowski* (1943–present), the research then shows how alchemical catoptrical thinking can inform our interpretation of the practices of these two moving image artists. The thesis concludes with an examination of the alchemical-catoptrical ideas and methods used for the production of two of my recent film works: *Speculum* (2011–2014) and *Catoptrica* (2011–2013).

3 x DVDs are included: *Speculum* (2014), *Catoptrica* (2014) and *Selected Works* (2014).

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<sup>1</sup> William Wees, *Light Moving in Time*, 1992: 100.

<sup>2</sup> The history of the camera, with roots in the history of optics, is extensively covered by other writers. The domain of *media archaeology* has shed further light on this world beyond the mapping of linear histories of technological innovation, unearthing correspondences and affinities with yet earlier systems of thought. I refer in particular to Siegfried Zielinski's *Deep Time of the Media* (Zielinski and Custance, 2008), the five book series, *Variantology*, edited by Siegfried Zielinski, Friedrich Kittler's *Optical Media* (Kittler and Enns, 2009) and Laurent Mannoni's *The Great Art of Light and Shadow* (Mannoni, 2000). Much of value is also to be found in Werner Nekes superb six DVD series, *Media Magica*, which demonstrates a wide range of pre-cinematic concepts and apparatus.

## **Acknowledgments**

My sincere thanks go to my supervisors:

Louise Milne  
Simon Biggs  
Kriss Ravetto

I am deeply indebted to Paul Ferguson who carried out the translations contained in the appendices with such helpfulness and generosity of spirit.

Bridie Ashrowan, Dove Ashrowan and Lily Ashrowan for their patience and tireless support.

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## 1. Introduction

The transformation of matter and the reflection of light are at the heart of both filmmaking and the historical practice of alchemical catoptrics, exemplified by Stan Brakhage's assertion that "matter is still light. Light held in a bind" (Wees, 1992: 100). *Catoptrics* is the use of optical devices, mirrors, crystals and lenses in the manipulation of light. *Alchemy* has a two thousand year history, commonly misunderstood as an erroneous proto-chemistry in which the *Philosopher's Stone* would transmute base metals into gold. Alchemy encompassed a broader enquiry into the fundamental properties of matter and its transformation, bound up in a range of pre-scientific beliefs, philosophies of matter, and theories of cosmogenesis. *Alchemical catoptrics* is the place where alchemy and catoptrics meet.

Can moving image making be considered a luminous *transformation* of matter? If so, can the methodologies of alchemical practice offer a language and context for the image-transformational strategies of filmmakers? The current research arose from an initial inquiry into *abstraction*, progressing through territories that include *information theory* and the philosophies of the *actual and the virtual* of Henri Bergson and Gilles Deleuze, to arrive at these questions. This led to an inquiry into how alchemists may have worked directly with light, uncovering a hitherto little researched area of historical practice.

It was not my intention to excavate the historical antecedents of moving image practice, though aspects of my research are applicable to this domain. This would have required a conventional media history approach, exploring the development of optics, through the telescope and the camera obscura to arrive at the camera.<sup>3</sup> While much insightful work has been done in this area, it reveals only the history of moving image apparatus. My own intention was quite different: it was to find a *language of transformation* that could speak to my own practice and be applicable to the contextualisation of the filmmaking practices of others.

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<sup>3</sup> The history of the camera, with its roots in the history of optics is extensively covered by other writers. The domain of 'media archaeology' has shed further light on this world beyond tracing linear histories of technological innovation, unearthing surprising correspondences with earlier systems of thought. I refer in particular to Siegfried Zielinski's *Deep Time of the Media* (Zielinski and Custance, 2008), the five volume *Variantology* series edited by Siegfried Zielinski et al (Zielinski, 2005-2011), Friedrich Kittler's *Optical Media* (Kittler and Enns, 2009), Laurent Mannoni's *The Great Art of Light and Shadow* (Mannoni, 2000). The six DVD series *Media Magica*, by Werner Nekes, explores pre-cinematic concepts through demonstrations of a range of early projection devices and visual media (Nekes, 2004).

A split between what is done for ‘spectacle’ and what is ‘necessary’ can be found in the words of Hero of Alexandria, almost two thousand years ago: “The study of catoptrics ... is useful not merely for affording diverting spectacles but also for necessary purposes” (Cohen and Drabkin, 1948: 261-262). The idea of mirroring is embedded within *catoptrics*, and this distinction from *optics* is important to my filmmaking practice and the discussion that follows. Historical practices explored in this research, such as John Dee’s angel conversations, or the relationship between his hieroglyphic monad, optics and light, are conceptually catoptrical, rather than optical. Furthermore, the recorded image itself is a virtual representation, or reflection, of its referent. I also attempt to *mirror* the concepts, ideas and images uncovered in the historical research in my filmmaking. I employ catoptrical mirroring, both practically and conceptually, throughout the making of *Speculum* and *Catoptrica*.

The history of optics, or pure catoptrics, takes us on a trajectory centred on the technical developments in visual media. It deals only with the superficial tools of moving image practice, binding itself up in the machinery of spectacle, while remaining silent on the deeper questions of humankind’s imaginative relationship with *luminous matter*. The practice of *alchemical catoptrics* was an experimental exploration of this relationship; between light, the phenomenal world, the deep structure of substance, imagination, belief and meaning. It is a fresh historical perspective offering new insight, a mirroring across time, for the motives and practices of moving image artists today. Through this exploration I hope to arrive at a deeper understanding of what it means to experiment with the substance of light in a transformative, luminous, meaning-making capacity within my own work.

My interest in this subject is rooted in a personal affinity for the pre-scientific thought of the early modern period<sup>4</sup>, a period in which imaginative ideas and speculative practices coexisted with an emergent rationality. Excavating ideas from this period and bringing them in to the present is a method I use to creatively inform my practice, while offering a means to disrupt and rehabilitate present discourse. This is artistic research. The primary purpose of the historical research undertaken is in the excavation of images, methods and conceptual frameworks that might offer scope for novel reinterpretation within my filmmaking practice.

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<sup>4</sup> The *early modern period* is roughly defined as between 1500 and 1800.

## **1.1 Structure and content of thesis**

I start by providing a background to my practice as a moving image artist. Works referred to are included on the *Selected Works* DVD (Ashrowan, 2014). In Chapter 2, I discuss how two important filmmakers of the American avant-garde, Stan Brakhage (1933-2003) and Hollis Frampton (1936-1984) drew on the 13<sup>th</sup> century light philosophy of Robert Grosseteste. This establishes the contemporary relevance of the historical review of alchemical catoptrics that follows.

In Chapter 3, a historical review, I present a genealogy of alchemical-catoptrical practice, contextualised within theories of light and matter of the period. This traces the evolution of catoptrical devices and their illustration within alchemy: from primitive *solar distillation*, the diagrammatic structures of *philosophical catoptrics*, the use of the burning mirror in the *calcination of antimony*, the extraction of an *astral essence* from the air or dew, the separation of the *light spectrum* and the irradiation of matter using *magic natural fire*. I trace the evolution of the esoteric and philosophical ideas that underpin these practices: the *multiplication of species*, the *spiritus mundi* as the alchemical quintessence, Paracelsian *correspondence* theory, John Dee's *Monad sigil* and his *angelology*, the idea of the *magnetic* substance, plus *Cabalistic* and *Christian theological* ideas. Compiling this genealogy necessitated original manuscript research, including a number of original translations prepared for the purpose of this thesis. Appendix 1 contains additional biographical notes on the historical figures discussed.

Chapter 4 illustrates how alchemical catoptrical thinking can inform our interpretation of the work of two significant moving image artists: *Man Ray* (1890–1976) and *Patrick Bokanowski* (1943-present). Through these examples, I argue that light has always been considered a form of mutable and poetic matter, subject to material catoptrical manipulation by the artist, while rooted in much earlier natural philosophies of the generative and transformative role of light.

In Chapter 5 I present an examination of the alchemical-catoptrical ideas and methods used in my moving image works: *Speculum* (2011-2014) and *Catoptrica* (2011-2013), included on two DVDs. In the early stages of my filmmaking, the 16<sup>th</sup> c. *Ripley Scrolls* were an important visual source. Since they are predominantly alchemical, rather than catoptrical, they are also discussed in Chapter 5, rather than within the earlier historical review.

The relationships between my filmmaking practice and the ideas discussed within the historical review are sometimes direct and sometimes tangential. Some ideas directly informed my filmmaking through choice of imagery or texts referred to. Others provided conceptual and contextual background. These correspondences and disjunctures are discussed in Chapter 6, the conclusion.

## **1.2 Background to research and practice**

Prior to my PhD research, my experimental short films and video installations explored the psycho-geography of the natural world (*The Windmills of Innerleithen* 2003, *A Landscape Symphony in 22 Movements* 2005, *Evanescence* 2007, *Fingal's Cave* 2008, *Lament* 2009). I described my films as “microcosms of place, emotion, time and memory” (Ashrowan, 2008). Some drew inspiration from John Ruskin (1819-1900) and his writing on the value of close observation. I often developed work for an expanded cinema<sup>5</sup> context using multiple screens or projections to explore new ways of spatialising the moving image (see fig. 1):

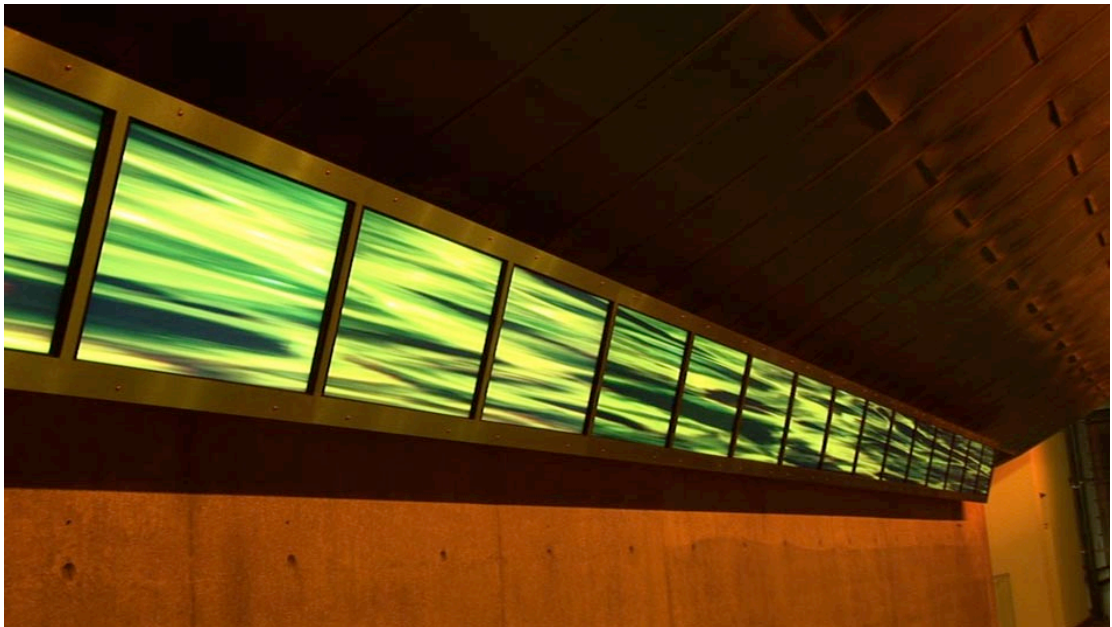


Fig. 1. *A Landscape Symphony in 22 Movements* (2006)

I filmed *A Landscape Symphony in 22 Movements* (2006, 22m, 32 screens) at the site where J.E Millais painted *The Sound of Many Waters* (1876). Realised as a 32 screen installation at the Threshold Artspace in Perth, I *abstracted* the film through a process of stretching it across a 22 screen digital canvas. This stimulated an interest in abstraction as a field for my practice-led research.

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<sup>5</sup> For definition, see 5.2

First, I examined abstraction in relation to the represented real, realising that all forms of representation were, in effect, forms of abstraction. I began to consider moving image practice as a process of perceptual transformation, which led me toward the study of alchemy. I approached this topic from four angles:

1. The transformational symbolism and literature of historical alchemical texts.
2. Philosophies of perception and the cinematic image in the writing of Henri Bergson and Gilles Deleuze.
3. Information theory as a basis for examining *transformations* within the image.
4. Gaston Bachelard's *material imagination* in relation to the four elements.

Between 2009 and 2012 I created four exploratory moving image works. I discuss them here as they significantly shaped the trajectory of my research.

In *Twelve Abstractions* (2009, 6m, single screen), I explored the relationship between the perceived *real* and the information content in a film. I used video compression tools to reduce image information content, subjecting a short sequence of water and grass to progressively heavier compression. I measured the remaining *information content* by calculating the resulting data size. Figure 2 shows examples of the percentage reduction in information content. This revealed that information content can be reduced by up to 95% while retaining a recognisable sense of representation.

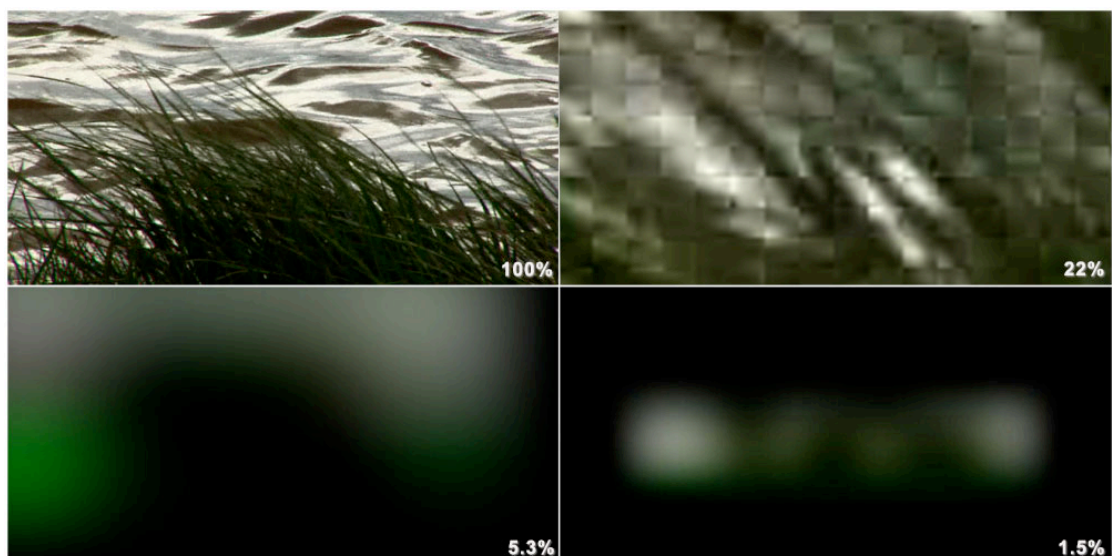


Fig. 2. *Twelve Abstractions* (2009)

I filmed *Reflections, Inversions, Symmetries* (2010, 21m, single screen) in Sutherland, editing together sequences of sea, sky, melting ice and reflections in peat pools. The

work explored the mirror image as a Deleuzian circuit of virtuality, using elemental images of water, air and earth. Specific structural techniques were applied:

- Vertical and horizontal mirroring around points of symmetry.
- Multiple layered mirror points.
- Mirroring of time, in which forward and backward movements of time coexist.
- Progressive inverse-mirroring of colour values through colour inversion.
- The mirroring of sky to sky, earth to earth, water to water, reflection to reflection.

Figure 3 shows the results of some of these structural interventions:

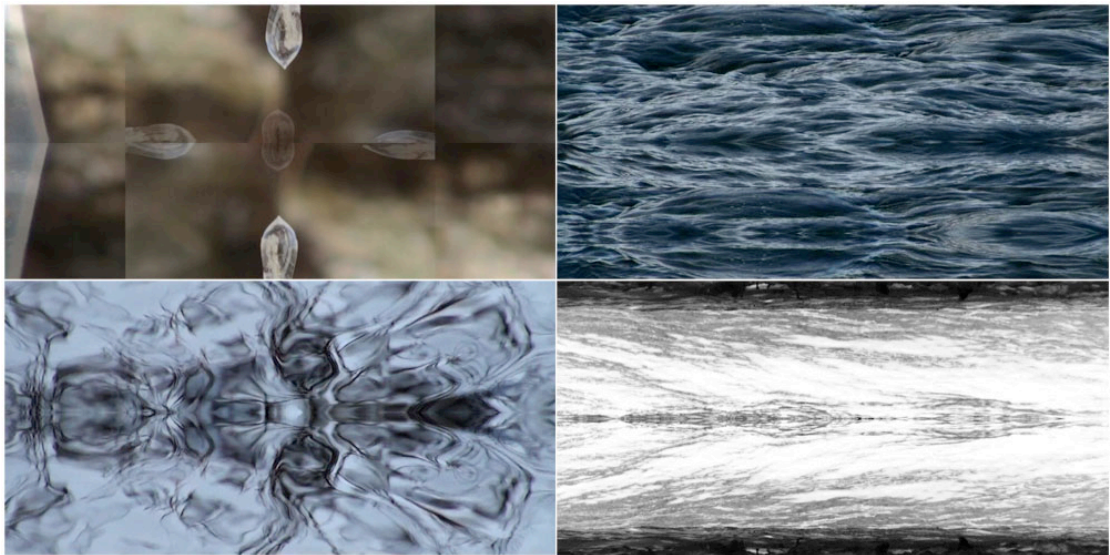


Fig. 3. *Reflections, Inversions, Symmetries* (2010)

I thought of the structural transformations as representing *closed circuits* (the mirrorings, time and colour inversions, edited at a structural, mechanical, data level) and *open circuits* (filmed mirrorings animated by water currents, translucence, and wind). One unexpected result was that the point of symmetry emerged as a transformational plane. The image and its reflection coalesced in a point of transformation around the symmetry point. I explored this aspect further in my next work, *Alchemist* (2010).

*Reflections, Inversions, Symmetries* began my movement away from theories of *abstraction* toward *transformation* as a more fundamental consideration. This led me to investigate the language and methodologies of transformation found within alchemical texts and illustrations.

*Alchemist* (2010, 29m, 2 screens, 2 black mirrors) arose out of research into Michael Scot, a 12th century Scottish born alchemist, astrologer and translator (Brown, 1897, Thorndike, 1965). I invited the performance artists Alastair MacLennan (MacLennan, 2009) and Sandra Johnston (Johnston, 2006) to participate, asking them to interpret alchemical themes and images, informed by ideas of animism, anthropomorphism, transubstantiation and transmutation.

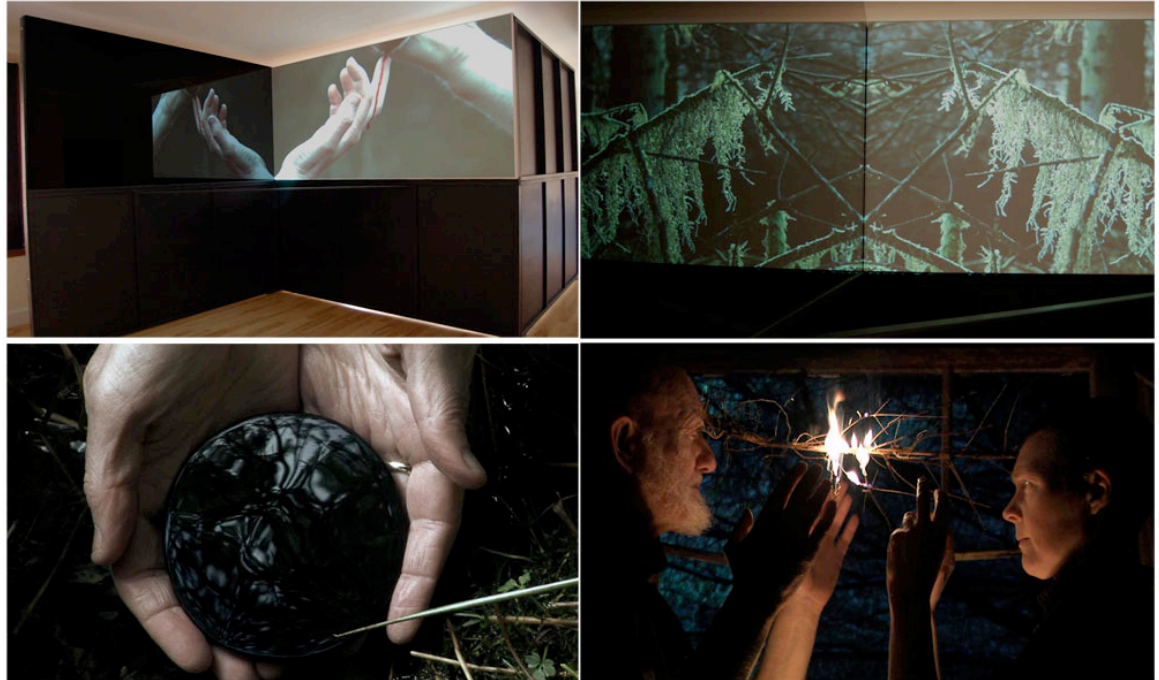


Fig. 4. *Alchemist* (2010)

The soundtrack included location sounds and spoken extracts from the alchemical texts of Scot. In *Alchemist*, I further developed my work with the mirror image, using it as a means to facilitate alchemical image transformation. The process of working with MacLennan and Johnston led to the emergence of several ritualistic image motifs related to fire, earth, air and water (fig. 4 bottom right). Several image structures reflected alchemical diagrams, including the transformational stages of *coniunctio*, *separatio* and *putrefactio*.

I designed the installation (fig. 4 top left and right) as an image-transformational space, projecting the same film on two screens, back to back, with one of the projections mirrored both in time (played backwards) and in horizontal orientation. This created a transformative reversal in the actions in the film – what was *received* on one screen was *given* on the other. What *became* on one *dissolved* on the other. These co-existing reversals created a temporal circularity and a simultaneous mirrored duality of meanings.

Large-scale black mirrors, which I associated with catoptromancy,<sup>6</sup> were set at 90 degrees to each projection screen, doubling each projection as a darkened mirror image. On one side of the installation, images emerged from their reflected image, while on the other side they would merge into their reflection. *Alchemist* thus spatialised transformational processes in its installation format, exploring the transformation of elements, the embodiment of natural forces, and alchemy as a language of transformation.

*Diagram* (2011, 7m, single screen in portrait orientation), filmed in Iceland, explored ideas of the *fixed* and the *volatile* and of film as a diagrammatic space. Repetitive processes of fixing the volatile and liberating the volatile from the fixed were central to the film, as they were to alchemical discourse. The four elements of *fire*, *earth*, *air* and *water* appear and disappear, forming and breaking particular conjunctions, effecting transformations upon one another. Elements affect one another through montage and temporal coexistence.



Fig. 5. *Diagram* (2011)

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<sup>6</sup> *Catoptromancy* was widely used throughout antiquity as means of divination using a mirror. Black mirrors made of black polished volcanic obsidian were often employed (see bottom left of fig. 4) (Pendergrast, 2004).

The portrait orientation was designed to mirror the vertical reading of alchemical diagrams, traditionally from bottom to top, as an ascension through processes of change and refinement. *Diagram* was the last film made before starting on *Speculum* and *Catoptrica*, discussed in Chapter 5 below.

### **1.3 Methodology**

My methodology combines reflective practice, the critical study of contemporary moving image works and historical research. It is an oscillation between filmmaking, reading and watching.

My interest in alchemical transformation led to my first discovery of the use of light by alchemists in Urszula Szulakowska's *The Alchemy of Light* (2000). A significant degree of primary manuscript research was then required. I visited libraries in London, Yale (USA) and Edinburgh to consult original manuscripts, obtaining electronic document scans from other libraries. I commissioned translations from Latin and medieval German specifically for this research. My focus on alchemists whose work centred on catoptrical practices was useful in reducing the enormous scope attached to the subject of alchemy. There is a large body of published research on a number of the alchemists I discuss, in books and journal articles, particularly from *Ambix*. Adam McLean's *Alchemy Website* (McLean, 2013b) was also invaluable for its wealth of online information and for help and advice received from its forum members.

I researched a wide range of filmmakers whose work could be described as alchemical or catoptrical, looking at early cinema, the American avant-garde and a broad range of contemporary work. I commissioned the digitisation of works only available as 16mm prints, such as James Whitney's alchemical *Dwija*. As a methodology for understanding contemporary practice in my field, I established *Alchemy Film and Moving Image Festival* in 2010.<sup>7</sup> I have curated four editions and personally viewed 1300 submitted works by artist filmmakers. The festival screens experimental film and artists' moving image works that relate to the "natural world, to landscape and to humankind's relationship with nature", or to the "alchemy of film" (Ashrowan, 2010).

My filmmaking methods were informed by my historical research. Some works, like *Diagram* (2011) are literal interpretations of alchemical diagrams. Others drew on textual sources and manuscript illustrations for their structure or visual material. As my research went deeper into *light*, my filmmaking echoed these preoccupations. The historical research and filmmaking happened concurrently, reflecting upon one another, as if in a catoptrical hall of mirrors.

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<sup>7</sup> The seventh edition will be in March 2017.

One significant way in which the alchemical research inspired my practice was through an increasingly process-based methodology of visual experimentation. My final film, *Speculum*, is structured as a series of *experiments* conducted over a three year period.

#### **1.4 Scope**

The historiography of alchemical catoptrics extends well beyond the overview presented here. My historical review focuses on what I see as the most important examples and the most original areas of my research.

In Chapter 4, my review of other artists' works focuses on two filmmakers where practical catoptrics are highly evident: Man Ray (1890-1976) and Patrick Bokanowski (1943-present), representing a historical bookending between early cinema and the present day. Some of the artists whose work I would have liked to include but whom I have had to leave out for reasons of brevity include: *Marcel Duchamp, Georges Méliès, August Strindberg, László Moholy-Nagy, Jim Davis, James Whitney, Thomas Wilfred, Harry Smith, Standish Lawder, Robert Cahen, Peter Campus, Dan Graham, Lawrence Jordan, James Turrell, Jurgen Reble, Thorsten Fleish, Rainer Gamsjager, Jacques Perconte, Joost van Rekveld, Jan Svankmajer, The Quay Brothers and Anthony McCall*. These artists will be the subject of future research.

## 2. A contemporary context for ancient theories of light

Before embarking on the historical review of alchemical catoptrics, I wish to set the scene with two examples of 20<sup>th</sup> c. experimental filmmakers who have engaged in a personal archaeology of ancient thought. This discussion illustrates two different strategies adopted by filmmakers in relating their work to historical sources. We also encounter the philosophy of Robert Grosseteste (1175-1253), tracing correspondences between his thought and contemporary filmmaking.<sup>8</sup>

The American avant-garde filmmakers Stan Brakhage (1933-2003) and Hollis Frampton (1936-1984) were both aware of early theories concerning the cosmogony of light, drawing on medieval philosophies of light in their work. Brakhage was particularly fond of the “English light philosophers”:

I believe with Johannes Scotus Erigena that “All that is is light”... That a dialogue beginning with him and reaching a public prominence in the 13<sup>th</sup> century in the writings of Grosseteste...And then later Duns Scotus and then of course Francis Bacon... this brilliance of these Light Philosophers, English philosophers, who because of their feelings stated in words that: *thought was illumination*.  
(Brakhage, 2008: 194)

In this 1974 interview Brakhage credits the poet Ezra Pound (1885-1972)<sup>9</sup> with introducing him to these philosophies. It is unknown to what extent Brakhage was directly familiar with Robert Grosseteste (1175-1253), Johannes Scotus Eriugena (815-877) or John Duns Scotus (1266–1308) and it is probable his knowledge of these philosophers was indirect.<sup>10</sup>

In *Ezra Pound and Neoplatonism*, Peter Liebrechts argues that Pound’s thinking belonged to a broad sense of a “metaphysical occult”, adapting from Grosseteste “the notion of light as an expression of the divine intelligence in the universe, and more specifically, of the sudden awareness of a spiritual reality behind this sensible world” (2004: 214-218).

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<sup>8</sup> There are experimental filmmakers working today who also draw on Grosseteste, including Janis Crystal Lipzin’s works *De Luce 1: Vegetare* (2009) and *De Luce 2: Architectura* (2013).

<sup>9</sup> On Brakhage’s relationship to Pound see (Elder, 1998), (Wees, 1992) and (Sitney, 2002). Ezra Pound’s philosophical influences included Plotinus (204/5–270), Robert Grosseteste (1168–1253) and Scotus Eriugena (815-877). Peter Liebrechts cites Pound’s use of at least eight direct Latin quotations from Grosseteste’s works, including four from *De Luce* (On Light) (Liebrechts, 2004).

<sup>10</sup> All Brakhage’s references to these philosophers I have located can be traced to Pound’s *Cantos*. John Powers, reviewing Brakhage’s correspondence, states that though Brakhage refers to Pound he makes no direct references to Grosseteste, Eriugena or Duns Scotus (Powers, 2012).

This is echoed in Brakhage's comment about the light philosophers describing "thought as illumination" and in his belief that "at least certain kinds of gestures are preceded by a flash of light-like emanation" (2008: 195).

In *Canto LXXIV*, Ezra Pound writes "All things that are are lights", which he attributes to Scotus Eriugena (Wees, 1992: 100). Brakhage frequently misquoted Pound's phrase as "All that is is light" (Haller, 1992: 29) and the phrase itself probably derives from Grosseteste rather than Eriugena (Elder, 1998: 484). The most likely contenders for its origin are from Grosseteste's *Tractatus de luce* (On Light): "The form (species) and perfection of all bodies is light" (Grosseteste, 1942: 15), or from the *Hexameron* "Every form that exists is some kind of light" (McEvoy, 2000: 91).

Robert Grosseteste gave one of the earliest systematic descriptions of the mechanism, as he saw it, by which physical creation was made manifest through the generative properties of light. Grosseteste's metaphysics of light is rooted in earlier philosophers who considered light to be emanatory and generative, including Plotinus, Al-Kindi, St Augustine and St Basil of Caesarea. Many drew on scholastic commentaries for the first six days of Genesis (a literary form known as a hexameron), beginning with the biblical "Let there be light; and light was made" (Gen, 1:3). Grosseteste's writing informed the development of John Dee's "optical physics", discussed below in Chapter 3.3 (Clulee, 1988: 54-70).

In *Tractatus de luce* (ca. 1225-1230), Grosseteste set forth a generative role for light as an emanatory force, based on the way light spreads and multiplies itself in a circular manner from any point of origination. He considered light to be the "first corporeal form" acting as an agent in "extending" and "multiplying" matter into dimensional space.

Thus light, which is the first form created in first matter, multiplied itself by its very nature an infinite number of times on all sides and spread itself out uniformly in every direction. In this way it proceeded in the beginning of time to extend matter...

*Tractatus de luce* in (Grosseteste, 1942: 11)

According to Grosseteste, light, as a "first form", issued from a dimensionless point. This light contained all the potentialities of the physical world it was to create.

Through light's perceived tendency to spread out, self-propagate and multiply, it first created three dimensional spherical space and then, by means of reflection back on itself from the outer boundaries of the world sphere, simultaneously contracted itself into

material forms, in an ongoing loop of reflexive and generative expansion and contraction. Without light, in Grosseteste's view, prime matter would have neither substance nor dimension, a sense of the materiality of light that Brakhage certainly shared.

A close reading of Grosseteste's thought reveals a more complex agency for light in animating and giving distinct form to matter. According to Grosseteste, the material world is inseparable from light, and matter itself generated through the multiplying rays of immaterial light, but matter is not actually the same thing as light. Grosseteste saw light and matter as existing within a cosmological hierarchy, with the immaterial spiritual light above the more corporeal forms, while creating, animating and giving form to them. "The form (species) and perfection of all bodies is light, but in the higher bodies it is more spiritual and simple, whereas in the lower bodies it is more corporeal and multiplied". Light and matter are inextricably bound together: "For the form [i.e. light] cannot desert matter, because it is inseparable from it" (1942: 10).

Seen within the context of Grosseteste's thought, Brakhage's experiments with the filming of light, dramatically illustrated in *The Text of Light* (1974, 71m), are fundamentally materialist. The images he photographed, frame by frame, were all taken from patterns of sunlight refracted in a glass ashtray, a crystal ball and other small glass objects (Brakhage and McPherson, 2001: 156). I was later to apply similar techniques in making *Speculum* and *Catoptrica*. Figure 6 shows how some of these images appear to suggest forms of primordial or celestial light:

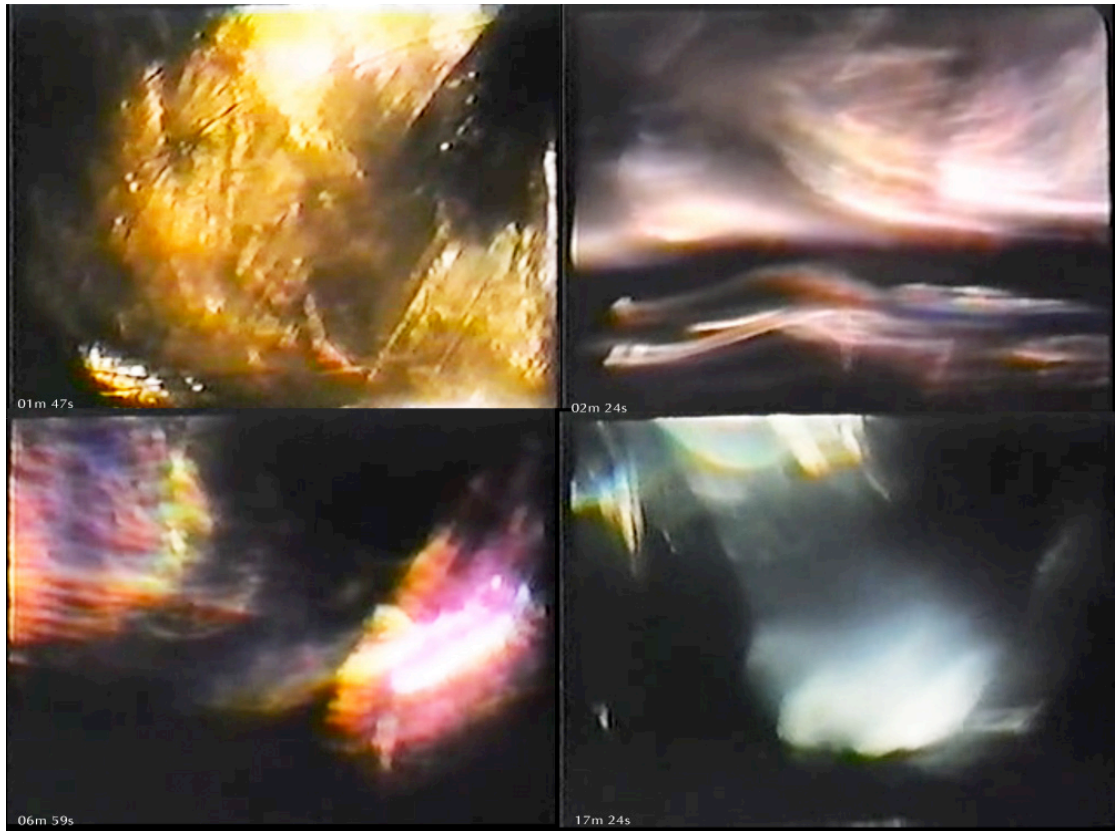


Fig. 6. Four film stills from *The Text of Light* (1974)

Connecting the “light philosophers” to Niels Bohr, Riemann and Einstein, Brakhage asserted that “matter is still light. Light held in a bind”. Brakhage was partly concerned with making light itself the subject of film, “what movie is at basis is the movement of light”, while he also wished to give “sight to the medium” of film (Wees, 1992: 100).

The *matter* of celluloid film – its plasticity, translucence, chemical emulsions and reactions to the *matter* of light, its sequential structure, strip-like form and sprocket holes, together with the mechanisms of projection itself, are Brakhage’s subjects. Grosseteste’s notion of light animating prime matter, can be seen as a direct analogue for the relationship between light and film matter. Brakhage’s subject is light. It hits the filmstrip, enters its material body and imprints itself within physical matter. What was previously dark and unexposed, the *prime matter* of film, has now, by means of light, the “first form”, become exposed and animated with life. This imprint of image into matter is still, at the stage of exposure, small in its physical dimensionality. Light is therefore applied, by means of the projector lamp, to multiply and expand the tiny film images into what we ultimately see and recognise as a film.

Grosseteste based his cosmogony on an experiential understanding of the expansive character of light, similar to the relationship between the projector light source and its large-scale projected image:

For light of its very nature diffuses itself in every direction in such a way that a point of light will produce instantaneously a sphere of light of any size whatsoever.

*Tractatus de luce* in (Grosseteste, 1942: 10)

The filmic enlargement of a close-up shot, often used in extreme ways by Brakhage, can only be achieved by means of this expansive, pinhole to sphere, quality of light. The images in Figure 6, of tiny light refractions in a glass ashtray (using a macro lens) are embedded in a film frame just 1cm x 0.7cm in size. It is light that multiplies the image scale to its projected size. This goes to the heart of the cinematic experience, wherein tiny images on filmstrip are thrown by means of light into dimensions of immense proportion. This capacity for expansion, central to the whole apparatus of film, mirrors Grosseteste's cosmogony, creating the world.

In the interview after a screening of *The Text of Light*, Brakhage seems to have an intuition about light as an astral body, a precursor to physical form:

I have seen before a rainstorm, [that] there are light-like streaks that come down through the air that are metaphors of rain though they are not wet. In fact I have held my hand and some of them have come through that hand with no sense of moisture and of course the fact that the streak goes right through the hand is itself clear that it's not raining. And then rain will follow.

I have seen light-like phosphorescence move horizontally along the ground, as a wind. And I have seen it in a pool, as if a pool of phosphorescent image. Then I have seen sometimes that streaks shoot up from these pools or from the very ground. Again light-like and ephemeral like a phosphorescence in daylight which makes shapes, shapes of plants. And I have seen this quite a bit in the spring on just dirt and I have seen a similarity of plant grow up in this place... I have seen leaves spark or emit spark-like emanation at their edges that are offshoots directly of the veins within that leaf, and therefore as that leaf grows, do create a metaphor previous to the actual extension of these veins.

(Brakhage, 2008: 193)

These comments are contemporary echoes of the "astral body" of Paracelsus (1493-1541) discussed later in Chapter 3.2. It is important to note that this kind of light, for Brakhage, is not an immaterial, literary or ghostly kind of a metaphor, but an actual perceptual experience.

I suggest that a close reading of Grosseteste might form the basis for harmonising Brakhage's practical approach to the materiality of film, his metaphysical leanings, and his filmic subject of light. Brakhage's use and attribution of "All that is is light" may be a simplification of a complex medieval cosmogony. It nonetheless connects him to a tradition of thought stretching back through Grosseteste to Plato (ca. 427-347 B.C.), whose cosmology was of a world created by means of light, fire and geometric measure (Szulakowska, 2000: 34). Brakhage used Grosseteste's thought as a philosophical inspiration while making *The Text of Light*. But Hollis Frampton, as we shall see, approached the works of Grosseteste far more directly.

Experimental filmmakers in the 1970s sought ways to subvert conventional narrative forms. This led many to invent new strategies for structuring their works. Some looked to ancient philosophy for ideas that could mirror their concerns with light, structure, language and materiality within film. Hollis Frampton (1936-1984) was an avant-garde filmmaker with a keen awareness of the deep "metahistory" of cinema. He filled his prolific theoretical writings on photography and cinema with references from Greek drama to Sanskrit poetry (Frampton and Jenkins, 2009: xi). In the final part of *Zorns Lemma* (1970, 60m), six alternating female voices narrate part of Grosseteste's *Tractatus de luce* in a rigid metronomic fashion. *Zorns Lemma* employs mathematical structures, set theory, the alphabet, grammar, language, photographic temporality and elements of personal biography (MacDonald, 1993: 69-77). The film invites a complex range of critical interpretations, functioning as an all-purpose talisman for the critical imagination.<sup>11</sup>

Frampton used his own translation of "*De Luce*" from the Latin, summarising it for the narration script, a technique I was later to apply to John Dee's *Monas Heiroglyphica* text (see Chapters 3.3 and 5.1). His version is reproduced in "On the Camera Arts and Consecutive Matters" (Frampton and Jenkins, 2009: 194). He used about one fifth of the original text of *De Luce*.<sup>12</sup> Frampton focussed on passages that deal with primordial light and matter, on the generation of the four elements and on a numerological exegesis of the four constituents of the world.

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<sup>11</sup> See (Sitney, 2002) for a structural description of the film. Scott MacDonald interprets it as a "narrative mapping of human development" and a "spiritual emblem" (MacDonald, 1993). Allen Weiss (Weiss, 1985) describes it as hinging around two principles, one mathematical and the other Grosseteste's "theology".

<sup>12</sup> I checked Frampton's text against (Grosseteste and Riedl, 1942). Frampton estimated his text used approximately twenty percent of Grosseteste's text. He leaves out passages relating to finite or infinite number and proportion, atoms, points, diameter, shape and geometrical line, the relationships between higher and lower spheres, their circular motion and the oscillation of light within them.

In Frampton's version of *De Luce*, light is the first form; it generates matter, creating the world sphere and the "nine celestial spheres". The ninth sphere, the moon, brought *Fire*, engendering *Light* which engendered *Air*, which in turn engendered *Water* and *Earth*. He included the often quoted paragraph "The Form and perfection of all bodies is Light" and related this to Grosseteste's numerological hierarchy of "things" – a quaternary of *Form*, *Matter*, *Composition*, and *Entirety*.



Fig. 7. Final scene *Zorns Lemma* (1970)

The narrated text appears over the final eleven minutes, in which a couple walk slowly across a snow-covered landscape and vanish into woodland (fig.7). The film fades to white. This sequence is in stark contrast to the rhythmic visual structure in the preceding section of the film, though the voices, reading one word at a time, keep up the same metronomic rhythm.

Frampton did not say why he used the Grosseteste text in his notes to the film. He described the film as "a kind of long *dissolve*", an allegorical journey from primordial darkness into light (Frampton and Jenkins, 2009: 202). *Zorns Lemma* has the linear structure of a journey, beginning with darkness and the emergence of linguistic grammar, and ending with the text of *De Luce*, culminating in white light. By using *De Luce*, I suggest Frampton offered a cosmogony for the creation of film itself.

It describes the progressive birth of the cosmos through emanation from a point of light, creating a hierarchy of forms, with the four elements as precursors to the appearance of matter, following numerological and rhythmic principles of organisation.

The film is therefore as much an *emanation* as a *dissolve*. In a crucial earlier transition, clips of alphabetised words begin to be substituted for clips of real world activities. The first four of these substitutions are *Fire* (a bonfire), for the letter X, *Water* (waves) for the letter Z, *Earth* (weeds in the ground) for the letter Y and *Air* (a steam vent) for the letter Q. This echoes Grosseteste's four elements as the centre of a luminous creation narrative. The relevance of Grosseteste's text within *Zorns Lemma* is not confined to its position in the last section; it oscillates back and forth, as Grosseteste's creative light does, across the entire structure of the film. Frampton used it as an organising principle involving properties of creation, emanation, rhythmic and numeric organisation, elemental substance, and the matter of the film itself as fundamentally participant in light.

Grosseteste's cosmogony can further be detected in Frampton's idea of the "infinite cinema". In *For a Metahistory of Film: Commonplace Notes and Hypotheses*, written in 1971, shortly after the completion of *Zorns Lemma*, he wrote:

A polymorphous camera has always turned, and will turn forever, its lens focussed upon all the appearances of the world. Before the invention of the still photography, the frames of the infinite camera were blank, black leader; then a few images began to appear upon the endless ribbon of film. Since the birth of the photographic cinema, all the frames are filled with images.  
(Frampton and Jenkins, 2009: 134)

For Brakhage, Grosseteste was a philosophical key, underpinning his motives in filming light refractions, and resonating with his own perceptual experiences of light as precursor to matter. Frampton used Grosseteste in a more direct way as a structural framework for his film, with Grosseteste's text read as voice-over. Both of these methods are mirrored in my own approach to the history that follows.

### 3. Historical review

#### 3.1 *Catoptrics in alchemy – an introduction*

Experimentation with *light* and *matter* is a defining characteristic of experimental film, which cannot be separated from its apparatus of production, its material carriers and substrates, and its projection. Yet the practice of relating light to matter through the use of mirrors and lenses is not at all new. It belongs to a much older and little known tradition of theory and practice I call *alchemical catoptrics*.<sup>13</sup>

Since Euclid (fl 300 B.C.) and Ptolemy (fl. 128-148 A.D.), theories of vision had consisted of three related branches of study, dealing with direct light (optics), reflected light (catoptrics) and refracted light (dioptrics). Catoptrics concerns the practical manipulation and refraction of light by means of mirrors and other optical devices. Early study of catoptrics is to be found within the fourth century B.C. Mohist canon,<sup>14</sup> containing passages on the behaviour of light, shadows, refraction and mirrors, while providing an early description of the camera obscura. The use of burning mirrors was described in several ancient Chinese texts, and the Chinese *magic mirror*, which is capable of projecting a reflected image inscribed on its reverse side,<sup>15</sup> has been in use since the fifth century B.C. (Needham, 1962: 81-99). In the *Huai-nan Tzu*, use of a mirror is advocated for extracting dew from moonlight, yielding both fire and a material water from light: “The *fu-sui* (burning mirror) gathers fire from the sun; the *fang-chu* (moon mirror) gathers dew from the moon” (Le Blanc, 1985: 120)<sup>16</sup>. The celestial correspondence of dew and its use within Western alchemical catoptrics is further discussed below.

In the first century B.C. Geminus defined catoptrics as “a subject which deals, in its entirety, with every kind of reflection of light and embraces the theory of images”

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<sup>13</sup> This term is my own, though the linking of alchemy and catoptrics has a long history. In modern scholarship, Urszula Szulakowska’s *The Alchemy of Light* (Szulakowska, 2000) and Siegfried Zielinski’s *Deep Time of the Media* (2002) have revived interest in the relationship between alchemy and catoptrics.

<sup>14</sup> Based on the writings of Mo Di (fl. 430 B.C.), who has been variously known as *Mozi*, *Master Mo*, *Mo Ti* and, in Latin, *Micius*). Mohism was a philosophical, social, and religious movement in China that flourished during the 4<sup>th</sup> and 3<sup>rd</sup> centuries B.C. The canon of writings is known as the *Mozi*. See (Needham, 1962) for an excellent introduction to optical discoveries in ancient China. Nianzu Dai investigates Chinese optics, including light refractions in dew in (Dai, 2014: 311). See (Johnston, 2010) for a translation and commentary on the *Mozi*.

<sup>15</sup> Image projection using the Chinese *magic mirror* is probably one of the earliest forms of projection. It is demonstrated in Werner Nekes’ *Media Magica* DVD series (Nekes, 2010).

<sup>16</sup> The moon mirror or moon crystal also occurs in ancient Indian texts, known as the *chandra-kanta*, and was used for collecting dew (Needham, 1962: notes on 90 & 115). This name is also given to the moonstone, and it means moon-light, or “beloved of the moon”.

(Cohen and Drabkin, 1948: 4). Archimedes defined it as “the study of the refraction and reflection of light-rays by mirrors or prisms” (Szulakowska, 2000: 35). The categorisation of catoptrics as a subset of optical study dealing with *reflected* light and mirrors is carried through into the optical work of Arabic scholars. Al-Fārābī (d. 950 AD) differentiated between that which is visible through direct rectilinear rays and that which is reflected through mirrors (*ilm al-maraya*), including *deflected*, *reversed* and *bent* rays (Sabra, 1989: lvii). Ibn al-Haytham (ca. 965-1039 AD) devoted one third of his *Optics* to vision by reflection.<sup>17</sup>

Seigfried Zielinski, writing in 2002, argues that catoptrics represents the technology of “looking at” things, whereas the related disciplines of optics and dioptrics represent the technology of “looking through” things:

All media requiring projection, including cinematography, are techniques of “looking at.” The former, dioptrics, are indebted to the idea of *perspicere*, of seeing through something in the sense of insight or understanding; the latter, catoptrics, are more orientated toward the illusionising potential of projection, the production of artificial reality.  
(Zielinski, 2008: 85-86)

As Zielinski affirms, filmmaking, with its illusionising potential, its mirroring and refracting apparatus, is an inherently catoptrical practice. Catoptrics in the history of alchemy is a conceptual and practical precursor to the catoptrical practices of filmmaking, occupying a hitherto under-acknowledged place in the prehistory of photography and the moving image.

Any attempt to define alchemy itself is more problematic. The term has been used to describe diverse chemical and metallurgical experiments in material transmutation, alongside a plethora of associated mystical, psychological and speculative practices, over a time period that emerges from pre-history and extends almost to the present day. One common discernable element within most uses of the word, is that it describes tools and processes aimed at artificially accelerating processes of transformation, whether material, luminous, or psychological. It is this aspect, in relation to light and catoptrics, that speaks most directly to filmmaking.

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<sup>17</sup> The *Optics* (Kitāb al-Manāzīr) of al-Haytham (Alhazen in Latin sources) achieved widespread distribution in medieval Europe through its Latin editions, *Perspectiva* and *De aspectibus*. The thirteenth century Western optical theoreticians Roger Bacon (ca. 1214-1292), John Pecham (ca. 1230-1292) and Erasmus Witelo (ca.1230-1314) all referred to this work (Sabra, 1989: lvi-lxxv).

My own discussion of the alchemical tradition is focussed on the later European period, a time rich in published works and illustration, in which the development of catoptrics can be seen to collide most directly with the practices of alchemy. Earlier and equally significant alchemical traditions are to be found within China, India, Egypt and the Islamic world,<sup>18</sup> each taking different trajectories, while cross-fertilising one another and informing some of the later practices discussed in this research.

A brief consideration of early Chinese alchemy<sup>19</sup> illustrates the persistence of alchemical tropes. Beginning around the second century B.C., Chinese alchemy consisted of two distinct yet overlapping traditions: *waidan* (*external alchemy*) and *neidan* (*internal alchemy*). This division itself mirrors the tension between spiritual and laboratory work that would re-emerge in later western traditions. The *Waidan* corpus describes a set of practices, theories and rituals concerned with the chemical, metallurgical, and herbal preparation of elixirs for immortality. As with later western traditions, preparations of mercury and potable alchemical gold were a central part of this quest, as their incorruptible nature was considered to correspond with notions of immortality and perfection. *Waidan* alchemy was later largely superseded by *neidan* alchemy, a set of internalised meditative processes designed to mirror natural transformations in the external world.<sup>20</sup> These ideas are once more reflected in later traditions as theories of the microcosm and macrocosm, and correspondences between the inner life of the alchemist and experimental effectiveness. In the twentieth century, it was after his encounter with a *neidan* text, *The Secrets of the Golden Flower* (Wilhelm, 2013: xiii-xv), that Carl Jung embarked on his influential and monumental psychological studies of the western alchemical tradition, in turn being referred to by the filmmakers I discuss in Chapter 4. The central idea of alchemy, which is one of positive transformation, remains remarkably persistent throughout its various ages, geographies and forms.

The role of alchemy, with its chemical innovations in the creation of light sensitive silver nitrate (*luna caustic* or *lapis infernalis*) and silver chloride, has been acknowledged by the prehistorians of photography (Eder, 1987: 15-33). Little significant study has been carried out in the use of practical catoptrics within alchemy.

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<sup>18</sup> For a basic introduction to these traditions see (Holmyard, 1957) and (Eliade, 1978).

<sup>19</sup> An introduction to early Chinese alchemy and its legacy can be found within *Great Clarity, Daoism and Alchemy in Early Medieval China* by Fabrizio Pregadio (Pregadio, 2006: 1-34 and 203-223).

<sup>20</sup> Some *neidan* practices are distinctly catoptrical. Ge Hong (283–343 A.D.) describes a meditation practice that involves dividing oneself into many duplicate copies, the “way of dividing one’s form” and the “way of the mirror” (Pregadio, 2006: 138). This idea, of division and multiplication, is also reflected in many alchemical processes found in the later literature of material alchemy.

The possible correspondences between the catoptrical practices of alchemists and those of photographers and filmmakers need now to be explored.<sup>21</sup>

I present here an introductory overview of catoptrics in alchemical practice based on primary and secondary sources, focussing on original documents in which catoptrical practice has been diagrammatically illustrated. A number of original translations prepared for accompanying text passages are included within Volume 2, appendices 2-4.

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<sup>21</sup> I have found only one essay, in French, showing an alchemical illustration of a catoptrical device, in the context of a study of alchemy and the evolution of early photography, but catoptrical practice is not discussed. See [http://herve.delboy.perso.sfr.fr/niepce\\_chevreul.html](http://herve.delboy.perso.sfr.fr/niepce_chevreul.html). The technical history of optics and the camera obscura are prioritised in histories of photography. Catoptrics is rarely mentioned in studies on alchemy, with two notable exceptions. The first is Urszula Szulakowska's *The Alchemy of Light* (Szulakowska, 2000) which deals more with alchemical theories of light than with practical catoptrics. The second is *Divo Sole* (Divine Sun) by Alessandro Boella and Antonella Galli (Boella and Galli, 2011). Available only in Italian, it deals with the wider subject of *solar alchemy*. It is a modern alchemical text celebrating use of the rays of the sun by alchemists. Catoptrics are often mentioned within historical studies of optical theory, but I have found no specific mention of its use in alchemical experiment within these sources.

### **3.2 Theories of light and the philosophical-chemical background**

Theories of light in alchemy must be situated in the contexts of medieval optics, Pythagorean geometry, Neo-Platonism, Paracelsian alchemy, Cabalism and Christian mysticism. The following survey shows how early theories of light and vision have informed the later development of alchemical catoptrics.

Questions of light were one of the earliest subjects of Greek philosophy, inextricably linked with theories of vision. Astronomy, astrology, cosmology, ophthalmology, mathematics, optics and geometry were all at this time closely related disciplines (Lindberg, 1981). Debates between the theory of *extramission*, the idea that the eyes shine illuminating rays upon their objects, and *intromission*, where the eyes receive light, exemplify the fact that light and sight remained a matter of uncertainty and imaginative debate for millennia.

Physical correspondences between the human body, light and vision was first established as a theory by Empedocles (ca. 490–430 B.C.), who believed human sight had an illuminative capacity coming from the *effluences* of the inner fire of the eye (Empedocles, 2001: 103/84: 127-129). Plato developed this, proposing that light was transmitted from the eye to merge with the light of the sun into a single coalesced body, associating light with the light of intelligence. Ptolemy (fl. 128-148 A.D.) considered sight to be due to a visual flux or *pneuma* issued from the eye of the observer, a visual radiation equivalent to external light. These ideas involved the human being as an active agent in the emanation of visible light.

Galen (ca. 129-199 A.D) shared the view that illuminative sight extended beyond the body, writing that “the eye has the same relation to the air as the brain does to the nerves” (Darrigol, 2012: 12-14). He believed that *pneuma* issued from the optic nerve caused sight through its excitation of the medium between observer and object. Plotinus (204/5–270 A.D) considered vision to be a unification between an inner light and exterior light, a unity between the philosophical and the sensory realms of perception, believing “vision is light, and light is vision” (Hadot and Chase, 1998: 62).

That light, sight and intelligence were bound together, with the body as a catoptrical medium, was an idea that continued to have currency long after the mechanics of sight were rationally explained. It was Ibn al-Haytham who first began to disentangle vision

and light, producing at least 90 works on subjects including reflection, refraction, lenses, perspective, burning mirrors, light, rainbows and halos, shadows, eclipses, moonlight and starlight. The thirteenth century Latin translations of Al-Haytham's *Optics* became a major conduit for the introduction of Arabic optical theories into the West. Through Friedrich Risner's 1572 translation, the *Perspectiva* or *Alhazeni Optica*, his optical theories gained further currency with some of the key figures of seventeenth century science.<sup>22</sup> Within his *Optics*, al-Haytham demonstrated how anatomical, physical and mathematical theories of vision and the geometries of light could be integrated and verified through experimental means. Within his *Optics* and *On the Form of the Eclipse* he described the camera obscura (Sabra, 1989: xlix-li). In his *Discourse on Light*, Al-Haytham differentiated between two forms of light: the *primary* light was the "essential form" in self luminous bodies (such as the sun and stars), and the *secondary* light was that which emanated as an "accidental form" from illuminated bodies as reflected rectilinear rays of light (1989: li-lii). This idea helped him develop his argument for *intromission*. "The eye's sensation of the light that is in the visible object should occur only through the light passing from the object to the eye" (al-Haytham, 1989: 63). Light from the sun illuminates objects which then reflect their light, entering the eye as discrete rays to enable vision.

The first indications that light might be a "hidden fire" in the air can be found in the writing of Aristotle (384–322 B.C.). He denied the idea of visual emission, considering light to be the actualisation or activity of the transparent medium between the seer and the seen:

Light is the activity... of what is transparent... and exists whenever the potentiality of the transparent is excited to actuality by the influence of fire or something resembling 'the uppermost body'... it is the presence of fire or something resembling fire in what is transparent.  
*De Anima*, 4i8b9-13 in (Aristotle, 1931)

The idea of a *fire* within the transparent medium of air was developed by the Stoics (early 3rd century. B.C.), who proposed an all pervasive agent, composed of fire and air, also called *pneuma*, enabling contact with a perceived object when excited by sunlight

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<sup>22</sup> The texts made their way into Latin, under the name *Alhazen* or *Alhacen*, most probably through the 13c. school of translation at Toledo in Spain. In the seventeenth century, al-Haytham is referred to by Johannes Kepler (1571–1630), René Descartes (1596-1650) and Christiaan Huygens (1629-1695) among others. See Vasco Ronchi (Ronchi, 1970), David C. Lindberg (Lindberg, 1981), Jan P. Hogendijk (Hogendijk, 2003) and A. Mark Smith (Smith, 2001, 2014) for context and influence. See *The Optics of Ibn Al-Haytham: On Direct Vision Bks.1-3* by Abdelhamid I. Sabra (Sabra, 1989) for an English translation and substantial commentary on the first three of the seven volume *Optics*, or *Kitāb al-Manāẓir*. see (Smith, 2001) for a translation and commentary on the Latin edition: *Alhacen's De Aspectibus*.

and vision. These ideas were to emerge again, refracted, within the “flamma vitalis” of Paracelsus and in later alchemical attempts to capture a “celestial salt” from the air, discussed below.

The geometries of light were explored by Euclid (fl 300 B.C), who developed the most comprehensive mathematical optical theory of antiquity with his *Optica*. Euclid’s theory of light described the rectilinear geometries of rays of light emanating from the eye. The geometric means by which light would emanate, spread and reflect provided Roger Bacon (ca. 1214-1292) with the mechanical basis for his ideas of emanatory *species*, discussed below (Bacon, 2010: lxxi). John Dee also refers to Euclid in outlining the light geometries required to concentrate occult celestial virtues (Clulee, 1988: 159-160).

Several authors in antiquity debated the veracity of the reflected versus the direct image (Bartsch, 2006: 38-39). It was Chalcidius’s translation and commentary on Plato’s *Timaeus* (early 4th c.), including sections on mirrors, that gave rise to “the three modes of radiation” of medieval optics and catoptrics: “direct, refracted and reflected” light (Lindberg, 1981: 89).

Lucius Annaeus Seneca (4–65 A.D) wrote extensively on reflections, seeing mirrors as a tool invented “that man might know himself” (Ilardi, 2007: 42).<sup>23</sup> He used analogies and examples of the mirror image to encourage philosophical self-reflection, and demonstrated a knowledge of water lenses made using the new technology of blown glass bulbs. Seneca posed one of central philosophical questions to haunt the practice of catoptrics:

Some people think that representations are seen in them [mirrors], that is, forms of our bodies that are emitted from our bodies and are distinct from them; others say that not images but the bodies themselves are seen in the mirror, as the eye-beam is twisted round and bent back upon itself.  
*Naturales Quaestiones*, 1.17.4 in (Seneca, 2010: 148)

This question still haunts contemporary discussion of the relationship between *actual* and *virtual*, a form of philosophical catoptrics, echoing fundamental human concerns born at the point humankind first questioned his/her own image reflected in still water. In *Catoptrica*, Hero of Alexandria (fl. 62 A.D.) demonstrates an early awareness of the relationship between entertainment and catoptrics:

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<sup>23</sup> Ilardi quotes this from Seneca’s *Naturales Quaestiones*, 1.17.4.

The science of vision is divided into three parts: optics, dioptics and catoptrics....  
The study of catoptrics, however, is useful not merely for affording diverting  
spectacles but also for necessary purposes.  
Hero of Alexandria, *Catoptrica*, ch. 1-6 in (Cohen and Drabkin, 1948: 261-262)

These early catoptrical writings raised philosophical questions about the meaning of the reflected image in relation to the self, its potential for illusion and entertainment. Such concerns are exemplified in the illustrations of Athanasius Kircher (1602-1680) and Giovanni Battista Della Porta (1538-1615) in Chapter 3.3. Both direct and reflected light were employed in later alchemical catoptrical practice, using parabolic mirrors, glass and water lenses.

Light also had a fundamental role in theories of divine emanation and astrological correspondence. Plotinus (204/5–270 A.D) proposed a hierarchy of the “One”, leading to multiplicity through radiation and emanation. For Plotinus, light was the creative emanation of God’s vision, generating the physical world through the act of sight, a notion similar to the biblical “let there be light” of *Genesis 1:3*. Plotinus suggested that light had a formative power within physical forms:

The beauty of colour is also the outcome of a unification: it derives from shape, from the conquest of the darkness inherent in Matter by the pouring in of light, the unembodied, which is a Rational-Principle and an Ideal-Form.  
*First Ennead*, sixth Tractate 1.6.3 in (Plotinus et al., 1991)

The Arabic scholars of the early middle ages often interrelated optical theories with astrology, linking light to a system of human / celestial correspondence that persistently pervades alchemical theory (Szulakowska, 2000: 30). The Arab scholars gave us the names we now use for both chemistry and alchemy: al-kimiya.<sup>24</sup> Al-Kindi (ca. 866) was critical of the transmutational claims of alchemists, a fact that did not prevent his chemical and emanatory theories being taken up by later alchemists including Arnald of Villanova (1235-1313) and John Dee (1527-1609) (Debus, 2004: 189-194). Al-Kindi proposed a theory of creation propagated through geometric rays of emanation:

All bringing-to-be is a being-acted-upon that makes exist that which did not exist. So the emanation of unity from the true, first One is the bringing-to-be of every sensible thing, and everything that attaches to the sensible.  
*On First Philosophy* XX.5–6 AR 161–2, RJ 97 in (Adamson, 2006: 56)

From the One, forms are manifest and radiate rays in turn upon one another, subject to the agency of the One (Adamson, 2006: 56-59):

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<sup>24</sup> Al-kimiya ‘الكيمياء’ is formed from *al* (the) and *kimiya* (chemistry), possibly derived from the Egyptian *kemi*, denoting the transformation of a black to a precious metal, or the Greek *kemia*. This word reached the West with the translation movement which took place in the twelfth century (Datta, 2005: 23).

It is manifest that everything in this world, whether it be substance or accident, produces rays in its own manner like a star... Everything that has actual existence in the world of the elements emits rays in every direction, which fill the whole world.

*De Radiis stellarium* in (Lindberg, 1981: 19)<sup>25</sup>

This is the cornerstone of later doctrines of emanation and interconnection. Al-Kindi also suggested that words themselves radiate, justifying the efficacy of prayers and incantations. In his view, even thought itself radiates and has effect upon the network of radiations that form the wider world:

Even images in the mind radiate... every creature in the universe is a source of radiation and the universe itself a vast network of forces.

*De Radiis stellarium* in (Lindberg, 1983: xlv)

Robert Grosseteste read Al-Kindi's emanatory cosmogony (McEvoy, 2000: 80) as did later thinkers, including Roger Bacon and John Dee (Bacon, 2010: lxxi, Clulee, 1988: 57, 70). His emanatory theories informed the emergence of an optically based natural philosophy underpinning much of the tradition I am about to discuss.

400 years later, the Oxford educated Franciscan friar Roger Bacon (ca. 1214-1292) attempted an ambitious synthesis of all optical knowledge. His theory of *species* sought to harmonise emanatory and philosophical theories with the ideas of Alhazen, Aristotle, Euclidian / Ptolemaic geometry and ophthalmology (Lindberg, 1983: xxv). Bacon wrote a practical treatise on catoptrics and burning mirrors, *De Speculis Comburentibus* (1266), describing the "multiplication" of light with mirrors, the emanation of sunlight, shadows, apertures and the paraboloid concave mirror. Bacon's alchemical work is contained in his *Opus tertium* (1267). He was well versed in alchemical sources and considered it an important branch of science, distinct from simple laboratory work because it had both speculative and operative procedures (Holmyard, 1957: 117-122). Bacon maintained an open mind to the "magical" elements of its practices and also linked alchemy to medicine and the search for longevity (Debus, 2002: 19, 33). *De Multiplicatione Specierum* (Of the Multiplication of Species, 1267), contains his important theory of emanatory *species*.

For Aristotle, *species* was a philosophical idea signifying a networked hierarchy for categorising ideas and material forms, as well as living things, into *genera*, their *species* and their *differentia*. But Bacon had more sympathy with the Platonic idea of species, linked to the less corporeal *ideal forms*. Plato considered species to exist outside of their

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<sup>25</sup> I use Lindberg's translation from the works existing only in Latin, *De Radiis* and *De Aspectibus* (*On Rays* and *On Perspectives*) which Lindberg derived from (Vescovini, 1965). Later thinkers, such as Dee, would only have had access to the Latin translations of Al-Kindi.

substantiation as perceived things. Bacon added to this the mechanics of emanation and multiplication of a thing to its surroundings, whether or not it be perceived.

Lindberg describes Bacon's species as "the force or power by which any object acts on its surroundings" (Lindberg, 1983: lv). *Species* includes an agent, emanating species, and a recipient, which receives species. The diversity of affect is not dependent on the species, but on the recipient, acting as a mediator, multiplying the species received:

The active substance of the agent, touching the substance of the recipient, can alter, by its active virtue and power, the first part of the recipient it touches. And this action flows into the interior of that part, since that part is not a surface, but a body, however small it may be.

Roger Bacon, *De Multiplicatione Specierum* in (Bacon, 1983: 52-53)

Bacon uses numerous words to define species: *similitude, image, sense, intellect, idol* (with respect to mirrors), *phantasm, simulacrum, form, intention, shadow of the philosophers, virtue, impression and passion*. "It is called 'passion'" writes Bacon, "because the medium and the sense, in receiving species, undergo a transmutation in their substance" (1983: 7).

Applying this to light, Bacon outlines a distinctly cinematic concept when he describes the relationship of a light source to its visible light, and its capacity for multiplication through mediation:

We say that the *lumen* of the sun in the air is the species of the solar *lux* in the body of the sun, and *lumen* falling... is the species of the *lux* of a star... *lumen* is that which is multiplied and generated from that *lux* and which is produced in air and other rare bodies, which are called media because species are multiplied by their mediation.

Roger Bacon, *De Multiplicatione Specierum* in (Bacon, 1983: 5)

Bacon proposes that the mediated emanations from an object are transformative: anything receiving species is to be transformed by it, in turn multiplying the species received. Visible light, phantasms, images and intentions are all forms of species emanating along geometrical lines, following the geometries of light. The emanation and *multiplication of species* forms a conceptual background for the multiplication and mediation of projections using mirrors in my performance work, *Catoptrica*, discussed in Chapter 5 and the conclusion.

In Renaissance Florence, the philosopher, translator and magus Marsilio Ficino (1433-1499) developed a sun-centred theology centred around the invisible agencies of light.

Ficino's approach was syncretic, integrating traces of pagan sun worship, Neoplatonism, magic, Hermeticism and Christianity. In *De vita coelitus comparanda* (On Obtaining Life from the Heavens, 1489)<sup>26</sup>, Ficino outlined his belief in a *spiritus mundi* flowing through the universe, creating a "channel of influence" between the heavenly, or astrological bodies and the lower world. This is Ficino's "fifth element" or *quinta essentia*, the alchemical quintessence, possessing the power to enter into the lower four elements (Walker, 2000: 12-13).

Ficino believed that celestial virtues could be embodied within inanimate objects, and that such objects could in turn be used to manipulate celestial influences. He suggested that lower and higher forms actively correspond, and that certain forms have a greater capability to attract "higher" forces than others:

The philosopher ... introduces the celestial into the earthly by particular lures...  
The Magus subjects earthly things to celestial, lower things everywhere to higher, just as particular females everywhere are subjected to males appropriate to them for impregnation, as iron to a magnet gets magnetized...  
*De vita coelitus comparanda*, 26 in (Voss, 2006: 174-175)

The idea of earthly substances acting as a "magnet" for celestial forces gained currency in alchemical practice, culminating in Isaac Newton's catoptrical experiments with the *star regulus* (see Chapter 3.3) and his theory of gravity in the late 17<sup>th</sup> century (Dobbs, 1975: 152). Ficino compared this form of attractive correspondence to a catoptrical mirror:

For whenever a material is exposed to the celestials, as a mirror to your face ... it gains in power from that experience, just as from the face the mirror reproduces an image and from the voice the wall produces an echo.  
*De vita coelitus comparanda*, 26 in (Voss, 2006: 175)

Linking specific stars and planets to specifically "magnetic" substances, Ficino described how metals could be used to confer therapeutic astrological influence (Voss, 2006: 117-118). Ideas of astrological metallic correspondence in fact extend back to early metallurgical practices (Eliade, 1978: 47-62) and were well established by Ficino's time. Moon corresponded with silver, Venus with copper, Saturn with lead, Mars with iron, Mercury with quicksilver and Jupiter with tin (Newman and Grafton, 2001). These ideas bound matter to light through a chain of catoptrical and celestial signification, continuing well into the seventeenth century (Almirantis, 2005).

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<sup>26</sup> Contained in *De vita libri tres* (Three Books on Life, 1489), with *De vita sana* (On healthy life) and *De vita longa* (On long life).

In *De Sole* (Book of the Sun, 1494), Ficino synthesised the idea of the sun as an allegory for God with the idea that the sun is God in actuality. His understanding of sunlight appears more pagan than Christian:

From the light of the Sun, three kinds of brightness are derived...To the red, the wholly corporeal senses of taste and touch; to the white the most incorporeal senses of imagination and sight; ... to the mixed light correspond the senses... of hearing and smell... the light of the Sun is not only the image of things of this kind, but also their cause. Indeed it is the sole image of pure intelligence...  
*De Sole*, 12 in (Voss, 2006: 209)

Ficino constantly celebrated the illuminative, generative and embodying capacities of the sun throughout *De Sole*. He was a teacher, astrologist, priest and philosopher rather than an alchemist, but his sun-centred thought helped shape the practice of alchemical catoptrics.<sup>27</sup>

Ficino was also responsible for one of the major innovations in Renaissance alchemy, identifying the spirit of the world with the alchemical quintessence:

Between the tangible and partly transient body of the world and its very soul... there exists everywhere a spirit... When this spirit is rightly separated ... it is able like the power of seed to generate a thing like itself, if only it is employed on a material of the same kind... The world generates everything through it (since, indeed, all things generate through their own spirit); and we call it both “the heavens” and “quintessence”.  
*De vita coelitus comparanda*, 1 in (Newman and Grafton, 2001: 24)<sup>28</sup>

In this critical passage, Ficino laid the foundation for later alchemical laboratory practices that sought to isolate, extract or embody the *vital spirit* in physical form. His theory suggested the presence of hidden magical, Godly or cosmic essences within matter, effectively lifting experimental laboratory practices to a new level of signification (Forshaw, 2011: 260). Ficino believed celestial rays were both Godly and actual light, able to inhabit and imprint themselves within physical substances. Those alchemists who interpreted the rays of the *spiritus mundi* most literally, as light itself, would deduce that these rays could be manipulated and concentrated by means of catoptrical apparatus.

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<sup>27</sup> Ficino refers to alchemical ideas and processes, the “perpetual transformation of forms”, elements, mixtures, stones, liquors and metals in chapters 40 and 41 of *Commentarium in Timaeum*. He refers to chaos, metals, the origin of gold, salt nitre, liquefaction and solution in *Appendix commentariorum in Timaeum Platonis*. He discusses the composition of gold in his *Commentary on Plotinus’s Enneads*. See (Forshaw, 2011) on Ficino’s alchemy.

<sup>28</sup> Quoting the Kaske and Clark translation (Ficinus et al., 1989).

In its wider context, Ficino's thought echoes through much of the work I now discuss. The legacy of his translation and interpretation of the *Corpus Hermetica* was profound, extending from the late 15<sup>th</sup> c. to the late 17<sup>th</sup> c. (Yates, 1964: 488-491, 66-89). Ficino in fact initiated a psychologising of natural philosophy, proposing a unity of human temperament and thought with astrological influence and the divine. This legacy extends into the modern era. His writing on melancholia and creativity, or his idea that divine *furor* and human love could lead to transcendence, continually resurface (Milne, 2011: 20-24). They are mirrored in my discussion of Man Ray's *L'Etoile De Mare* and Jungian alchemy in Chapter 4.

Cologne born Heinrich Cornelius Agrippa von Nettesheim (ca. 1486-1535 A.D.) was an occultist, lawyer and practicing physician. He was a follower of Ficino and Johannes Trithemius, abbot of Sponheim (1462–1516), an important figure in this chronology in providing a link between Ficino and John Dee's later exploration of catoptric astral magic (see Chapter 3.3).<sup>29</sup> Agrippa built upon the metaphysical aspects of Ficino's thought, blending them with Cabala<sup>30</sup> and practical magic. He proposed that symbols, letters and numbers could have a living correspondence with the stars and planets they represented, so might be used to manipulate celestial powers (Yates, 1979: 44-47). In *De occulta philosophia libri tres* (Three Books of Occult Philosophy, 1533) he described a system of numerology, symbols and language for working with celestial forces, much of it Cabalistic in nature:

There are certain tables of numbers distributed to the seven planets ... endowed with ... very great vertues of the Heavens, in as much as they represent that divine order of Celestiall numbers, impressed upon Celestials by the Idea's of the divine mind, by means of the soul of the world, and the sweet harmony of those Celestiall rayes, signifying according to the proportion of effigies, super-celestiall Intelligencies, which can no other way be expressed, then by the marks of numbers, and Characters.

*De occulta philosophia* in (Agrippa von Nettesheim, 1651: 240)

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<sup>29</sup> Dee owned several copies of Agrippa's *De occulta philosophia*, plus *De incertitudine & vanitate scientiarum*. Dee also owned Trithemius's *Stenographia* and several copies of *Polygraphia* and *De septem secundadeis*. The influence of Trithemius on Dee's *Monas* is the subject explored in an essay by N.H Clulee (Newman and Grafton, 2001: 173 - 226).

<sup>30</sup> A mystical tradition derived from Jewish Kabbalah, Christianised and blended with Hermeticism during the Renaissance as part of the recovery of hermetic thought led by Ficino. It was promoted by a student of Ficino's, Giovanni Pico della Mirandola (1463–1494). See chapters 2-4 in (Yates, 1979).

The Table of the Sun in his compass.

In Hebrew notes.

6	32	3	34	25	1
7	11	27	28	8	30
19	14	16	15	23	24
18	20	22	21	17	13
25	29	10	9	26	12
36	5	33	4	2	31

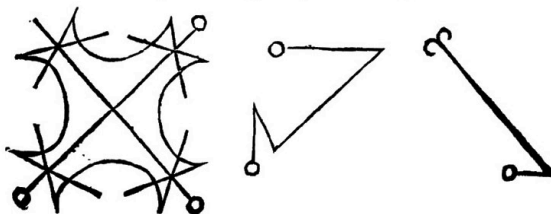
א	ל	ה	ל	ר	ו	ל	ב	ו
ל	ח	כ	ז	כ	ז	י	א	ז
כ	נ	י	ה	י	ו	י	ש	ו
י	ז	כ	א	כ	ב	י	ח	י
י	כ	ו	ט	י	כ	ט	כ	ה
א	ב	ד	ל	ה	ל	ו	ו	ו

The Seals or Characters

Of the Sun:

Of the intelligence of the Sun.

Of the Spirit of the Sun.

Fig. 8. *De occulta philosophia libri tres* (1533)

*De occulta* provides instruction in the use of magical gestures to accompany the recitation of celestial numbers. A particular characteristic of Agrippa's work is its evolved development of mathematical and symbolic tools, including ritual gesture, as methods for actively working with celestial forces. Figure 8 shows Agrippa's Sun symbols and their Hebrew numerology, which I used in the making of *Speculum* alongside Agrippa's instruction on hand gestures (see Chapter 5.1). Agrippa's focus on the mathematical, as magical numerology, was a new and appealing quasi-rational tool for working with celestial forces, a subject also covered by Trithemius. Both authors were read by John Dee and traces of their thinking are clear to see Dee's later *Monas Hieroglyphica*, discussed in Chapter 3.3.

Ficino was one of the few authorities praised by Theophrastus Paracelsus (1493-1541) a Swiss born physician, reformer, theologian and alchemist-philosopher whose ideas gave a new direction to alchemical thought (Forshaw, 2011: 263). His doctrine of the union of macrocosm with microcosm within the body of man was committed and highly elaborate.

Paracelsus Christianised the macrocosm / microcosm theory in the context of a spiritual hierarchy, headed by God, with angelic and celestial emanations radiating to and from the lower forms of man and the elementals. His structured hierarchy consisted of: *Vulcan*, an agent within heaven, earth, water and fire that could draw out the power hidden within prime matter. This prime matter was stored in the *Iliaster*. The *Archeus*

was the “individualising principle in the elemental matrix” giving things their specificity of form. The *Archeus* was also responsible for the higher forms of human activity, such as imagination and spirit-consciousness. The *Cagastum* was the process by which things degenerate from unity, related to ideas of breaking down, putrefaction, the fall of man and individuation (Pagel, 1982: 104-112). Paracelsus believed that all matter was composed of three fundamental substances, his *Tria Prima*, enlarging the traditional alchemical duality of mercury and sulphur by adding salt (Pagel, 1958: 88).

Paracelsus thought that celestial bodies were correspondent with the human body through a stellar emanation he referred to as “astral virtue”, “aerial nitre” or “flamma vitalis”. This was “the fiery virtue of the air produced by the sun’s rays” (Szulakowska, 2000: 23-24). Through this media, the human being could experience direct celestial correspondences:

The inner stars of man are... like his outer stars and different only in form and material. For as regards their nature, it is the same in the ether and in the microcosm, man ... Just as the sun shines through a glass – as though divested of body and substance – so the stars penetrate one another in the body.... For the sun and the moon and all planets, as well as all the stars and the whole chaos, are in man ...

Paracelsus, *Das buch paragranum*, 1530 in (Paracelsus, 1951: 21)<sup>31</sup>

For Paracelsus, these “inner stars” were most often associated with sense, intellect, imagination and will. Imagination had a potent agency for Paracelsus, through a “two way astrology” between the body of man and the cosmos (Jevons, 1964):

Now what is imagination other than a sun in man . . . As the sun acts on bodies, so does imagination . . . No instrument is necessary... man is all the stars. As he thinks, so he is... It is only imagination, [acting] like a magnet [or] an impression, like the sun and the sky, which makes a man in Vulcan's art.

Paracelsus, *Libri de virtute imaginativa*, 1530s in (Jevons, 1964)<sup>32</sup>

Paracelsus linked light with imagination. The causal pathways through which this action at a distance worked were, for Paracelsus, linked to a hierarchy of invisible agents, overseen by a governing divinity. The agency ascribed to the imagination<sup>33</sup> in our contemporary age of visual media appears similar to that granted by Paracelsus in the sixteenth century. It is implicated in most forms of speculative enquiry and creative

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<sup>31</sup> Jacobi’s version is translated from (Sudhoff, 1922-1933): Paracelsus’ complete works in 14 volumes.

<sup>32</sup> Translated from (Sudhoff, 1922-1933: xiv, 310-31 I).

<sup>33</sup> Imagination might today be thought of as the less rational and more intuitive cousin of rational speculation. Like speculative deduction, imagination contains a ‘*what if?*’ component for hypothesising future outcomes. It is, in other words, a form of *divination*, linked to less clearly defined capacities for dreaming and subconscious activity, and aspects of mysticism.

experimentation. The Paracelsian idea of the unity of light, imagination and matter corresponds with my experience as a filmmaker.

For Paracelsus, light was something both inward and outward, connecting him to ancient ideas of the body as a source of luminosity (see above). He thought we could see half the world, the other half being hidden from view as an “astral” body, recalling Brakhage’s experience of “ephemeral phosphorescence” above. Paracelsus believed man had an invisible double which extended to a “super-nature” of all material reality, something implicit in the macrocosm / microcosm theory (Paracelsus, 1951: 43-44). For Paracelsus, this higher spiritual double could be manipulated to bring about changes in its physical correspondents, an idea that helped explain the causes and treatment of disease. On a human level, the Paracelsian “light of nature” possessed transcendent qualities which, when used, might bring insight and knowledge, the gift of prophecy, and could ultimately lead to people becoming *Magi*, themselves like stars or comets (Webster, 2008: 300).

In the time of Paracelsus, the causes of disease were often considered to be bound up in a reciprocal flux of supernatural or astrological causation, part of a mutually reflexive mechanism. According to his biographer, Webster:

Paracelsus concluded that plague originated in the earthly environment. For instance, displays of personal enmity might prompt malign imaginations to spark off an ignition on the planet Mars, which acted as a fire-iron on sulphur. Sulphurous fumes then shot to earth and incited an outbreak of plague that took effect at one of three relevant bodily sites.  
(Webster, 2008: 165)

The thoughts of man and the invisible radiance of the stars formed a complex catoptrical apparatus of cause and effect, activated through invisible emanation, reflection and counter-reflection, the human being caught between two mirrors facing one another. For Paracelsus, the macrocosm within the microcosm was a living reality with its own complex mechanics of expression. Humans occupied a privileged position as catoptrical intermediaries in his celestial hierarchy. The active and causal role that Paracelsus gave to imagination has resonance for me as a filmmaker, a catoptrical body working with a catoptrical camera in the manipulation of light.

The *four element* theory and the idea of *prima materia* as a substance, are two terms central to an alchemical understanding of matter. Since theories of light were connected to the generation of matter, I introduce them here. The four element theory has its

origins in pre-history, but was first formally theorised by Empedocles (492-432 B.C.), who suggested the four elements, or roots, constituted all matter, bound or separated by love and strife (Empedocles, 2001: 25/17 - 26/21: 215-219). The theory was later developed by Aristotle (484 B.C – 322 B.C). Changes in matter would arise out of the different combinations of *fire, earth, air* and *water* or transmutations between them. This idea formed the philosophical basis for materialist alchemical thought, persevering to the eighteenth century as a basic theory of matter.

The four elements were considered more as *properties* of matter than as discreet substances or literal images. Fire would be those properties of matter that were hot, volatile and dry. Water would denote fluidity, cold and moistness. Air would be vaporous, hot and moist. Earth would be cold, dry, dense and substantial.

The four element theory came to be seen as having cosmological and body-mind correspondences, later developing into a theory of the *four humours* through Hippocrates and Galen. During the medieval period this evolved into a complex set of correspondences, showing how “the elements, properties and humours operate as an organising principle for knowing the world, one’s self, and their integrated nature” (Anderson, 2009). Earth, for example, became linked to the liver, melancholy, autumn, Saturn, coldness, dryness, blackness, old age and the Mixolydian musical mode (Arikha, 2007: 11). This sense of the elements containing a powerful imaginative agency informed my choice of the four elements as a prime image substance (see Chapter 5.1), central to some of the sequences used within *Speculum* and *Catoptrica*.

In alchemy, the *prima materia* was the base matter used at the beginning of the experimental process. It was often a metal or mineral, or a substance such as blood, excrement, urine, eggs or dirt. Dew was also commonly used and occupied an important position in the imagination of the alchemist (see Chapter 3.3). The prime matter was first heated in order to break down, mortify, or purify it. The phrase “prima materia” was also used to describe the alchemical search for the *prime matter* underlying material forms, as in Paracelsus’s *Iliaster*. Over 50 synonyms for the *prima materia* are defined in Martin Rulandus’s *Lexicon of Alchemy* (1612), while his translator, Arthur E Waite, defines a further 83 (Rulandus, 1612).

So, by 1600, philosophers had bound light up within a complex web of ideas related to the nature of matter, divinity, philosophy, vision, optics, geometry, astrology,

mathematics, magic, cosmogenesis, medicine and mysticism. Despite the overlapping of so many ideas within the occult sciences, any one of these ideas may have been pursued in its own right. To subscribe to one is not to subscribe to all. William Newman makes this point in *Secrets of Nature*, tracing the relationship between alchemy and astrology in the medieval period. He argues that the “universal mage” is a far less common figure than portrayed (Newman and Grafton, 2001).<sup>34</sup> Disciplines such as alchemy and astrology were linked by many, including the alchemical antiquary Elias Ashmole (1617-1692) (Ashmole, 1652), but they were often practiced independently.

The idea of *light* had become increasingly complex during this period. Light was participant in various types of invisible agency: divinity, intelligence, species, astral bodies, imagination, astrological, thermal, magical or celestial influence. The relationship between light as a metaphysical emanation and its illuminative qualities was often confused (*lux* and *lumen*)<sup>35</sup>. Hierarchies of creative emanation were coupled with the geometries of light: its mechanics of diffusion, radiation, refraction and reflection offering a means to explain cosmogenesis, the multiplication of species, astrological cause and effect, and symbolic magic. The celestial agencies of light therefore extended into matter, metals and their constituent four elements. These agencies could also be embodied or evoked through symbols, numbers and letters. The light of the macrocosm was reflected in the microcosm, further implicating the human being as a catoptrical device. In this way, theories of light, geometry, astronomy, astrology, magic, psychology and mysticism were comingled into an optically based natural philosophy.

The discovery that parabolic mirrors, water lenses and magnifying optics could concentrate light led alchemists to apply these techniques in their experimental practice, directing the generative and transformative emanations of light into their experiments. Light might have the same transformative power as the alchemist’s fire when applied to matter within the alembic, an idea related to the alchemical theory of the slow fermentation of metals in the ground.<sup>36</sup>

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<sup>34</sup> Newman ignores alchemical catoptrics, which closely link the two practices in the subject of his book.

<sup>35</sup> In his study on Athanasius Kircher, John Edward Fletcher says of *lux* and *lumen* “Lux is the essence, lumen the product of its effulgence”. Kircher differentiates *lux* into *lux primigenia* (primordial light), *lux solis* (sunlight) and *lux coelestis* (heavenly light) and says that *lumen* is not a simple emanation but a productive extension. See (Fletcher, 2011: 146).

<sup>36</sup> The *fermentation of metals* theory was pervasive in alchemy. Metals were differentiated by their time and circumstances of fermentation in the ground. Gold was considered the most perfectly fermented. ‘Natural’ fermentation happened through celestial influence, direct action from the sun’s rays, the inner fires of the earth, or through latent fire within substances. Lesser metals could be encouraged to more rapidly ferment through the alchemist’s art, the basis for transmutation. In this way, alchemy became a “quest to perfect nature”, a potentially heretical claim in the eyes of the church. See (Newman, 2005).

The use of light, mirrors and lenses, could further have the effect of “assembling species in one place” (Bacon, 1983: lxx), creating a multiplication and intensification of their agency. This increased intensity, of heat and the other *invisible* agents of luminosity, could then be used in the service of material and metaphysical transformation.

The next chapter explores the practical application of alchemical catoptrics. I discuss the experimental use of lenses and mirrors in alchemical practice, geometric symbols as a catoptrical tool, the calcination of antimony, dew as a *prima materia*, and end with a discussion of Newton’s alchemy of light.

### 3.3 Alchemical Catoptrics

One of the earliest diagrams of a catoptrical device appears in Giovanni Battista Della Porta's *Magiae Naturalis Libri* (1558 & 1584). Della Porta (1535-1615) was an Italian polymath who lived in Naples, pursuing interests in optical experimentation, astrology, playwriting, alchemy and occult philosophy.<sup>37</sup> His work on catoptrics, *De Catoptricus imaginibus* contains 23 chapters on burning glasses, refraction and lenses.<sup>38</sup> Della Porta was a strong advocate of experimental method, credited with contributing to the development of the telescope and the camera obscura. In his discussion of Della Porta's natural magic, William Eamon contextualises his work within the medieval tradition of the "books of secrets". His was a "a science of the extraordinary", developing natural explanations for "marvelous" phenomena, based on laws of attraction and repulsion through which the magus could learn techniques to manipulate the "Form" of matter and its occult properties (Eamon, 1994: 194-233). Della Porta was familiar with the ideas of Ficino, Trithemius, Agrippa, Albertus Magnus (1206-1280) and Girolamo Cardano (1501-1576). In *Magiae Naturalis Libri*, Della Porta describes what a magus of his generation should know:

The Mathematical Sciences, and especially Astrologie; ... how the Sun ... governs it by twelve Signes: ... from thence many things receive both active and passive powers ... how these inferiour things should receive influence from heaven. Moreover, he must be skilful in the Opticks, that he may know how the sight may be deceived, and how the likeness of a vision that is seen in the water, may be seen hanging without in the air, by the help of certain Glasses of divers fashions; and how to make one see that plainly which is a great way off, and how to throw fire very far from us: upon which seights, the greatest part of the secrecies of Magick doth depend.  
*Magiae Naturalis Libri* in (Della Porta, 1658: 4)

On burning glasses to kindle fire, Della Porta refers to a "concave glass" (mirror), a "concave crystal pillar" and a "pyramidal" (1651: 600).<sup>39</sup> In the later 1609 edition of *De Distillatione*, Della Porta recommends using burning glasses to aid distillation:

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<sup>37</sup> See (Borrelli, 2014) for a discussion of his optics. On his Natural Magic, see (Borrelli, 2011), (Balbiani, 1999, 2001), (Eamon, 1994). For his life and work, see (Clubb, 1965), (Muraro, & Vaiani, 1978), (Zielinski, 2006), (Picari, 2007).

<sup>38</sup> *Magiae Naturalis Libri*. 1584, ch. 17. The *Magia Naturalis* appeared in more than twenty Latin editions and was translated into Italian, French, German, English and Dutch (Eamon, 1994: 206). This book alone made Della Porta famous in his own lifetime.

<sup>39</sup> See (Della Porta, 2005), English translation 1658.

A spherical concave mirror (or, better still, a parabolic concave one) turned to the Sun will divert the reflected rays to the flask. The stillatory should, of course, be located between the Sun and the mirror, for if the Sun's rays are allowed to reverberate in the bowl of the flask then they will not just heat the material but may even ignite it.

*De Distillatione* in (Della Porta, 1609: 31)<sup>40</sup>



Fig. 9. *De Distillatione* (1609)



Fig. 10. *De Distillatione* (1609)

Della Porta's practical work on solar distillation used direct light (see fig 9.) and reflected light (fig 10.) as a heat source for medicinal distillation, demonstrating his knowledge of both concave and paraboloid mirrors. Zielinski highlights the wider importance of experimental catoptrics for Della Porta, describing his work as "a strange balancing act between truth and falsehood, image and reality..... what fascinated him most of all were transformations, metamorphoses, and production of visual spectacles, which we cannot see under the naked eye in normal conditions". Noting that Della Porta moves seamlessly from writing of alchemy to catoptrics in *Magiæ Naturalis*, Zielinski connects his catoptrical practice to alchemical *projection*, "the highest stage in the transformation of the base to the noble" (2008: 86).

<sup>40</sup> An original translation. See appendix 2.



Fig. 11. Frontispiece of *Magia Naturalis* (1644)<sup>41</sup>

Figure 11 seems uncannily emblematic of some of the concerns of contemporary visual media practice, illustrating a pointed catoptrical enquiry into the self, within a context of luminous experimentation. As sunlight transforms and illuminates the materials in the glass vessel, this in turn focuses the sun's rays to ignite fire.

Della Porta's enquiry into the world was as alchemically involved with light as it was with matter. Later thinkers would follow in his footsteps, including John Dee, Marcus Marci, Robert Boyle and Isaac Newton, discussed below.

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<sup>41</sup> Another version of this image, mirrored, from the 1607 edition, is reproduced in (Zielinski, 2008: 64)

To the degree that Della Porta was practical, John Dee (1527–1609) was abstract and philosophical. Dee was an English alchemist, mathematician, astrologer and would-be religious reformer. There is a substantial body of modern scholarship surrounding the life and work of Dee, beginning with Charlotte Fell-Smith’s biographical work of 1909 (Smith, 1909).<sup>42</sup> Some early twentieth century scholars attempted to rescue Dee from his reputation as an occultist, dismissing his “fuzzy minded” irrationality (Shumaker 1978: 5), while positioning his work within ‘Scientific Revolution’ narratives or broader histories of the Tudor period (Taylor, 1930, Johnson, 1937, Shumaker, 1978, Sherman, 1997). Others have sought to integrate Dee’s occultism into the history of science and Renaissance thought through the lens of Hermetic Neoplatonism, a thesis promoted by Frances Yates, Ian Calder and Peter French among others (Calder, 1952, French, 1972, Yates, 2003, Szonyi, 2010). This interpretation of Dee has been called the “Warburg interpretation” by Nicholas Clulee, who has argued for a more nuanced view of Dee in all his historical complexity (Clulee, 1988: 2, 2006). Recent scholarship has done much to present a balanced view of Dee and his “omnidisciplinarity”, exploring his mathematics, mapping and maritime affairs, his influence within the Elizabethan court, his astrological, alchemical, mystical and religious practices in equal measure (Clucas, 2006).

The focus of my own discussion is on Dee’s catoptrical practices, which included his use of a “Chrystallaine Globe” and a black mirror for divination, a method known as scrying or catoptromancy.<sup>43</sup> Dee advocated using catoptrics for concentrating visible and invisible celestial forces for his experiments in angelic magic.<sup>44</sup> In *Propaedeumata Aphoristica* (1558) he adopted a Baconian model for the propagation of species through light. Dee visualised the action of celestial rays upon the Earth as conical structures, describing how to measure the strength of their forces. Burning mirrors could be used to concentrate and harness the celestial virtues:

If you were skilled in catoptrics, you would be able, by art, to imprint the rays of any star much more strongly upon matter subjected to it than nature does... By

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<sup>42</sup> Stephen Clucas has compiled a bibliography of 56 scholarly studies on Dee. See “John Dee: Interdisciplinary Studies in Renaissance Thought”, also containing an essay on the historiography of Dee studies by Nicholas Clulee (Clucas, 2006).

<sup>43</sup> *Catoptromancy* is the art of divination using mirrors. Widely used in antiquity as part of a range of pre-scientific occult practices, black mirrors of obsidian were often employed. Contemporary research has shown that periods of staring into a mirror (under 30 minutes) can induce hallucinations. Due to the complex nature of pre-scientific cosmology, hallucinatory visions by means of the mirror, or *speculum*, were often considered a valid method of divining reality. See (Pendergrast et al., 2008) and (Brown, 1897).

<sup>44</sup> See *Biographical Appendix 1* for Dee’s catoptrical manuscripts. Dee’s angel conversations drew in part upon common mediaeval theurgical practices (Clucas, 2006). See also the in-depth study by Deborah Harkness (Harkness, 1999).

this means obscure, weak, and, as it were, hidden virtues of things, when strengthened by the catoptrical art, may become quite manifest to our senses.  
John Dee, *Propaedeumata Aporistica*, lii in (Dee, 1978: 148)

Dee believed that celestial virtues could be imprinted into substances, including symbols and talismans, through catoptrical apparatus. In *Monas Hieroglyphica* (1564), he set forth a detailed exegesis of his *Monad* (fig. 12), a geometric magical sigil<sup>45</sup> rooted in the emanatory theories of Al-Kindi and Grosseteste (see 3.2 above).



Fig. 12. Dee's Monad (left) in the *Monas Hieroglyphica* (1564)

Figure 12 shows the complete *Monad* to the left. To the right, Dee begins to break his Monad apart into Luna (Moon), Sol (Sun), Elementa (the cross representing the elemental quaternary, see *Speculum*, 2nd seal and Chapter 5.1), and Ignis (the sign for Aries, representing fire). In this work, Dee drew upon the *Emerald Tablet* of Hermes Trismegistus, Neo-Platonism, Pythagorean geometry, Cabala, Trithemius, Agrippa, Roger Bacon and Paracelsus (Forshaw, 2005, Newman and Grafton, 2001: 173-226). Dee considered his *Monad* a practical alchemical device and the *Monad* symbol was later widely used in alchemical manuscripts.

In his introduction, Dee demonstrates familiarity with catoptrical burning glasses and suggests his *Monad* might be a far more powerful “mirror” than the mirrors and lenses used in conventional catoptrics:

And will not the astronomer be very sorry for the cold he suffered under the open sky... [when] he may most exactly observe with his eyes the orbits of the heavenly bodies under [his own] roof, with windows and doors shut on all sides,

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<sup>45</sup> A *sigil* is a symbol or word considered to have a magical or hidden power over things beyond itself, including both material things and invisible agencies (such as gods or angels). A *sigil* possesses similar agency to that of a *talisman*, which is more typically used to describe an object with occult powers of *action at a distance*.



The circle cannot be artificially produced without the straight line, or the straight line without the point. Hence, things first began to be by way of a point, and a monad. And things related to the periphery (however big they may be) can in no way exist without the aid of the central point.  
*Monas Hieroglyphica*, Theorem II in (Dee, 1964: 155)

The sun and moon are produced from the generative point. The Sun is the circle, the Moon is the crescent shape, with Earth created at the centre “around which the Sun and the other planets complete their courses” (1964: 155). The four straight lines, emanating from the central point of the cross, correspond to the flowing outward of the elements (as “drops”, like dew) from an “indivisible” central point, in opposite directions:

Our lines signifying the elements are produced by the continuous fall of [successive] drops becoming a flow (if we consider drops to be like mathematical points).  
*Monas Hieroglyphica*, Theorem VII in (Dee, 1964: 159)

Dee believed the four elements were composed of prime matter and *two kinds of light*. Drawing on Giovanni Pantheus’s *Voarchadumia contra alchimian* (1530), Dee believed the elements were the “four separate great wombs of the larger world”, each of which had three parts “condensed, structured and regulated” by their “appropriate weights”. The elements were composed of “Materia prima artis”, “Lux maior” and “Lux minor”, consisting of both “Ignis” and “Aer” (Dee, 1978: 129, Harkness, 1999).

The planets, through magical correspondence with their astrological signs, are produced out of the sun and moon by geometrical rotation of aspects of the *Monad*. The two inverted semi-circles at the bottom are the zodiacal sign of Aries and are explained in Theorem X: “in the practice of this Monad the aid of fire is required” (1964: 161).

Dee invests the word for light, written in Latin as “LVX” with a structural and numerological significance throughout the work (Burns, 2007), giving a method for extracting light from the shape of the cross:

If we allow our Cross to be divided into two other letters then, just as we previously carefully examined, according to a certain method, the numerological values of those letters, so we now compare with that selfsame Cross the verbal values of each of those letters in turn. We then conclude with the greatest wonder that there arises from that comparison LIGHT (LVX), the ultimate and Magistral Word (out of that tripartite phenomenon, born in the unity, harmony and consensus of the Word).

This passage was to form the basis for the voiceover script I used throughout *Speculum* (see Chapter 5.1). The characters within *LVX*, meaning *Light*, are derived from a rotation of the “elemental” cross, revealing two L’s, two V’s, and an X (see fig. 14). The “tripartite” refers to the two lines making up the cross, the central point from which they emanate, and the numerology of the three letters in *LVX*. The material elements, and the point of their generation, therefore exist within *LVX*, as both a word and as light itself, alluding to *fiat lux* (“And God said, Let there be light: and there was light”.) of Genesis 1:13.



Fig. 14. *LVX* from the cross

For Dee, the geometric manipulation of his *Monad* was a catoptrical practice, transcending conventional optics. Through a catoptrical manipulation of the form of the sigil, Dee believed that light and celestial influence might be manipulated together.

The *Monas Hieroglyphica* contains several geometric manipulations of the *Monad* sigil, oscillating between allegorical, magical and psychological levels. In the words of Clulee, “a penumbra of indistinctness will always surround the concrete contents of the *Monas*” (1988: 80). Dees *Monas* was referenced by later alchemists, most notably the Paracelsian alchemist Gerard Dorn (1530–1584), Heinrich Khunrath (1560–1605), Oswald Croll (1560–1608) and in Rosicrucian texts.<sup>47</sup>

<sup>46</sup> A new translation of this passage by Paul Ferguson (2012). Josten’s standard translation of the *Monas* muddles the meaning, losing the important textual emphasis given to ‘*LVX*’ by Dee. In preparing the new translation Ferguson consulted four extant translations of this passage – De Givry (1923), J.W Hamilton-Jones (1947), C.H Josten (1968), Turner and Burns (2007), and available commentaries (Hamilton Jones, Clucas. Calder, Turner and Burns).

<sup>47</sup> This movement had a broadly Lutheran agenda, advocating spiritual reformation through the recovery of esoteric alchemical and hermetic principles. It began with two manifestos originally appearing in Germany in the early 17<sup>th</sup> century. In the *Secretioris Philosophiae Consideratio brevis* in the *Rosicrucian Confession* (1615), Dee’s *Monas* is referred to throughout as ‘*Stella*’. According to Clulee, it develops the connection between astral optics and alchemy, citing Dee’s *Propaedeumata Aphoristica*. Dee’s *Monad* also appears as a horizontal symbol in the *Chemical Wedding of Christian Rosenkreuz* (1616) of Johann Valentin Andreae (1586–1654), Adam Haslmayr’s *Novum lumen physico-chemicum* (1616) and *Amphitheatrum Chymicum Sacrum* (1629) (Forshaw, 2005) and see (Yates, 1972).

Dee employed another catoptrical practice, of divinatory scrying<sup>48</sup> using a human medium with “shew stones” (fig. 16) or a “glass” (mirror, *speculum*). In scrying, the human medium and the mirror become integral parts of the catoptrical apparatus (Whitby, 1982: 75-94). Dee used this practice to converse with angels, recording the conversations for 25 years. This was an important part of Dees attempt to create a universal science, including fundamental religious reform. It has been widely acknowledged that the “angel conversations” have been problematic for modern scholarship, due to their links with angelology, Christian Cabala, magic, numerology, mysticism, apocalyptic prophecy and divination.<sup>49</sup> Dee’s conversations with angels drew similar suspicion from the church, but were taken seriously by a number of European monarchs and patrons. An extension of his work in optics, geometry, numerology, alchemy and Cabala, Dee saw these conversations as a legitimate method of interrogating the immaterial foundations of material reality.

Dee held that invisible astral and angelic forces could be focussed and concentrated in a mirror or crystal stone, in the same way as visible light (see *Propaedeumata Aphoristica*, lii, above). While Dee himself could not see visions in his showstone, the scryers he worked with did, seeing and hearing visions of angels who appeared to communicate divine truths. Figure 15 shows the wax sigil (the *Sigillum Dei*)<sup>50</sup> on which Dee placed his showstone (fig. 16), on a table decorated with further sigils. After prayer, Dee would consult and interrogate the apparitions through his scryer, noting down what was revealed in methodical detail.

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<sup>48</sup> *Scrying* refers to the art of gazing into a mirror or crystal to see visions. *Scryers* were common in Dee’s era. Throughout his adult life, Dee worked with scyers as intermediaries for his angel conversations. The most infamous of these was Edward Kelley. He also worked with Barnabus Saul, his son, Arthur Dee and Batholemew Hickman (Harkness, 1999: 16-26).

<sup>49</sup> See (Harkness, 1999: 117), (Szonyi, 2004: 171, 191) and (Parry, 2012: 105). Serious study of John Dee’s angel conversations may have been hindered by their still active currency in ‘new age’ belief systems. His enochian magic has been used within the *Hermetic Order of the Golden Dawn* and by *Aleister Crowley*. The channelling of spirit entities is still common today. It is a significant legacy.

<sup>50</sup> The ‘*Sigillum Dei*’ (Seal of God) is complex heptagonal diagram of “angelic” letters from which Dee derived the names of seven angels, the seven governors of the planets, seven names for God and the seven “sons and daughters of light” (Whitby, 1988: 66).



Fig. 15. Dee's "Sigillum Dei" (1580s)



Fig. 16. Dee's "Chrystallaine Globe" (1580s)<sup>51</sup>

Deborah Harkness argues that Dee's angel conversations were an attempt at "the unification of all branches of natural philosophy into a single discipline that explored the propagation of rays, employed mathematical aspects of optics, [and] depended upon astrology to capture astral radiation", raising the philosopher "to a state of communication with celestial truths" (1999: 96).

Dee's programme of angel interrogation was centred on the restoration of the original, primordial angelic language, the language of Adam, or *lingua adamica*, and the lost book of Enoch.<sup>52</sup> For Dee, word and language were linked to the primordial Word and the primordial light contained in *fiat lux*. In the Christian Cabala tradition upon which Dee drew; letters, words, symbols and numbers were correspondent with celestial and angelic forces, revealing mystical truths through a variety of Cabalistic exegesis techniques. Rediscovering the primordial language would give Dee the tools he needed to directly access those immaterial forces governing earthly life and material reality.<sup>53</sup> One result of this work was Dee's *Great Table* of Earthly Governors. I used Dees table to structure the 5<sup>th</sup> seal in *Speculum*, discussed below in Chapter 5.

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<sup>51</sup> In The British Museum collection of Dee's objects. Some doubt about its provenance remains.

<sup>52</sup> Old Testament: Enoch is the great-grandfather of Noah. Dee believed Enoch to have possessed the original language used to communicate directly with angels through the use of a "Shew stone" (Szonyi, 2004: 188).

<sup>53</sup> Dee believed the world to be made of "incorruptible" and "unchangeable" supernatural things and "corruptible" and "changeable" material things. Mathematics was an "immaterial" intermediary between the two, which could "by material things hable to be signified" (Whitby, 1988: 34). His passionate commitment to mathematics as a language of abstraction for interpreting material reality is something he shares with modern scientific method, though many other aspects of his thought may now appear incomprehensible to the scientific mind.

The relationship between light, optics and imaginative vision so central to filmmaking is clear in Dee's methods. In his "Chrystallaine Globe" (Dee, 1982: 8a5, 12)<sup>54</sup> the "whole world in manner did seme to appeare, heven and erth etc" (Dee, 1982: 18b3, 48).<sup>55</sup> The angels he consulted instructed him to use it on "the brightest day, when the Sonne shyneth: in the morning, fasting, begynne to pray. In the Sonne Set the stone" (Dee, 1982: 8b10, 15). He was further instructed to align his experiments to celestial light: "Work in the sunshine, and from the change of the [moon] to the 14 days after... in increasing hours, which are from [sun]rise to Noone... let the sun be well placed & a good planet raigning" (Dee and Ashmole, 1790: f.39r). Within the catoptrical stone, through Kelley, Dee received instructions in alchemical processes and the "true names" of the seven alchemical stages. The instructions conjured dreamlike imaginative visions of alchemical emblemata in motion, possessing a fantastical cinematic quality (Harkness, 1999: 200-213).

Through the medium of the crystal "stone", which is a *lens*, Dee's scryers saw visions appear in abstract refracting patterns of sunlight. Dee clearly valued the optical properties of the lens and was careful of its placement in the rays of the sun, in order to concentrate the accumulation of the invisible beings he thought it contained. The lens provided a central visual focus for his angel conversations, interrogating hidden realities as people might interrogate reality through the camera lens today. A tool for seeing not only what is there, but also a catoptrical tool for *imagining*.

A new kind of philosophical and pictorial alchemy emerged during the latter 16<sup>th</sup> and early 17<sup>th</sup> centuries. Widespread publishing at this time popularised a catoptrical light-centred philosophy, best exemplified in the works of Heinrich Khunrath, Michael Maier and Robert Fludd.<sup>56</sup> Unlike Dee, these alchemists made rich pictorial and diagrammatic renditions of their ideas, initiating a visual culture of alchemical catoptrics I will now explore. Proper credit is due to Johan Theodor de Bry and Matthäus Merian, who engraved many of the following diagrams.<sup>57</sup> Many of these images have left a lasting legacy in contemporary visual culture after the revival of interest in alchemy in the late

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<sup>54</sup> The small crystal ball described as belonging to John Dee at the British Museum (fig. 16) broadly matches Dee's description of his stone "as big as an egg, most bright, clere and glorious" Its provenance is uncertain, acquired by the museum in 1700 from the Cottonian Collection, where it was described "as a globe of solid pink tinted glass, size and form of a full-grown orange" or as "a polished crystal" or as a "smoky ball" (Szonyi, 2004: 205).

<sup>55</sup> Transcribed by (Whitby, 1982) from British Library Sloane MS 3188. Other angel diary manuscripts are Sloane MS 3189, 3191, British Library Add. MS 36674 and Bodleian Library Ashmole 1790. Incomplete extracts were first published by Meric Casaubon in *A True and Faithful Relation..* (1659).

<sup>56</sup> This discussion draws on (Szulakowska, 2000).

<sup>57</sup> Published in large editions by the de Bry family, Lucas Jennis, and Matthäus Merian in Oppenheim and Frankfurt (Klossowski de Rola, 1997: 14-15).

19<sup>th</sup> and early 20<sup>th</sup> c (Elder, 2013a: 446-454), leading to a rehabilitation and appropriation of alchemical imagery by psychoanalysis and the Surrealists (see Chapter 4).<sup>58</sup>

Heinrich Khunrath (1560-1605) was a German born alchemist and physician who knew John Dee and worked in the alchemical court of Rudolph II in Prague. Khunrath was both a practical and a spiritual alchemist, promoting an elaborate religio-philosophical Cabalistic alchemy containing a Paracelsian exposition of the hierarchies of creation through divine light. His explanation of practical catoptrics appears in his last treatise *De Igne Magorum Philosophorumque secreto extremo et visibili* (Of the secret, external and visible Fire of the Mages and Philosophers, 1602 – 1604).<sup>59</sup>

Khunrath equated Christ with “lumen” (as a primal Godly light) and with “lux” (natural light) materialised on Earth. He identified the philosopher’s stone with Christ, believing divine light to descend from the Father. This light was the “Azoth”, the quintessence or divine fire, linked directly to sunlight. As Szulakowska says, for Khunrath, “God is an alchemist using the sun” (2000: 96).

Khunrath’s *De Igne Magorum* was one of the earliest books to provide clear instruction in alchemical catoptrics, referring to Agrippa, Paracelsus, Dee and Della Porta. He described using steel and crystal mirrors to focus the divine virtues of the sun, irradiating matter to introduce the soul into it. He considered the alchemical fire to contain the species of the sun and instructed that it should be lit, or *magnetically animated*, by catoptrical means. Most of Khunrath’s written work appears abstract and unworldly, heavily laden with Christian doctrine. The illustrations are complex and multivalent, compressing time and space in ways I found useful when thinking about film as a contained diagrammatic space:

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<sup>58</sup> Through Ethan Hitchcock (1798-1870), Albert Poisson (1860-1893), Francois Jollivet-Castelot (1874-1937), Herbert Silberer (1882-1923), E.A Grillot de Givry (1870-1929), Frederic Portal (1804-1876) and Carl Jung (1875– 1961).

<sup>59</sup> See (Forshaw, 2006b: 108).



Fig. 17. *Rebis and Hermes' Bird* (1609)

Figure 17 shows the genesis of the world as an alchemical process. From primordial chaos below, through the four elements and the Paracelsian *tria prima* (body, soul and spirit), to light. The two headed hermaphrodite *Rebis* is at the centre. Hermes' bird is shown with a black body, white wings and the radiating peacock tail. The ascension then progresses through *Urim*, the "Heavenly Fire and Light", to *Esh*, the "Solar Fire" used to kindle the furnace (Forshaw, 2006a: 206-207). I read this as a luminous ascension with the peacock's tail representing the light spectrum, the body and wings the duality of light and dark (See Chapter 5.1 for how I used the peacock tail in *Speculum*). Dee's Monad appears in the centre of the bird's chest, forming part of the word "Azoth", the universal solvent, or the "sharpest acid" of the wise (Forshaw, 2005).

The alchemist Michael Maier (1568-1622), born in Germany, also worked at the court of Rudolph II, and for several years in London. Maier promoted an alchemy of geometric forms: the circle, square and triangle represented masculine and feminine qualities, with correspondences between them. Maier believed "the static circle was nature perfected, manifesting in the form of red, coagulated sulphur, or gold" (Szulakowska, 2000: 155).

*Atalanta Fugiens* (1617) contains dramatic narrative engravings, personifying the correspondences between metals and the stars (see Ficino above in Chapter 3.2). In Figure 18, celestial light is represented by two figures in a luminous erotic conjunction, the Sun and Venus, as gold emanates down. Vulcan (fire) violently splits the head of Jupiter (lead), releasing naked Athena (mercury, sublimated) (Klossowski de Rola, 1997: 100):

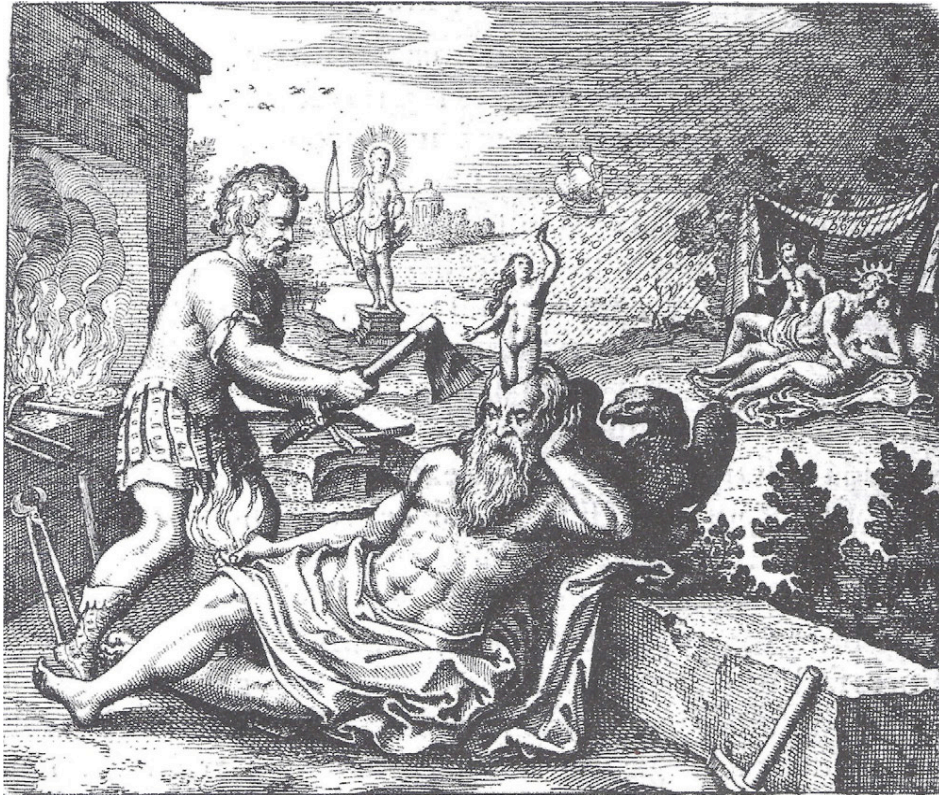


Fig. 18. *Emblem XXIII, Atalanta Fugiens* (1617)<sup>60</sup>

Maier described using catoptrics in his commentary to this engraving:

Thus, the sun, the celestial luminary, sends its beams to the earth and when these beams are bundled in a sun-glass, shapes are seen, which are... form projections of the sun... sunbeams are nothing but flames of fire, which are spread out over a wide space; when, however, they are focussed, they burn everything that comes within the point of focus.

*Atalanta Fugiens* 1617 in (Maier, 2002)

Maier's use of perspective geometry within Emblem VIII (fig. 19) is a catoptrical reference, showing a single point perspective tunnel, resembling a light *projection* booth. It emanates onto an alchemical egg, reminiscent of Dee's egg in Figure 13 above (an image I used in *Speculum*):

<sup>60</sup> The plates were engraved by Johan Theodor de Bry (Klossowski de Rola, 1997: 68).

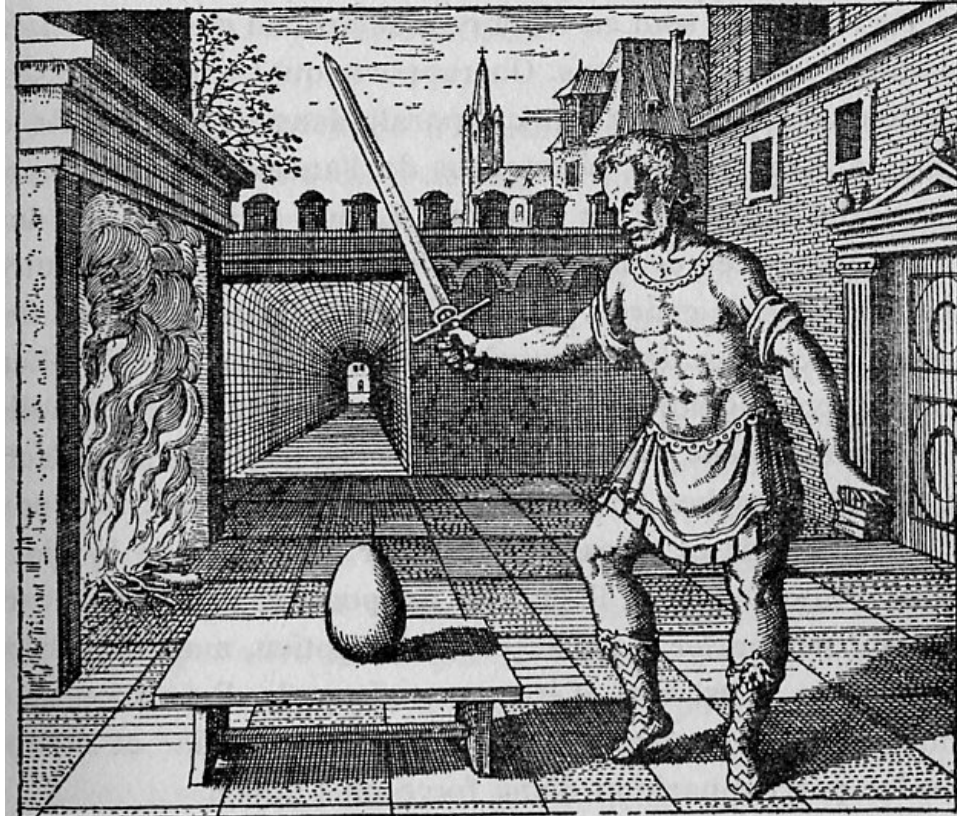


Fig. 19. Emblem VIII, *Atalanta Fugiens* (1617)

Maier says of this emblem “take the egg and smite it with a fiery sword”. Astral influences are directed into the egg: “a specific being transmitted by the stars, an individual Bird is made of that kind whose Egg it was & whose seed was infused into it”. As the sword breaks open the egg, “so an Embryo being freed from that human vegetable life ... obtains another ... by his birth & coming into the light of the world” (Maier, 17th c.: Discourse 8th). It is a story of luminous gestation and fiery birth.

There are 50 emblems of this kind in *Atalanta Fugiens* alone. Each offers a striking theatrical-cinematic mise-en-scène for an alchemical process of transformation. Unlike Khunrath, who flattened time and space into a single diagram, Maier’s images read like the storyboard for a film. *Atalanta Fugiens* included 50 musical scores to accompany the engravings. Adam McLean describes it as “one of the first attempts at multimedia” and has recorded the “fugues”, set to a video of the engravings (2013c).

Robert Fludd (1574-1637) was an English physician, alchemist-philosopher and Rosicrucian supporter, whose patron was King James I. Fludd argued that the universe was created out of infinite primordial darkness, which he represented as a black square (fig. 20). This kind of darkness is the primordial yet pregnant state of every film.

Zielinski points out that this image anticipates Malevich's more famous *Black Square* (1915) by 300 years (1999: 289).<sup>61</sup>

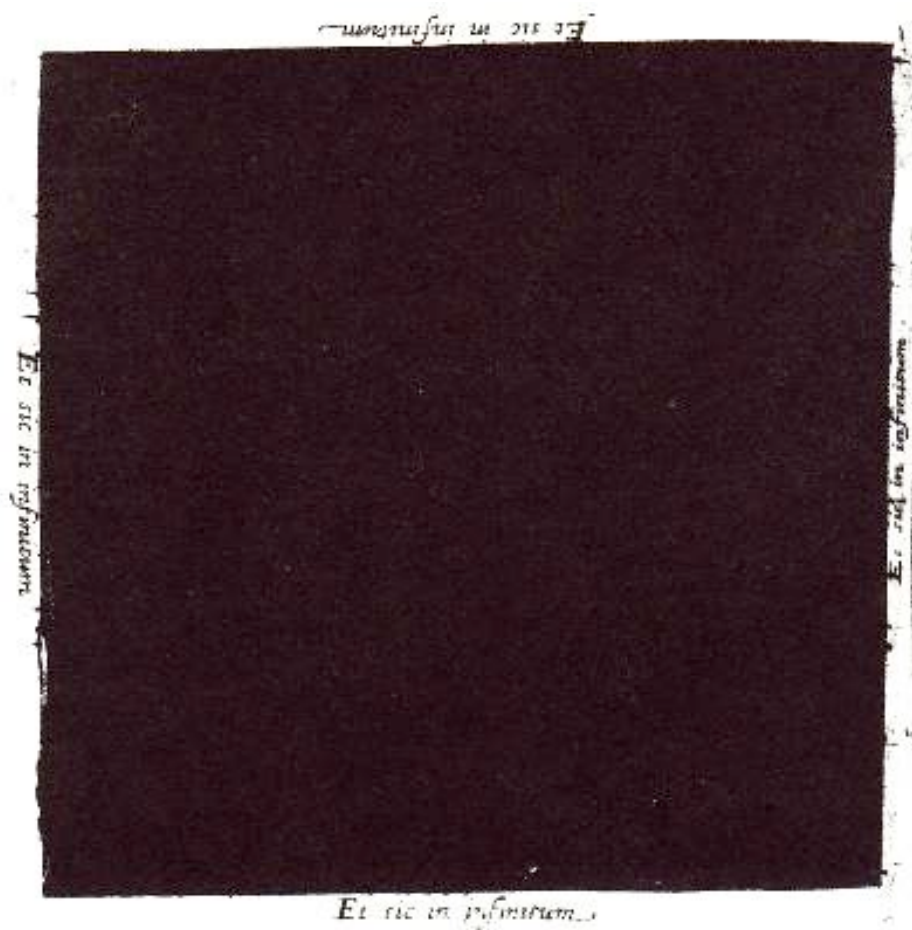


Fig. 20. *The Great Darkness, Utriusque Cosmi... Historia I* (1617)

Through God's act of creative *vision*, an emanation of divine light, Fludd's philosophy explored the resulting hierarchies of creation:

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<sup>61</sup> See also (Zielinski, 2008: 111-113).

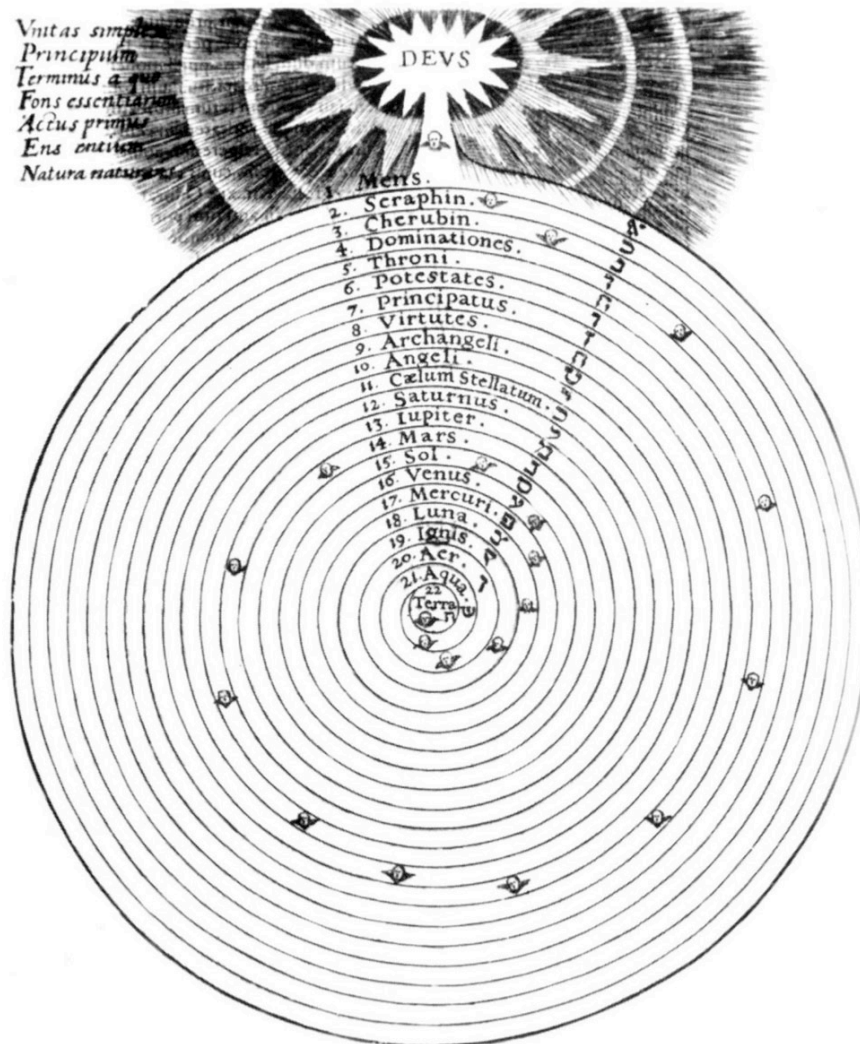


Fig. 21. *The Ptolemaic Universe, Utriusque Cosmi... Historia II* (1619)

Figure 21 depicts a luminous God (*Deus*) emanating light to the cosmic mind (*Mens*), through a spiral of the nine orders of metaphysical angels (labelled 2-10), into the celestial sphere (*Caelum Stellarum*) containing seven planets, progressing into four elements constituting all matter. His works contain numerous elaborate diagrams of causality linked to divine light, astrology, geometry, musical harmony and the ten sephiroth (divine emanations) of Cabala (Godwin, 1991: 21).

As a physician, Fludd wondered if divine luminosity could be embodied in an elixir created from wheat:

In the vegetable is a pure volatile salt, which is nothing but the essentiall aire of the specifick... an unctuous liquor, as white and clear as crystal; this is inwardly nevertheless full of vegetating fire, by which the species is multiplied ad infinitum: for it is a magenticall vertue, by which it draweth and sucketh abundantly his life from the aire, and sunne beams, which is the principal

treasure house of life, forasmuch as in it the eternall emanation of life did plant his tabernacle...

*The Mosaicall Philosophy* in (Fludd, 1659)<sup>62</sup>

The white liquid could later be irradiated under the sun because air contained an ethereal spirit, whose essence was celestial light (the Paracelsian “aerial nitre”). This light, when ingested, would permeate the whole body with a vital spirit.

Fludd illustrated celestial light through optical-geometric diagrams with intersecting *pyramides lucis*, cones of light. As Szulakowska states “the optical genealogy of Fludd’s intersecting cones produced an image of God and his created universe as being perpetually locked in a mutual gaze” (2000: 170). Fludd saw strong correspondences between matter, mind, light and divinity.

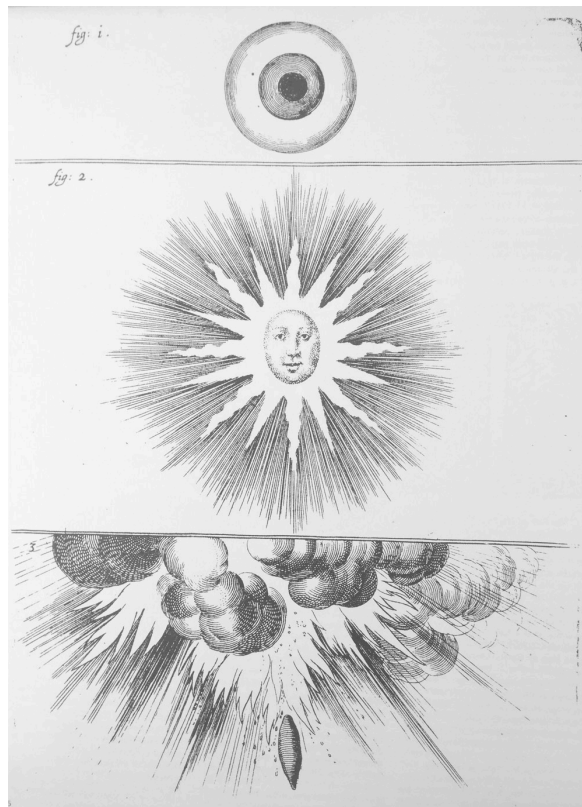


Fig. 22. *The Trinity and the generation of the Four Elements, Utriusque Cosmi... Historia II* (1619)

Synthesising optics and theories of emanatory creation within an overall Hermetic-Cabalistic philosophy, Fludd’s work interests me for its catoptrical illustration of creation as a movement *of vision* from darkness, through light, to substance (fig. 22).

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<sup>62</sup> Published posthumously in Latin (1638) and English (1659) (Huffman, 2001: 36).

I now turn from the philosophical to the substantial, examining *dew*. Dew first caught my attention on the title page of Dee's *Monas Hieroglyphica* (see above and Chapter 5.1) and subsequently for its catoptrical quality as an extreme convex mirror. Its image appears frequently in *Speculum*. Like Fludd, a number of alchemists in the 17<sup>th</sup> and 18<sup>th</sup> c. experimented with catoptrical techniques to test the inherited theory that visible or divine light might be the hidden *primum ens*, or prime being of matter. They invested dew with a particular mystical significance: air itself, and the dew which would appear to settle from it, was seen as occupying an interstitial space between luminous divinity and the corporeal world. Dew had a catoptrical light-gathering significance. The metaphor of dew as a pearl, crystal or a jewel is in fact very common throughout literature. Gaston Bachelard (1884-1962)<sup>63</sup> quotes *The Bestiary of Philippe de Thaon* (ca. 1121) on the transformation of dew into gemstones, while describing several accounts of how oysters make pearls by rising to the surface of the sea at night, opening themselves to consume dew (Bachelard, 2002b: 253-261).

Formed under the light of the moon and stars, dew was prized as a *prima materia*, possessing earthly and celestial qualities. It contained all four elements – *water*, in its substance, *air*, from which it appeared to coalesce, *fire*, from the celestial rays and *earth*, from which it appeared to rise.

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<sup>63</sup> Bachelard's work on dew and the four elements is discussed in Chapter 5.1.

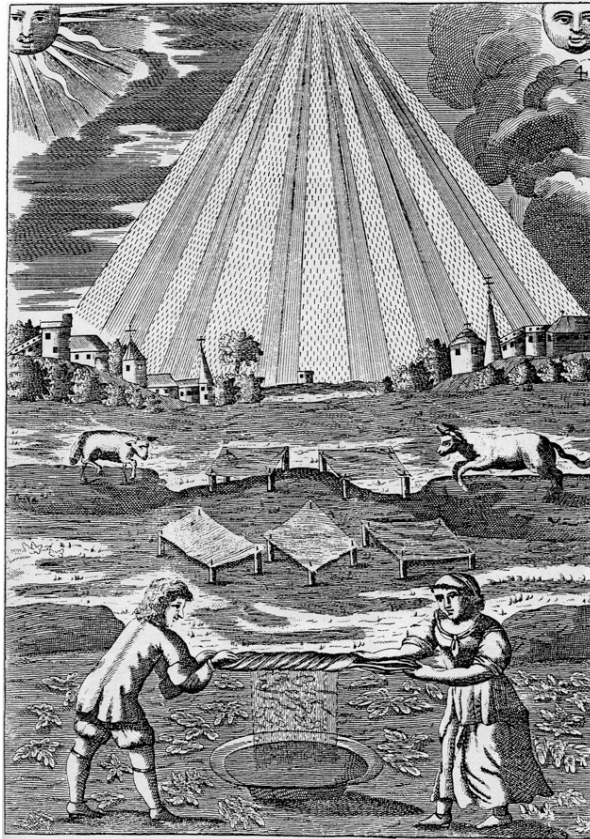


Fig. 23. Plate Four, *Mutus Liber* (1702)

The *Mutus Liber* (Silent Book, 1677) illustrates the alchemical distillation of dew. Figure 23 shows the first stage in the alchemical experiment: celestial forces radiate down upon suspended sheets pegged out to collect dew. The alchemist and his *soror mystica* (discussed below in relation to Robert Desnos in Chapter 4.1) wring out the dew for their *prima materia*.

David Beuther (ca. 1514 – 1582) was a German born alchemist, working at the *Goldhaus* in Dresden, established by the Elector August of Saxony. He was one of the first to advocate catoptrical means for extracting a “celestial salt” from air. His *Universal und Particularia* (Universal and Particular, 1718)<sup>64</sup> mixes Paracelsian correspondence theory with an impressive array of chemical experiments.

Beuther proposed correspondences between the processes of the human body, mind and the life of alchemical substances, perhaps sowing the seed for later Jungian interpretations of alchemy.

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<sup>64</sup> See *Appendix 1* for a note on sources.

The alchemical processes of “calcinations, solution, sublimation, putrefaction and coagulation” are compared to the redemption of fallen Man.

Beuther describes the force of the sun in the mineral substances of the “cinnabar mountain”<sup>65</sup>, containing “solar spirits” formed at the birth of these minerals. He likens the relationship between man and his metals to that of god and the sun, with quotes from *Genesis*. Man has dominion over the “earthy sun” (ie gold) which gives “the inferior planets and the metals their luster and brightness”.

The Sun illuminates everything in the sky above with its brightness, and indeed produces the same result in the inner spheres, such as gold, minerals, rubies, plants, animals, lions, birds, and even men.  
*Universal and Particular* in (Beuther, 1718: para. 25)

For Beuther, gold must contain the “seed” that is the original generative light of the sun and biblical *Genesis*. By mutual correspondence, materialised light would also contain the “seed” of material gold. Beuther then describes the capturing of a “celestial salt” from the air with a concave mirror:

Take a perfectly round reflecting mirror, a weighing scale of proper size and depth so that the rays of the sun can be focused on a spot in the middle, then set up this mirror when the sun is giving of its hottest rays, under a cloudless sky; and allow it to stand several days, removing it at night, and protected from the wind and rain, and then a beautiful white salt forms in the middle of the mirror, which is shaved off by means of a knife in a clean glass and collected, in a short period of time it can amount to several ounces and then increase both in appearance and weight, and in this salt all four elements are found, from the air it has become conceivable when set in the sun’s heat that it flows like water, the fire brings out the taste, and when allowed to stand for a long period of time in decaying matter, it turned blood-red like a fiery red ruby.  
*Universal and Particular: Mystery of Mysteries* (Beuther, 1718: para. 2)

Beuther here provides a clear practical description of his catoptrical method for capturing celestial forces in material form. The salt extracted from the air by means of a mirror must be derived from dew. It is plausible that a salt could be extracted from atmospheric dew in this way, since it contains a concentration of inorganic compounds, including pollutants, 6-7 times higher than rainwater.<sup>66</sup>

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<sup>65</sup> Cinnabar is a naturally occurring red mercury ore (mercury sulphide), similar to quartz in structure. It was often used as the raw material for the extraction of liquid mercury. Heated over a furnace, the mercury content vaporises and is subsequently extracted by means of cool distillation.

<sup>66</sup> Dew’s composition is dominated by SO<sub>4</sub> (sulphate), NH<sub>4</sub> (ammonium), and high levels of Ca (calcium). It is lower in NO<sub>3</sub> (nitrates) than rainwater. Because of its ability to concentrate atmospheric chemicals, it can be used as a pollutant indicator (Polkowska et al., 2008).

In 1728, Christian Friedrich Sendimir von Siebenstern<sup>67</sup> published *Chymisch-unterirdischer Sonnen-Glantz* in Leipzig, later titled *Chymischer Monden Schein* (Chemical Moonshine, 1739). *Chymischer Monden Schein* is a mystical celebration of dew as a *prima materia*.

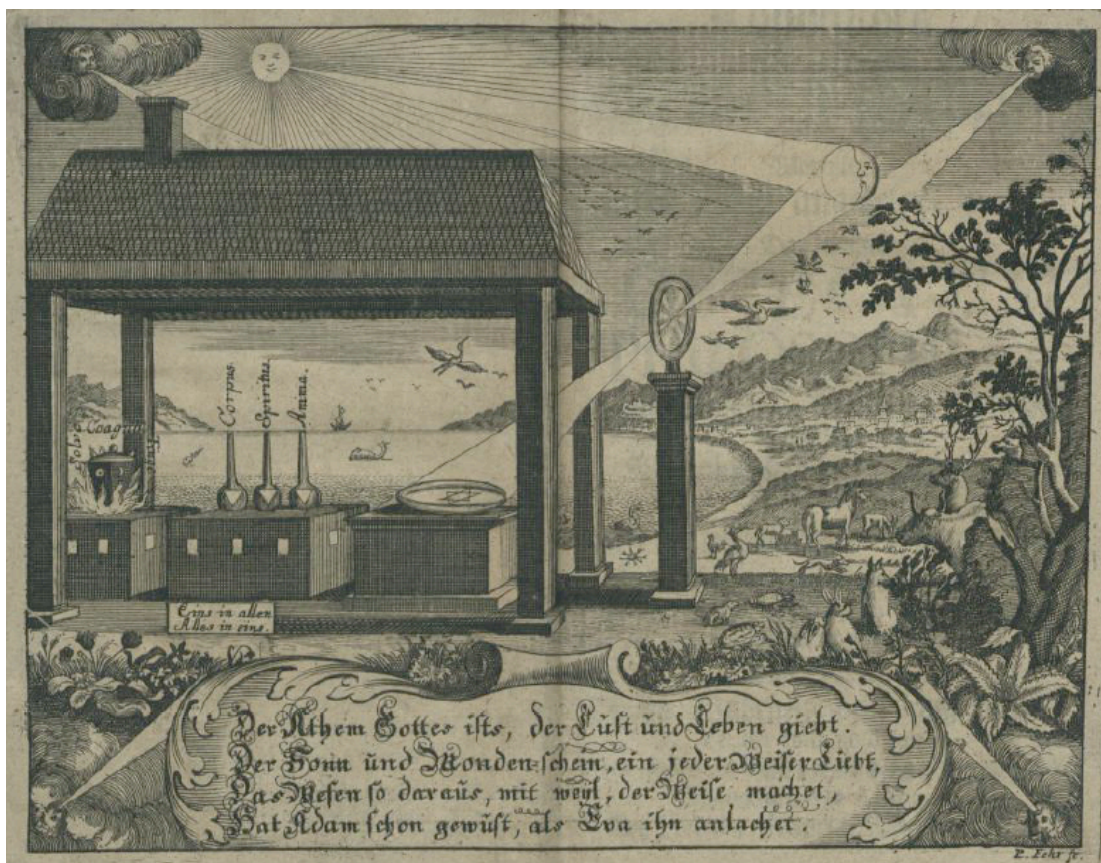


Fig. 24. Frontispiece, *Chymischer Monden Schein* (1739)

In Figure 24 we see something resembling cinematic projection. It shows the four winds blowing and a catoptrical apparatus including a standing lens. The lens focusses moonlight, reflected from the sun, onto a collecting dish containing two intersecting triangles: the Seal of Solomon<sup>68</sup>. There are three vessels labelled “corpus” (body), “spiritus” (spirit) and “anima” (soul). The last stage, at the furnace is labelled “solve”, “coagula” and “tincte” (solution, coagulation and tincture).<sup>69</sup>

<sup>67</sup> Little is known of this author. He concealed his authorship and his dates and true identity are uncertain. See *Appendix 1* for notes on this.

<sup>68</sup> A design attributed to a signet ring belonging to the King of Solomon (ca. 970 to 931 BC), widely used in a variety of mystical traditions as a talisman or magical sigil.

<sup>69</sup> Translated text below the illustration: “The Breath/Spirit of God it is, giver of Joy and of Life / The Son and the Moonshine, which every Master loves / The Being from therein, which the Wise patiently makes / Was already known by Adam, as Eve laughed at him.” The text below the laboratory reads “One in all, All in one”(Androgynus, 2010).

In “celestial dew”, von Siebenstern believed he had found the fundamental substance that many previous alchemists had referred to in obfuscated ways. He refers to dew as the “Astral essence”, a salt fundamental in all things. While admonishing alchemists for “so much daubing through dissolution, distillation, separation, cohobation, alembics, curcurbits, and pelicans”, he says that the essence will never be found by “driving it out” from material bodies. He invokes the doctrine of like begetting like, “each brings forth its form, after the Materia is pure”, suggesting that dew (and its salt) is the only substance containing sufficient celestial purity to carry the essence, “the key that unlocks all, and transmutes into its own likeness”.

Von Siebenstern identifies this substance with light:

Such a water is to be drawn out of the rays of the Sun and the Moon, in a wonderful manner, by a skillful Master of Art: This rarified Water is a Material compared to the Light, a Forma compared to the Created or Elemental, but it is itself an Astral Substance, and a Tincture of all natural things.  
*Chymischer Monden Schein* in (von Siebenstern, 1739: para. 23)

Dew here becomes the catoptrical apparatus, a medium for celestial light in material form as the “Quintessence”. A hierarchical cosmology is invoked to support this view, progressing from God, to the heavens, then Fire, which “he put into the heights under the moon”, a “pure part of the Quintessence”, after which he made Air (also containing some of the Quintessence), then Water, which has much of the “fifth essence”, then Earth, which “holds in itself the Least of the Fifth essence”. Celestial dew, he says, is “the fixed middle between the lowest and the highest” (von Siebenstern, 1739: para. 52-56).

The text provides concrete descriptions of the collection and distillation of dew, referring twice to mirrors, yielding at first a salt and then a red tincture that can be “projected” onto base metals to affect a transmutation. Von Siebenstern’s ideas provided a new level of signification to my work with the image of dew. I explored dew’s innate reflective properties, exposed it to concentrated light and *projected* it upon smoke in the making of *Speculum* (see Chapter 5) .

Beyond the purely alchemical, catoptrical devices were used for the projection of images and the creation of visual spectacle: the archaic antecedents of cinema. The German born Jesuit polymath and prodigious encyclopaedist Athanasius Kircher (1602–1680) worked in Rome and used his extensive Jesuit network to collect knowledge from around the world. Following John Edward Fletcher’s seminal 1966 thesis,<sup>70</sup> scholarly interest in Kircher has increased dramatically in recent years. His illustrations have been celebrated in sumptuous books by Joscelyn Godwin (Godwin, 1979, 2009) and Ignacio Gómez de Liaño (de Liaño, 2001) and his work has been the subject of several recent academic studies and symposia.<sup>71</sup> Kircher emerges from this body of work as a complex and contradictory figure, acknowledged in Findlen’s own study as both “the man who got everything wrong” and “the man who knew everything”. His frequent mistakes and self aggrandising proclamations sit side by side with a passionate commitment to universal knowledge, both rational and esoteric, coupled with a fecund imagination and a powerful desire to mediatise his world.

According to Zielinski, Kircher was a precursor to the modern media figure, entertaining the public with spectacular visual demonstrations and publishing lavishly illustrated volumes combining disparate fields of learning:

The world he creates in his prodigious oeuvre is highly ordered and beautiful. It is full of harmony, effects, illusions; it is calculated, dreamy and fantastic: an ideal media world.  
(Zielinski, 2008: 157)

I will focus on his alchemy and optical illustrations, through *Ars magna lucis et umbrae* (The great art of light and shadows, 1646) and the eleventh book within *Mundus Subterraneus, De Alchimia* (On Alchemy, 1665). The *Ars magna lucis et umbrae* includes observations on lenses, burning and optical mirrors, rainbows, astronomy and astrology. Kircher’s ideas occupy a liminal space between the rational and the mystical. He rejected many occult beliefs (Godwin, 1979: 85), but believed astral rays had direct and wide-ranging influence on the world through a luminous seminal principle he called *pranspermia rerum* (Rowland, 2004).

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<sup>70</sup> Originally submitted as his MA dissertation to Queen Mary College in 1966, and posthumously published as an edited edition in 2011, following his death in 1992. See (Fletcher, 2011).

<sup>71</sup> For a good overview of Kircher scholarship see Gary Trompf’s introductory essay in (Fletcher, 2011: xxi – xxxiv). Additional sources for the study of Kircher include (Stolzenberg, 2001, 2013), (Findlen 2004), (Baldwin, 1987), (Lo Sardo, 2001), (Leinkauf, 2009), (Partini, 2004), (Rowland, 2000), (Fletcher, 1988), (Haakman & Ferrari, 1995), (Gorman & Wilding, 2000), (Glassie, 2012).

Kircher illustrates the *lanterna magicka*, the *camera obscura*, a hall of mirrors, abstract light projection using coloured crystals and numerous other catoptrical devices for achieving theatrical effects (Musser, 1994: 20-27, 55-58, Mannoni, 2000).<sup>72</sup> He describes projecting words, still and moving images traced or etched upon mirrors. Many devices operated as early screen-based entertainment or were used for communication at a distance. Kircher gives instruction in using magnets behind mirrors to move projected objects around, a practice resembling a kind of contemporary art installation:

If you wish to show live flies, smear honey on the mirror and behold how the flies will be projected on the wall through the surface of the mirror with extraordinary size.

*Ars Magna Lucis* in (Musser, 1994: 19)

Figures 25 to 28 from *Ars magna lucis et umbrae*, show some practical and spectacular uses of mirrors and lenses: they suggest the camera, the projector and the cinematic experience.



Fig. 25. *Frontispiece, Ars magna lucis ...* (1646)

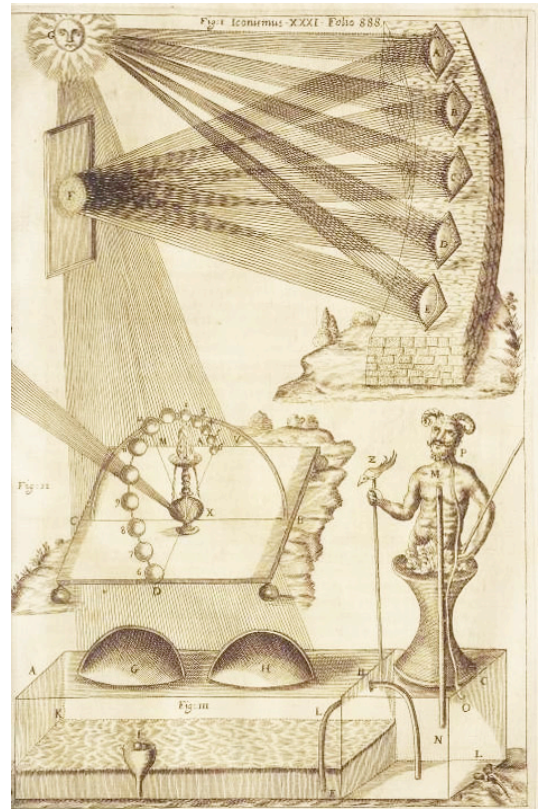


Fig. 26. *Ars magna lucis ... after p. 889* (1646)

<sup>72</sup> For Kircher's contribution to the history of projection and cinema see (Mannoni, 2000) and (Zielinski, 2008).

A hierarchy of projected light is evident within Figure 25. The main light shines down from YHWH (in Hebrew – God). The figure on the left, possibly Apollo or Hermes, the Sun and creator, shines three rays from his eyes. A mirror held by the figure of the moon and the constellations on the right, reflects light to a bowl in a garden with a sundial in its centre. A second ray shines through a telescope to produce an image, the third shines into a cave to reflect from a concave mirror as a focussed projection. Up high, sacred authority “Auctoritas Sacra” is illuminated directly by YHWH, while the intellect “Ratio” is illuminated by a super-celestial eye, or the light of sight. Lower down, the senses “Sensus” are illuminated from the Sun figure through the telescope, with profane authority “Auctoritas Profana” illuminated by a projection lamp shining upon a book.

A catoptrical illustration typical of Kircher’s playfulness is shown in the lower part of Figure 26. In a section entitled “Catoptrical Magic”, Kircher describes the operation of this figure: “To construct a statue which makes an impressive sound at sunrise and at each individual hour thereafter when the Sun's rays alight upon it”. The Memnonian statue emits an “animal like sound”, moving its eyes around and making its tongue protrude once every hour.<sup>73</sup> It is a kinetic sculpture, animated by light.

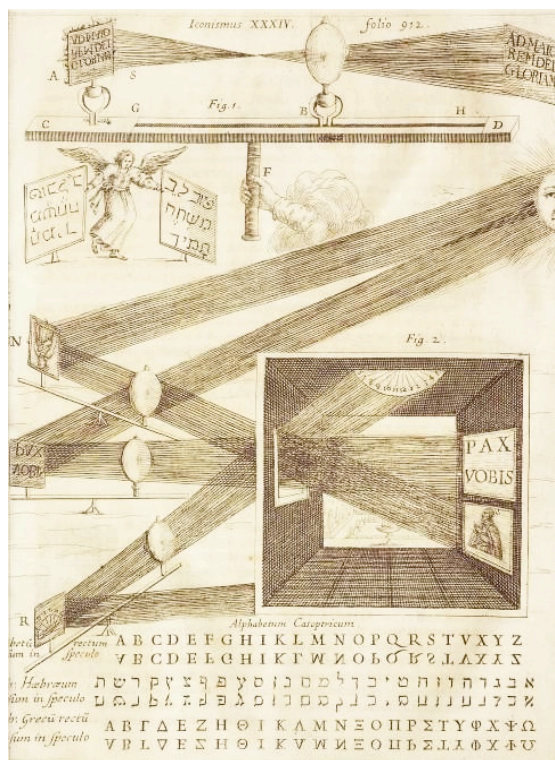


Fig. 27. *Ars magna lucis...* after p.912 (1646)

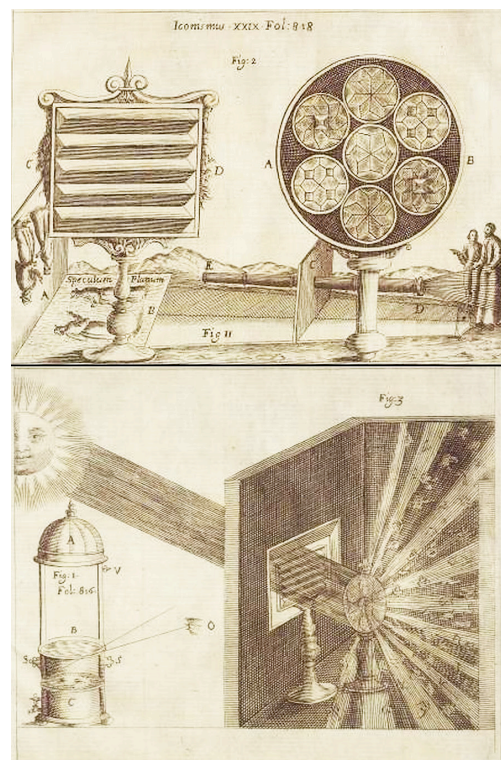


Fig. 28. *Ars magna lucis...* p.816 / 819 (1646)

<sup>73</sup> An original translation: see *Appendix 1* for full passage. In fact, this device was devised by Salomon De Caus and illustrated earlier in *Les raisons des forces mouvantes* (Caus, 1615). See (Yates, 1972: 20, plate 6b).

Kircher's stenographic mirror, using sunlight for projection, uses pictures painted on a mirror, mounted on adjustable poles, with adjustable lenses, projecting into a darkened *cubiculum* (fig.27), or chamber, which gives us the word *camera*. Here, Kircher was aiming for a kind of *television*, the transmission of images over distance. He claimed he could project letters at a distance of 500 feet, but noted: "the longer the distance is, the greater is the difficulty to distinguish these images, until finally almost nothing at all can be seen, except for in a completely dark chamber" (Rendel, 1997).

In Figure 28, the different arrangements of mirrors on a reflecting disc recall the devices Patrick Bokanowski has used in his filmmaking (see Chapter 4). Also shown, are devices for telescopic light projection and for throwing multiple images around the walls of a darkened room, a primitive cinema. These images resemble contemporary expanded cinema practice and informed my multi-projector work *Catoptrica* (see Chapter 5).

Kircher's discussion of alchemy appears in *Mundus Subterraneus* (The Subterranean World, 1665), a treatise on the inner workings of the Earth drawn from his study of vulcanology. His alchemy is often derivative.<sup>74</sup> According to Baldwin, Kircher believed the geocosmos was the "archetype of alchemical transformation", echoing Khunrath. He considered alchemical methods to be reflections of metallurgical transformations happening within the earth's subterranean chambers (1993).

Kircher's enthusiasm for visual drama extended into his alchemy. He gave public displays of alchemical transmutations, exhibiting colour changes in molten metals for his audiences. His alchemical practice included a catoptrical furnace:

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<sup>74</sup> According to Baldwin, Kircher borrowed from Brasavola, Agricola, Paracelsus and Faloppio, though the way he connected alchemy to vulcanology may be original (1993).

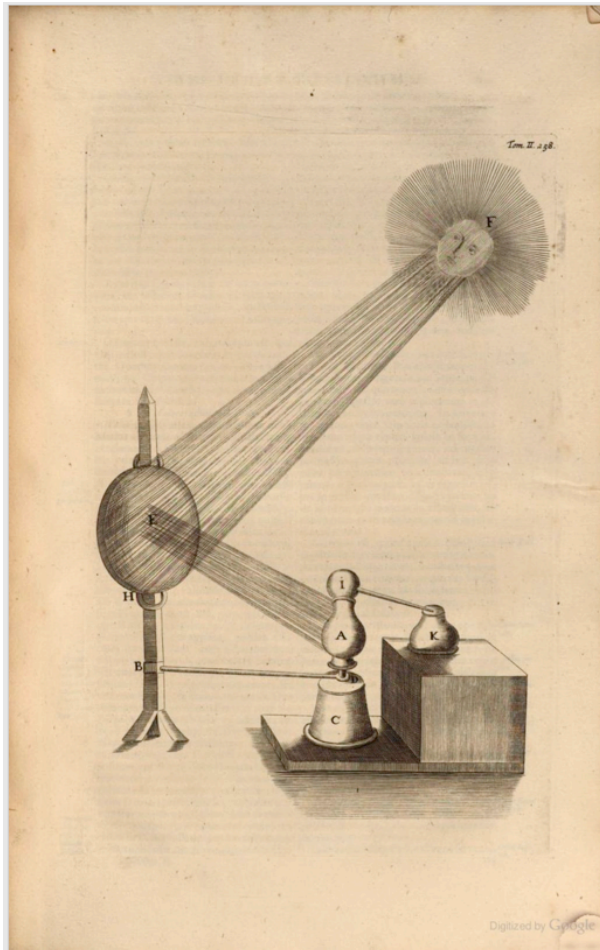


Fig. 29. *Mundus subterraneus* vol 2 (1678)

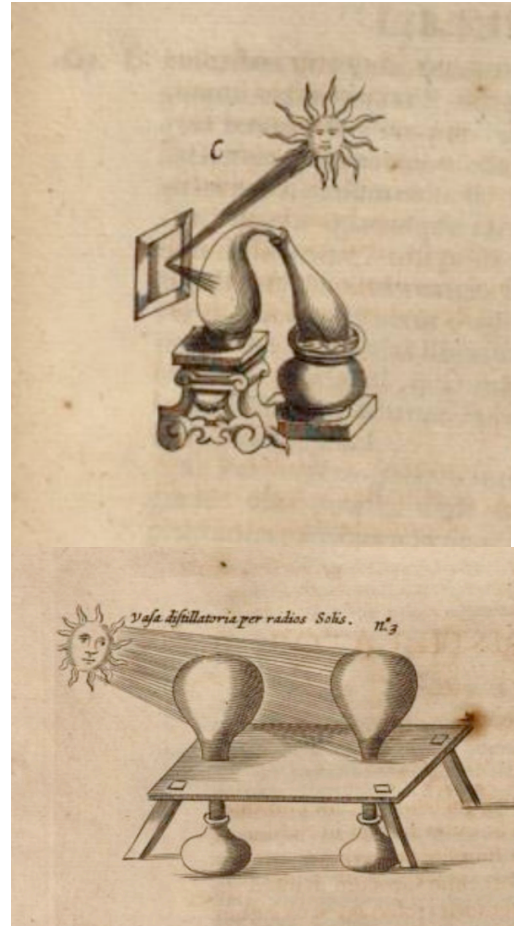


Fig. 30. *Mundus subterraneus* (1678)

Kircher claimed to have invented solar distillation, but the illustrations derive from Della Porta's already long extant *Magiae Naturalis* of 1584 and *De Distillatione* of 1609 (see fig. 30, plus figs. 9 and 10 above). Kircher added only an adjustable stand to the reflecting mirror (fig.29).

Kircher saw a correspondence between the sun and the fires at the centre of the earth, attributing to them both a transformative action on natural metals. He brought his interests in catoptrical contraptions and alchemy together, popularising these ideas in successful publications. His works were in circulation within the Royal Society in London at the time of Robert Boyle, Nicaise Le Fèvre and Isaac Newton, whose works I will now discuss.<sup>75</sup>

<sup>75</sup> Boyle quoted from Kircher's works, established contact with Kircher and became a correspondent with one of Kircher's former assistants, Fr Kaspar Schott. A treatise published by Schott contains works by both Boyle and Kircher (Reilly, 1955).

Using catoptrical apparatus for irradiating substances became widespread during the seventeenth century. One notable application was in the *calcination of antimony*, a process considered to prove a physical correspondence between light and its *magnetic* matter. The idea of the *magnet* dates back to Ficino (See above, Chapter 3.2) and the evolution of catoptrical devices now enabled this theory to be tested.



Fig. 31. Le Fèvre: *The calcination of antimony by the sun* (1660)

Nicaise Le Fèvre (1610-1669) focussed the heat of the sun with a “Burning Glass”, as seen in Figure 31. He called the resulting heat a “Magical Fire”, explaining that it would preserve and multiply substances rather than destroy them. The point was proven, he claimed, by the “Solar calcination” of antimony,<sup>76</sup> which increased in weight after exposure to concentrated light, rather than decreasing as with “vulgar” forms of fire. Le Fèvre claimed the increase was due to the absorption of light in matter. This implied a “magnetic” correspondence between solar forces and antimony, positing an idea similar to the solar “seed” of Beuther:

<sup>76</sup> Antimony is a natural occurring mineral, known today as mercury sulphide, or Stibnite. Le Fèvre was not the first to describe the calcination of antimony using this process, though he gives the most complete description. This method was previously described by Hamerus Poppius in *Basilica antimonii* (1618) and by John French in *The Art of Distillation* (1653). See (Koertge, 2008a) And (French, 1653).

It will allay ... your astonishment, if you are acquainted a little more with the nature of this miraculous Fire, and can comprehend, that Light is that Promethean Fire, which gives life to all natural bodies, is their Principle, and indivisibly joyns it self to its like, wheresoever it meets with it in any subject.  
*A compendious body of chemistry* in (Le Fèvre, 1662: 84-85)

Le Fèvre described the preparation of the “Regulus of antimony” as involving repeated meltings of antimony with iron and niter, yielding “a stellate or starry Antimony ... white as silver, and flowing already something of its solar Tincture”. The perfect regulus visibly resembles a star. Antimony was one of the most important of alchemical ingredients, and Le Fèvre invests the star-like regulus with miraculous benefits through its “emanation or irradiation of ... inward vertue”, supplied to it “by irradiation and influence from above” (1662: 240).

Le Fèvre’s method “fixes” antimony since antimony has light “corporified” within it, highlighting its capacity to act as a “natural Magnet”, attracting from the heavens his “noble kin” and “similar light”. He includes a description for the making of a water lens for this purpose:

Let the Artist have a burning-Glass of three or four foot Diameter, made with two concave pieces of Glass joined together, the two concavities within looking one towards another, the convexity without, and let there be a hole to fill up the concave space with clear water; for this Glass will concentrate more beames, and calcine better then if it was all of one piece, and broader in Diameter....it also must be fitted upon a Pedestal or Foot, wherein is a Screw to raise and deprese it according as occasion shall equire..  
*A compendious body of chemistry* in (Le Fèvre, 1662: 241)

I experimented with the filming of light through water lenses in *Speculum*, discovering they had a capacity for revealing the colour spectrum, a quality absent in pure glass lenses. Many of the light effects seen in *Speculum* where filmed in this way (Chapter 5.1 below).

Isaac Newton (1643–1727) began his laboratory work in 1669, seven years after the appearance of Le Fèvre’s *A compendious body of chymistry*. The making of the *star regulus of antimony* became one of his major alchemical preoccupations. Newton was interested in the celestial correspondences of the *star regulus*, connecting it to the “regulus of leo” and to the lion in alchemical symbolism. He expended significant laboratory effort on producing a visibly perfect star pattern within the regulus, with the structure of its visible rays radiating inwards.

Figure 32 shows a contemporary reproduction of the *regulus*, created using Newton's own methods. Its visual resemblance to a celestial body is apparent. Newton believed the *star regulus* to be the key to drawing the "philosophical mercury" from other metals and convinced himself of its "magnetic" properties, identifying antimony with the *Chalybs* of the alchemist Michael Sendivogius (1566-1636):

This is ye nitre of the Philosophy or ye radical moisture extracted from ye water of their dew, the matter of which is the [matrix] of sun and moon as well celestial as terrestrial. The air generates ye chalybs or magnet & this makes ye air to appear. So ye father of it is sun & ye mother of it moon.

Newton, translating Sendivogius in (Newton, 1685-90: 41.8)



Fig. 32. *The star regulus of antimony* (2014)

The magnetic quality Newton invested in the *star regulus* belonged within the alchemical tradition, linked to Le Fèvre's conception of the magnetic qualities existing between antimony and light. The alchemical "magnet" and the inward radiating *star regulus* may have influenced Newton's later work on magnetism (Dobbs, 1975: 212-213). Newton worked with antimony and the *star regulus* for several years, drawing on a wide range of ancient alchemical sources,<sup>77</sup> ultimately recording his apparent success

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<sup>77</sup> The alchemists Newton studied included Eirenaeus Philalethes (George Starkey), Basilus Valentinus (Basil Valentine), George Ripley (1415-1490), Michael Sendivogius (Michał Sędziwój) (1566-1636) and Jean d'Espagnet (1564-1637). See (Dobbs, 1975: 192).

in making “philosophical mercury” with a process using the *star regulus* and common mercury.<sup>78</sup>

Like Le Fèvre, Newton may have used catoptrical apparatus in making the *star regulus*. He developed a large scale burning mirror which he presented at the Royal Society in 1704, consisting of a central mirror surrounded by six others, each a foot in width. Each mirror was partly spherical or paraboloid, combining to form a focal point 22 inches from the centre. In presenting his “speculum” Newton demonstrated that it could melt gold in 30 seconds (Simms and Hinkley, 1989).

The possibility that Newton employed catoptrical apparatus is given further weight by the way he described “illuminating” his chemical matter, a plausible reference to direct catoptrical irradiation.<sup>79</sup> For him, everything was derived “out of black Chaos and its first matter, through the separation of the elements and the illumination of matter” (Dobbs, 2002: 80). Newton consulted works by Basil Valentine (Dobbs, 2002: 122) which include a description of the preparation of antimony by means of exposure to the rays of the sun.<sup>80</sup>

In the year Newton demonstrated his burning mirror, he published his *Opticks*. In *Query 30* he suggests that light and matter may be convertible one to another:

Are not gross Bodies and Light convertible into one another, and may not Bodies receive much of their Activity from the Particles of Light which enter their Composition?  
*Opticks* in (Newton, 1704)

Newton hypothesises here that light has an animating effect upon matter, an idea indebted to alchemical theories of light embodiment within matter.

Le Fèvre and Newton sought to explore light’s fundamental reciprocity with matter. They tested the idea that certain substances could act as a “magnet” to light, fixing light as material substance. But the occult properties of light remained steadfastly occult, while its visible properties became a rewarding subject of study in their own right.

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<sup>78</sup> Among Newton’s laboratory notebooks is a bound volume titled *Idea Of a table booke* detailing Newton’s experiments both with light and the *regulus of antimony*, between 1669-1693. See (Newton, 1669-1693) and (Newton, 1678 to 1696).

<sup>79</sup> Dobbs concludes that this “illumination” was probably metaphorical. Szulakowska argues that it was a direct reference to catoptrics (Szulakowska, 2000: 99). Given Newton’s interest in optics, his access to burning mirrors, his familiarity with Basil Valentine and probably Le Fèvre’s work, and his interest in alchemical sources that deal with catoptrical irradiation, it would seem highly plausible that Newton employed his burning glass in his alchemical experiments.

<sup>80</sup> Basil Valentine’s *Der Triumph-Wagen Antimonii* (Leipzig, 1604) describes the making of a potable medicine by means of antimony and the rays of the sun (Szulakowska, 2000: 163).

The work of Johannes Marcus Marci (1595-1667) and later Isaac Newton (1643–1727) represent a turning point, wherein the nature of light itself became the subject of catoptrical experiment, resulting in the discovery of the light spectrum. Marci synthesised alchemical theory with empirical experimentation. From directing light *at* and *into* things using burning mirrors and lenses, Marci began to develop new catoptrical methods to explore the material characteristics of light itself. Separating light into colours through refracting prisms, he concluded that light consisted of a “bundle” of separate colour rays, twenty-four years before Newton’s *New Theory of Light and Colours* (1672).

Marci, a professor of medicine in Prague, was interested in the *celestial arch*, the rainbow. He discovered that further refraction of individual colours did not produce further colour changes, challenging contemporary theories that light was homogeneously white. The appearance of rainbows and prismatic colour changes were previously considered a result of the *modification* of white light through shadows, or changes in light intensity as light passed through translucent objects (Aiton, 1970). Unlike Newton’s famous *experimentum crucis*, Marci did not take the step of using an inverted prism to recombine these rays back into white light:

Marci reproduced the rainbow by shining candle light through an opening in a screen and then onto a prism, which would project colored bands on a piece of paper. He performed a variety of tests in a darkened room in front of a mobile candle using armillary and triangular prisms, and inserted items, such as knives, crystal balls, and colored paper, between his eye and the rainbow projection. (Garber, 2005)

Marci believed sunlight to be a “corpuscular” form of fire, acting “radiatively” and “radically”, according to its sulphurous chemical nature. He invoked his corpuscular theory to explain light’s behaviour in different densities of matter, concentrating or expanding the rays of light. This sulphurous chymical theory was largely Paracelsian. He held that light contained the *vis seminalis*, the seminal force, dispersing the unfolding universe along perpendicular rays. In *Philosophia vetus restituta* (Restoration of old Philosophy, 1662), Marci posited an optical model for the generation of planets and metals, through the emanation of “ideas” from the first light of creation. This idea takes us back to Al-Kindi, Grosseteste and Bacon (Chapter 3.2 above).

Through prismatic division, Marci believed white light “degenerate[d] into offspring of that sort related more to matter”, invoking the alchemical motif of birth through division

and separation, yielding individual colour rays which, for Marci, had a baser nature than white light (Garber, 2005).

Marci's theories were rooted in earlier emanatory and alchemical concepts of light and transmutation. His greatest innovation was in taking light into the laboratory to explore its properties, applying alchemical processes of separation.

As we have seen, Newton was equally embroiled in alchemical theory, but he took the experiment one step further. Marci had drawn on philosophical and theological notions of light to inform his own experiments, but Newton drew more upon the *practical* methodology of alchemy. His *experimentum crucis* of 1672 (Darrigol, 2012: 81-82) was an alchemical-catoptrical *separation*, followed by a second *separation*, which did not produce further transformations in colour. Newton then mixed separated colours back together, an alchemical *conjunction*, reproducing white light. This challenged the idea that colours were permanent transmutations or "offsprings" of light, but were instead immutable. Such methods of repeated separation and recombination, frequently encountered in alchemical literature, may have been borrowed by Newton from Robert Boyle and his own reading of alchemical works (Newman, 2011).<sup>81</sup>

Figure 33 shows Newton's sketch, resembling other catoptrical devices so far illustrated (figs. 28, 31). Newton's addition of prisms turned light itself into the experimental subject. Light, passing into the chamber through a hole to a focussing lens, refracted in the first prism. Separating out just one colour and subjecting this to a further prism produced no further transformation. Newton later added a lens to recombine the spectrum into white light.

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<sup>81</sup> Newman does not mention Marci as a source for Newton's methods, but Boyle was familiar with Marci's work, an indication of a more contemporary alchemical source for his ideas (Anstey, 2002: 116). Scholarship has recently revised the image of Boyle as a rational and reforming chemist, acknowledging he was as much a practicing alchemist as a scientist, with a lifelong interest in transmutation, the philosopher's stone and in communicating with disembodied adepts. For Boyle and Newton, there was nothing unusual about these alchemical interests, their work belonging more to the domain of natural philosophy than to empirical science as we recognise it today (Principe, 2011).

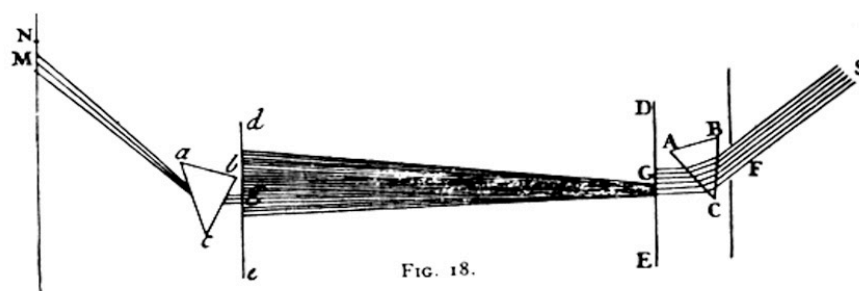
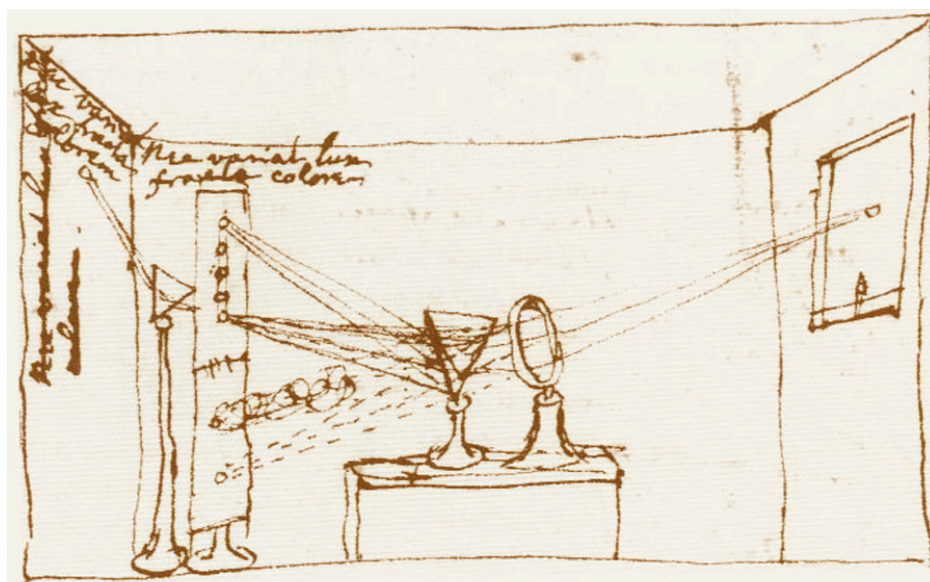


Fig. 33. Newton's illustrations for his *Experimentum Crucis* (1672/1704)

In Newton's hands, light began to be disentangled from philosophical and metaphysical theories of matter. This disentanglement allowed the new breed of chymists to begin to understand the photochemical effects of the spectrum of light upon photosensitive substances, ushering in a new era of experimentation with light upon matter: one which would ultimately lead to the photograph and the film.

While Newton used catoptrical apparatus to study the composition of light, catoptrics in alchemy remained underpinned by metaphysical ideas, even while its technologies continued to develop to a sophisticated level. I survey here a number of illustrated alchemical-catoptrical devices in use from the 17<sup>th</sup> to the 19<sup>th</sup> century.

The *Arcana Divina* (The Divine Secret, early 18<sup>th</sup> c. to late 19<sup>th</sup> c.)<sup>82</sup> is a key text in the history of alchemical catoptrics. At least seven manuscript versions are known to exist,

<sup>82</sup> London, Wellcome Institute MS. 3123 (1889-1919)  
 London, Wellcome Institute MS. 971 (early 18th Century, 9 drawings of alchemical mirrors and apparatus)  
 London, Wellcome Institute MS. 1091 (1777)  
 Biblioteca Philosophica Hermetica MS. 14. (18th or 19th c.)  
 Mellon Collection, Yale University Library MS. 81. (18th c.)  
 Mellon Collection, Yale University Library MS. 88. (c. 1725)

in German and Latin, one of which is entitled *Das Zweyte Silentium Dei* (The Second Silence of God).



Fig. 34. *Arcana Divina*, Mellon MS. 88 (ca. 1725)

Our first encounter with a double lens is seen in Figure 34, showing a range of experimental applications. To the left, a solar *distillation* is performed, in the centre, an “ethereal calcination” surrounded by two angels pointing heavenwards. To the right, the rays are directed toward the top of a *circulatory* still.

The *Arcana Divina* is a practical text. The author clearly had direct experience in exposing a wide range of substances to light. The text describes irradiating mercury/antimony, gold, silver, sulphur, salt, aluminium, talc, cobalt, pearls, wine, vegetable matter, bats, fish and even a selection of domestic fowl. The use of nitre (nitric acid) along with silver and salt within the pantheon of ingredients is significant, as this combination yields silver nitrate (silver and nitric acid) or, with the addition of salt, light sensitive silver chloride. The author describes specific lighting conditions for storing

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Mellon Collection, Yale University Library MS. 136. (1798 c. *Das Zweyte Silentium Dei*)

certain solutions and it is probable that photochemical reactions were observed using such apparatus (Anonymous, 1989, Anonymous, 1777: appendix 3).<sup>83</sup>

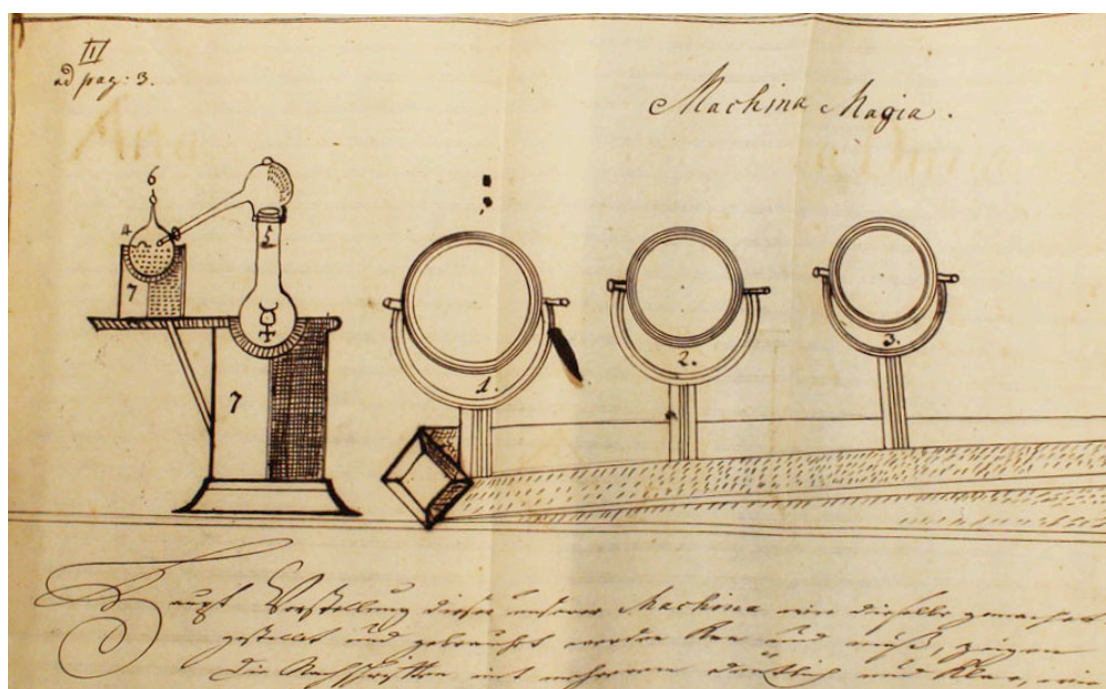


Fig. 35. *Arcana Divina* MS. 971 (early 1700's)

In Figure 35, the “magic machine” has a three lens structure, mounted on an adjustable track, directed toward the distillation apparatus. The main flask contains Dee’s Monas symbol, linking this work to earlier traditions.

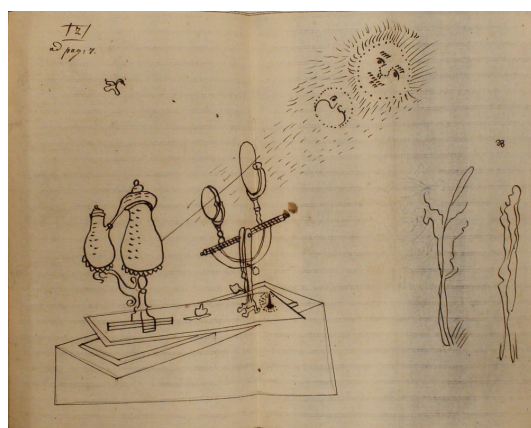


Fig. 36. *Arcana Divina* MS. 971

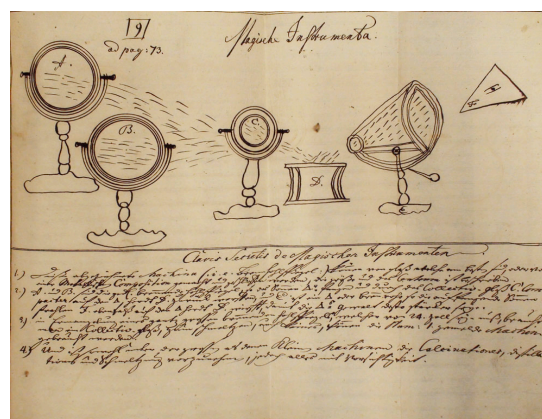


Fig. 37. *Arcana Divina* MS. 971

Figure 36 shows the use of two kinds of radiation: the “cold lunar fire” and “solar fire” creating what the author described as a “regeneration” inside the vessel. The “magic instrument” in Figure 37 has two mirrors (or lenses) shining upon a third lens,

<sup>83</sup> Appendix 3 contains notes on sources, a commentary on the text and an original translation of sections referring to the use of catoptrics: pages 379-407, 348-349 of Wellcome MS 1091 (1777).

performing a *calcination*. A double lens device is further irradiating the same surface. A triangle containing a dot and two lines is the light source, possibly referring to the author's discussion of the "spiritus mundi" as the source of the "astral fire".

Though practical, the accompanying text is distinctly Paracelsian: it attributes the "natural fire" to the Holy Ghost as its active principle, a Paracelsian *flamma vitalis*. It applies the Paracelsian *mercury, sulphur* and *salt* trinity of ingredients. The fact that aerial fire could be concentrated to yield an "astral salt" and would increase the weight of exposed substances, is offered as a proof of light's material manifestation as matter, much like Le Fèvre's case for antimony. For the author, light corresponds with Godly illumination, allowing substances exposed to carry a kind of godliness into the person who ingests them. References to astrological timings further link this text to older traditions connecting optics, astrology and alchemy (Anonymous, 1989, Anonymous, 1777: appendix 3).

The German manuscript *Das Zweyte Silentium Dei* (1599/1798) is doubtfully attributed to Johann Arndt (1555-1621) and Paracelsus (Arndt, 1798: appendix 4).<sup>84</sup> The text gives technical specifications for the "secret magic machine": its lenses, use of rollers, dishes, accoutrements, and green glass goggles (fig. 40, labelled "18") for working with the "celestial fire". Many concepts and terminologies are similar to the *Arcana Divina*.

Of particular interest is the technical instruction for extracting the "Spirit of the world" from the air, using a double alembic containing 16 holes (not illustrated) to "enable air from all four directions of the heavens to pass through the device". This alembic, "the Glass Paradise", is heated in the sun using the "secret magic heat machine", yielding a sediment which the author describes as a "pure paradisiacal body, i.e. the true Spirit of the World filled with pure light". This substance is poured out and stored, having a "mercurial" character in spring and a "sulphuric" character in autumn (Arndt, 1798: appendix 4). It can be assumed this substance is similar to the "celestial salt" described by David Beuther or the "astral salt" extracted from dew and frost in *Chemical Moonshine* and the *Arcana Divina*. What sets the description apart in *Das Zweyte Silentium Dei* is the advanced level of technical detail and methodology. It had reached a significant level of technical evolution, aimed at minimising impurities.

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<sup>84</sup> Appendix 4 contains notes on the uncertain dating and attribution of this MS, a commentary on the text and an original translation of sections referring to the use of catoptrics: pages 16-35, 73- 81 of Mellon MS 136.

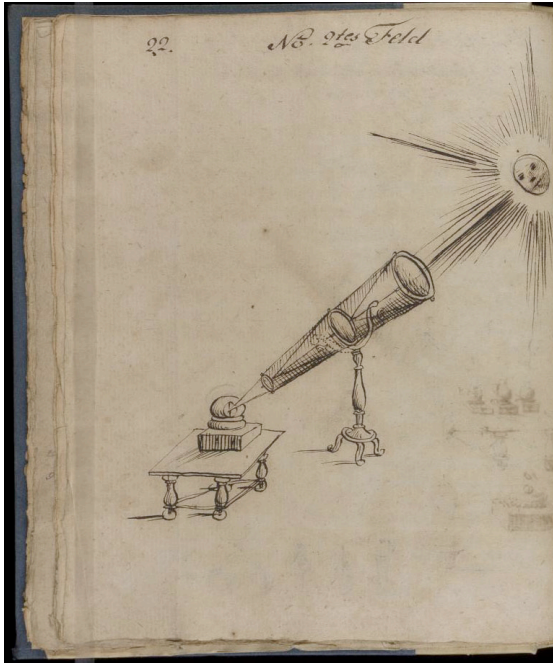


Fig. 38. *Das zweyte Silentium Dei* (1798)

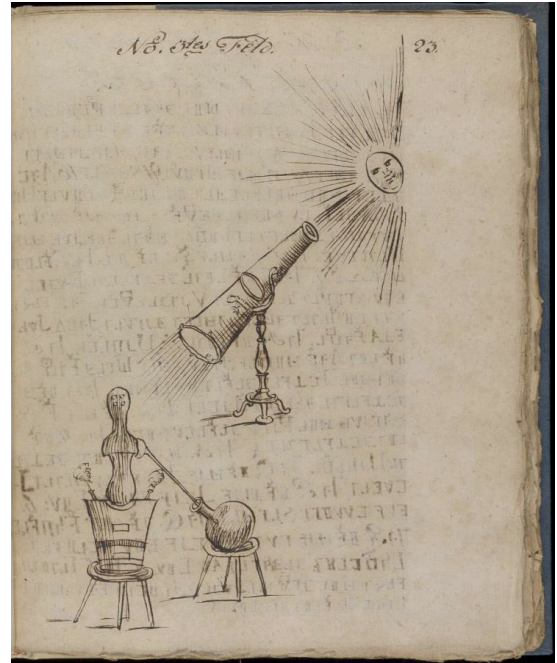


Fig. 39. *Das zweyte Silentium Dei* (1798)



Fig. 40. *Das zweyte Silentium Dei* (1798)

In Figure 38 we see a telescopic device containing three lenses for giving an intense heat. The device is reversed in Figure 39 to give a more gentle heat for distillation. Figure 40 illustrates the various items of laboratory equipment required.

The *Alchemistische recepten: Miscellanea* (Anonymous, 1748) contains four unique catoptrical illustrations, preceded by one of Hermes sitting upon a mountain, under the light of a six pointed star (Anonymous, 1700s: 65-69). The author states it is a copy of an original given to him, but does not include the text that may have accompanied the original images. Figures 41-44 depict the use of a single lens device:

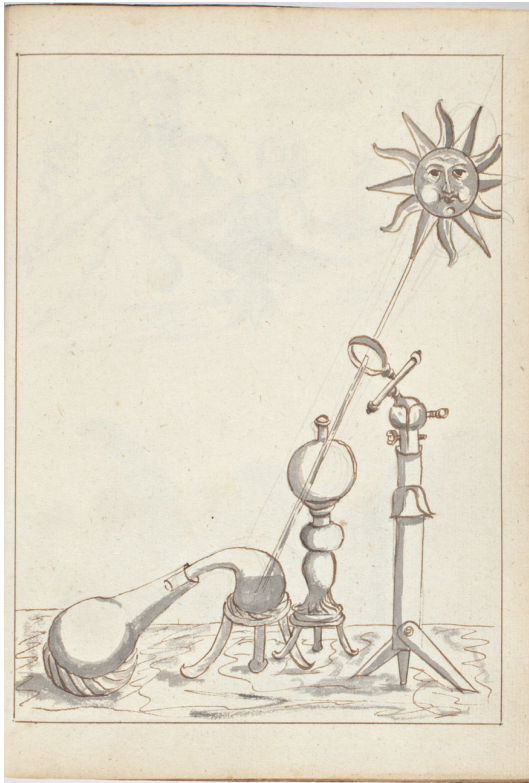


Fig. 41. *Alchemistische recepten* (1700s)

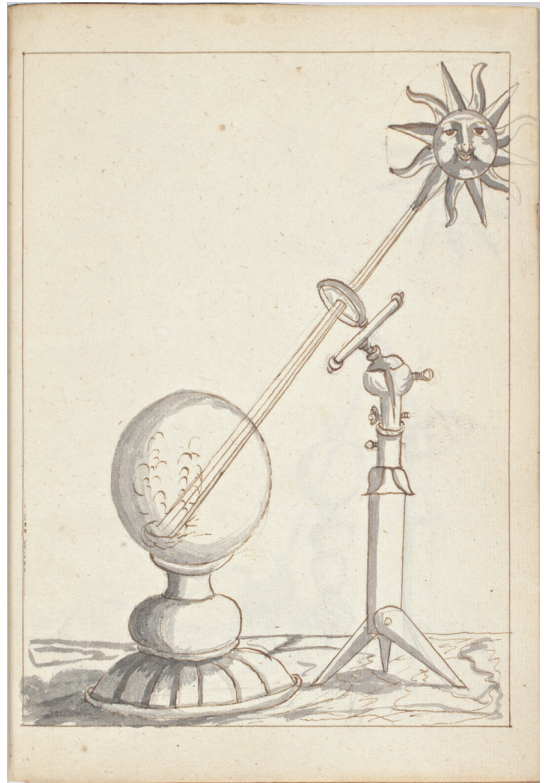


Fig. 42. *Alchemistische recepten* (1700s)



Fig. 43. *Alchemistische recepten* (1700s)



Fig. 44. *Alchemistische recepten* (1700s)

The short Latin text accompanying these illustrations translates as:

A copy of the second manuscript of chemical magic, the original of which is preserved at the Holy Cross Monastery, and which was handed over to me in 1748. This manuscript contains some things that are worth knowing and which seem to succeed in practice; certain other matters which are raised in the more commonplace manner of the chemists, matters that might be commended more to theory than to practice; and, finally, some rural superstitions and magic spells for devouring souls [sic], as well as something about the magic mirror known as the “English mirror”, and which latter matters are here omitted (for I did not wish to describe them).  
(Anonymous, 1700s: 69)<sup>85</sup>

The intriguing reference to the use of a magic “English mirror” may well be a reference to John Dee. I end this chapter with two large surviving devices from this era, made by Ehrenfried Walther von Tschirnhaus (1651-1708) in Germany (figs. 45 and 46). Tschirnhaus worked with an alchemist, met Newton and Boyle and employed his burning mirror in the discovery of porcelain. The technology had evolved to enable Tschirnhaus to reach temperatures of 1400 degrees at the point of focus (Newcomb, 2009: 40:42, Simms and Hinkley, 1989):



Fig. 45. *Burning mirror (copper)* (1686)



Fig. 46. *Catoptrical furnace* (1686)

<sup>85</sup> An original translation by Paul Ferguson 2013.

We have covered a distinct set of archaic practices in which light was used to infuse matter in transformative ways:

#### 16<sup>th</sup> century

Giovanni Battista Della Porta introduced the use of the parabolic or concave mirror for focussing the sun's rays, which he used for distillation, alongside the development of many optical devices and illusions. John Dee evolved a distinct form of philosophical catoptrics, based on geometric optical principles, for imprinting the virtues of light into both matter and symbols, linking this with a numerological exegesis of light. He used mirrors and optical devices for divination and conversing with angelic hierarchies.

#### 17<sup>th</sup> century

Heinrich Khunrath developed an alchemy of light that was both practical and spiritual in orientation, advocating the use of lenses and mirrors to introduce divinity into irradiated substances, within a light-centred Christian theology. Michael Maier illustrated a number of alchemical processes in which the geometries of light could be utilised in experiments, connecting this to astrology, to the sun, and the circle. Robert Fludd proposed a light-centred Cabalistic hierarchy of creation in which God's vision and emanatory light could be embodied within material substances. Athanasius Kircher's compendious works appear, illustrating a wide range of catoptrical contraptions. Johannes Marcus Marci separated light into the colour spectrum, believing light to be the "seminal force", and colour to be its degenerated "offspring". Nicaise Le Fèvre used light for the calcination of antimony, believing this to prove the materiality of light and its embodiment within matter. Isaac Newton experiments with "magnetic" antimony, burning mirrors, light and prisms in an alchemical and an optical context.

#### 18<sup>th</sup> century

David Beuther's work suggested catoptrical practices to extract a "celestial salt" from the air itself, based on a belief that light was the "seminal seed" underlying the creation of all matter. *Chemical Moonshine* proposed a salt extracted from "celestial dew" as the "astral essence" hidden within all matter, and that this might be extracted or concentrated by catoptrical means. This idea is echoed in the *Mutus Liber*, which identified dew at the catoptrical *prima materia*. The *Arcana Divina* manuscript appears, advocating the use of the "magic natural fire" and a catoptrical "magic machine" for a range of alchemical experiments, based on a belief in a divine "aerial fire" that could be imprinted into substances, correspondent with a theology of godly illumination.

The uses to which catoptrical devices were put, point toward vivid imaginative relationships between concentrated light and matter. With these devices people created visually observed material transformation, imprinting light within matter. Alchemical catoptrical devices functioned as practical experimental tools for divining the “spiritus mundi”, equally useful for enquiring into light, matter, belief or philosophical ideas. The capacity of moulded glass and polished metal to distort and multiply light, was coupled with a committed belief in the occult properties of light and emanation. Early cameras were a catoptrical assemblage of lenses and mirrors in a dark chamber or box, designed to fix light to a material substrate. They were used as a tool in similar ways and for similar objectives.

Next, I explore the ways in which two filmmakers have exploited catoptrical methods, challenging the visual veracity of the camera lens within their own forms of catoptrical visual alchemy.

## 4. Alchemical catoptrics in the moving image

In the early 20<sup>th</sup> century, alchemy was rediscovered by a set of people who had quite different interests. There was a widespread resurgence in the publication of alchemical emblem books, coupled with a growing interest in the occult, facilitating a re-entry of alchemical ideas into popular culture and aesthetic discourse, albeit transmogrified. This trend was particularly active in the Dada and the Surrealist movements, whose participants actively excavated these ideas in an attempt to recover alternatives to rationalism.<sup>86</sup> Meanwhile, Carl Jung (1875-1961) appropriated alchemy for psychoanalysis as a mystical-psychological journey toward individuation. The two filmmakers I now discuss, Man Ray (1890-1976) and Patrick Bokanowski (1943-present) both have links to this period of alchemical *revivification*. These two filmmakers represent a historical bookending of this field of practice, from Ray's 1923 film *Le Retour à la Raison* (1923) to Bokanowski's *Battements Solaires* of 2008. In works separated by eighty five years of cinematic experimentation, it is striking that these filmmakers share a visual language in which alchemical references and catoptrical practices co-exist. My research uncovered several distinct *outside the camera* catoptrical methods they used, indirectly informing the experiments I later conducted in my own filmmaking. The works discussed further embody differing degrees of referencing to historical texts and images, a methodology central to my own approach to artistic research. The focus of the following discussion will be on their alchemical-catoptrical practices.

### 4.1 An “alchemy of appearances” in the films of Man Ray

The discussion around Man Ray's early films, *Le Retour à la Raison* (1923), *Emak-Bakia* (1926), *L'Etoile de Mer* (1928) and *Les Mystères du Château de Dé* (1929)<sup>87</sup> testifies to their importance as the parents of contemporary experimental film practice. These films

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<sup>86</sup> See (Elder, 2013a: 446-468) on how these ideas spread through these circles and (Dubois, 2005: 62) for a chronology. In 1920, the founder of *Societe Alchimique of France*, Francois Jollivet-Castelot, published three alchemical novels. Other significant works included the German *Geheime Wissenschafte* and Albert Poisson's *Theories et symboles des alchimistes* (1891), *Cinq Traités d'alchimie des plus grands philosophes* (1890), *Histoire de l'alchimie XIV siecle* (1893), and Herbert Silberer's *Probleme der Mystik und Ihrer Symbolik* (1914). See (Warlick, 1987).

<sup>87</sup> Man Ray (Emmanuel Radnitsky - 1890 – 1976) was born in Philadelphia and grew up in New York where his family changed their name to “Ray”. He moved to Paris in 1918 and spent 18 years there. There are a plethora of articles and books referencing these films. The most comprehensive recent work on his films is the book by Kim Knowles, *A Cinematic Artist: The Films of Man Ray* (2009). The following contain useful commentary on Man Ray's films: (Sitney, 2002, Le Grice, 1977, Kuenzli, 1996, Wees, 1992, Wees, 2007, Rees, 1999, Schwarz and Ray, 1977, Graf and Scheunemann, 2007, Harper and Stone, 2007, Elder, 2013a)

have a canonical role as catoptrical artefacts for the critical imagination and their qualities evade fixed interpretation. This discussion is centred on Man Ray's catoptrics within *Emak Bakia* and, secondly, on alchemical/catoptrical references in *L'Etoile de Mer*.

Man Ray produced these films in the Dadaist and Surrealist circles of early to mid 20<sup>th</sup> century Paris,<sup>88</sup> with which Man Ray had a strong association (Knowles, 2009). Man Ray came to make his first film *Le Retour à la raison* (1923) through Tristan Tzara and his Dadaist anti-art movement. He was familiar with Tzara's advocacy of chance as an organising principle through Tzara's famous *To make a dadaist poem* (1920-21), which recommended cutting up the words of a newspaper article, randomly extracting them one by one to form a poem.<sup>89</sup> This randomness was not nonsensical to the extent that the action became devoid of meaning, but was a method for transforming the banal into the artistic. Through such action, Tzara said, "The poem will resemble you" (2011: 59). Such creative processes were highly valued within Dada for their random experimentation over conscious design, assigning a Paracelsian kind of creative agency to the unconscious. This view contains echoes of the thinking that underpinned the experimental practices of transmutational alchemy, coupled with mystical divinatory practices based on randomisation and chance. As Hans Richter (1888-1976) noted in 1965: "absolute acceptance of chance brought us into the realm of magic, conjurations, oracles, and divination" (1965: 60). Tzara was the catalyst for Man Ray's cameraless photogram techniques and the making of *Le Retour à la raison*. Man Ray's commitment to experimentation, favoured over conscious design, was to surface to a greater extent in *Emak Bakia* (1926). Man Ray later said of his filmmaking:

All the films I made were improvisations. I did not write scenarios. It was automatic cinema. I worked alone.  
(Kuenzli, 1996: 3)

As Dada morphed into Surrealism during the 1920s, interest grew in exploring new experimental methods for liberating the creative potential of the unconscious: hypnosis, lucid dreaming, dream recording, automatic writing and séances. Freud's *The Interpretation of Dreams* (1900) became a significant text, linking dream-states to the unconscious mind, sexuality and desire. Andre Breton, Georges Bataille, Antonin Artaud,

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<sup>88</sup> Despite playing a key role in the last Dada event, Man Ray was a somewhat peripheral figure on the Dada scene but he sought and found acceptance within surrealist circles (Knowles, 2009). He was also friendly with Duchamp and collaborated with him on the making of his rotary glass plate machine, plus the subsequent cinematography, for the film *Anemic Cinema* (1926).

<sup>89</sup> Hans Arp was the first within Dada circles to employ this technique as a form of collage.

Robert Desnos (1900-1945), Max Ernst (1891-1976) and Marcel Duchamp (1887-1968) spearheaded a renewal of interest in historical alchemy and the occult, with alchemy becoming a major preoccupation of the Surrealists by 1928. Historical alchemical books were published in Paris, referred to within Surrealist journals (Elder, 2013a: 446-468). These texts granted access to a world of ideas that seemed to the Surrealists to be relevant in their explorations of the unconscious.

As early as 1922 the group began to experiment with séances. Ray collaborated with Robert Desnos, who was highly susceptible to trance states. Visual echoes of John Dee recording the visions of Edward Kelley, his sycr for the “angel conversations” (Chapter 3.3), are to be found here, with Ray photographing the séances and recording Desnos emerging from a trance (fig. 47):



Fig. 47. Man Ray, *Once Again, Now I See Robert Desnos* (1928)

The publication of Fulcanelli's *Mysteres des Cathedrales* in 1926 helped to stimulate a heightened interest in alchemy. Fulcanelli, whose real identity has not been definitely confirmed, was allegedly a practicing Parisian alchemist.<sup>90</sup> The book explored the alchemical symbolism hidden in Notre Dame Cathedral and other Parisian buildings. Fulcanelli proposed that they could be read as three dimensional alchemical diagrams, their Hermetic truths concealed in Christian symbolism (Szulakowska, 2011: 34-35). This led to a number of Surrealist walking tours of Paris, in which the group explored streets "haunted by the ghosts of former alchemists" (Warlick, 2001: 94).

Man Ray was aware of the discussion of alchemical and occult ideas, though this does not mean that he was familiar with historical alchemical sources (Schwarz and Ray, 1977: 9-10). The context of *unconscious* experimentation around Man Ray was highly significant. A defining characteristic of this group was their spirit of experimentation with different methods for accessing dream-states to enhance their aesthetic activities. Man Ray was to approach his filmmaking in a similar vein, using apparently spontaneous and often random filmic techniques. He explored visual distortion, camera movement and light-play to evoke dream-like states, playing down conventional tropes of representation and narrative structure. His method was to some extent "magical-circumstantial", a term used by Andre Breton<sup>91</sup> to describe the uncovering of hidden meanings and magical correspondences of things through chance.<sup>92</sup>

As early as 1914, Adolf Wolff described Man Rays as:

A youthful alchemist forever in quest of the painter's philosopher's stone. May he never find it, as that would bring an end to his experimentations which are the very condition of living art expression.  
(Naumann and Museum, 2003: 21)<sup>93</sup>

In Andre Breton's essay *Surrealism and Painting* (1928), he wrote insightfully on Man Ray's work, quoting the alchemist Ramon Lull (ca. 1232-1316).<sup>94</sup> The short text by Lull

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<sup>90</sup> Fulcanelli is a pseudonym. He may have been Eugène Canseliet (1899-1982), a latter day alchemist who claimed to be a student of Fulcanelli, or the physicist Jules Violle (1841-1923), or someone else. See (Rivière, 2006, Dubois, 2005).

<sup>91</sup> Andre Breton had a lifelong interest in alchemical, magical and occult subjects. His early exposure to various books and manuscript sources is explored in Szulakowska's *Alchemy in Contemporary Art* (2011: 34-37). His 1957 book *L'Art Magique* contained an interview with Eugene Canseliet, alongside 76 interviews with artists, critics and art historians, on the subject of art and magic.

<sup>92</sup> *La beauté sera convulsive* was published in *Minotaure* (later in *L'Amour fou*), long after Man Ray made his films. Breton discussed one of Man Ray's images – of a mandrake root, as a "magical-circumstantial" image, resembling Aeneas carrying his father. The other two categories of images discussed were the "veiled-erotic" and the "fixed-explosive". By this time at least, Breton was clearly familiar with the *Doctrine of Signatures* (of which the Mandrake root is a most common example) and Paracelsian theories of magical correspondence (Schenkel et al., 2007).

<sup>93</sup> Quoting *Art Notes* by Adolf Wolff for an early exhibition of Man Ray's paintings.

is densely visual and psychological, dealing with several complex ideas, such as the mirror as a body for receiving images:

A ghost is an absence reminiscent of things through the imagination...  
Significance is the revelation of secrets that are shown with the sign.  
Beauty is a certain specious form received by sight, or by hearing or by  
imagination, or by conception, or by delectation.  
..Shadow is the habit of the loss of light.  
Creation in Eternity is the idea; creation in Time is the creature.  
Comprehension is the resemblance of the Infinite, and the apprehension of the  
finite.  
The mirror is a diaphanous body disposed to receive all the figures that are  
presented to it.  
Andre Breton, quoting Ramon Lull in (Breton, 1972: 32)

Breton discussed Man Ray's photography and film:

Far from entrusting himself to photography's ... common ground of  
representation... Man Ray has applied himself vigorously to the task of stripping  
it of its positive nature... If, as Ramon Lulle has stated, "the mirror is a  
diaphanous body disposed to receive all the figures that are presented to it,"  
then one cannot say as much for the photographic plate, which begins by  
requiring that these figures assume favorable attitudes, or goes even farther and  
takes them unawares at their most fugitive moments. These same considerations  
apply, indeed, to the taking of cinematographic images, which tend to  
compromise these figures not only in an inanimate state but also in motion.  
(Breton, 1972: 33)

Whereas the mirror is "disposed to receive all the figures", the camera is a tool in which  
conscious choice, fixity and constructed scenario all play a part. For Breton, the camera  
fixes images in such a way that reality is "compromised" by its representation: "it is  
not... the faithful image that we aim to retain". He praises Man Ray's ambivalence  
towards his subjects, saying that "beautiful women who expose their tresses" are the  
same to him as "a quartz gun, a bunch of keys, hoar-frost or fern". They are all  
"abandoned simultaneously to the delectation of the shadows", the gregarious  
photographic negative, which seems to derive pleasure from contact with the world of  
light and images. "The two images live and die from the same trembling, the same lost or  
intercepted glimmers of light" (1972: 32-33). Breton understood, as few authors have,  
that Man Ray's true subject is light and he linked Man Ray's gaze to a subject-  
ambivalence shared by Lull's catoptrical mirror. The mirror and the gaze were both  
reflectively concerned with imaging and light. Both opposed the fixity and narrative  
structuring of conventional cinematography.

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<sup>94</sup> Lull was a favoured alchemical authority for Dee, Bacon (French, 1987: 47) and Newton (Newton, 1680-1690).

Rudolf Kuenzli and Inez Hedges are among those who have discussed the alchemical symbolism of Man Ray's works.<sup>95</sup>

*Emak Bakia* (1926, 21m)<sup>96</sup> develops the experimental themes Man Ray introduced in his first film. This was Man Ray's first real opportunity to develop a *cinépoem*, as he titled it, with his own ideas, under his own direction, and with proper financial backing. The result is a tour de force of catoptrical visual experimentation, a film depicting the movement of light. These light forms dominate the film and are interspersed with more recognisable scenes, including a sea which inverts, transforming to sky.

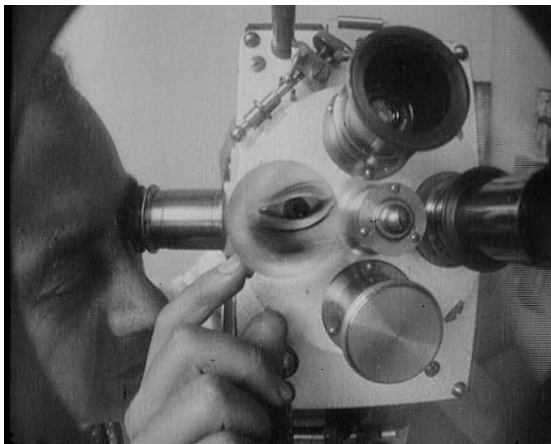


Fig. 48. *Emak Bakia* (1926)

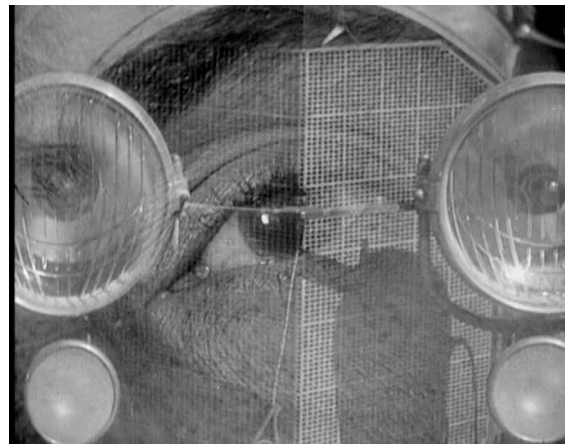


Fig. 49. *Emak Bakia* (1926)

In the opening shot (fig. 48), Man Ray's own upside-down eye is superimposed to take the place of the lens, looking at us. To film this he would have been looking back at himself, filming in a mirror. It is a powerfully reflexive cinematic image, capturing the tension between self-reflection and visual questioning that is so fundamental to experimental filmmaking. A sequence of light play follows, composed of rayograms, light patterns, an electronic billboard, light refractions through a prism, and shadows across surfaces. The film then cuts to a closed eye. As the eye opens, it cross-fades to the front lights of a car (fig. 49). The two images, of the *camera eye* and of the *headlight eye*, both testify to the penetrating nature of filmic sight. They also foreground the glass *lens* and the *mirror* as devices implicated in the perception of light, in actual illumination, and inside the film apparatus itself. It is a very particular kind of seeing that involves light in

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<sup>95</sup> See (Kuenzli, 2007) and (Hedges, 1996). Man Ray's wider work is discussed in an alchemical context in (Schwarz and Ray, 1977). Man Ray's "alchemy" is mentioned more lightly in numerous catalogues and publications.

<sup>96</sup> The title, according to Man Ray, is a Basque expression meaning "don't bother me". A degree of mystery surrounded his use of this name, including the myth that Man Ray took the words from a gravestone. It is in fact the name of the house in which the scenes looking out to sea were shot (now renamed). *The Search for Emak Bakia* is the title of a 2012 documentary by Oskar Alegria, who makes an idiosyncratic filmic journey in search of the place that was *Emak Bakia*. The film is also a visual homage to Man Ray's film itself.

ancient theories of both *intromission* and *extramission* at once (see Chapter 3.2). One is receptive, voyeuristic and inwardly reflective, the other emanatory, illuminating and outwardly reflective. Man Ray may or may not have known anything about early theories of vision, with their ideas of light emanating in order to illuminate the subject of sight, but I can think of no better image to represent active *extramission* than this image of the *headlight-eye*.

William Wees draws attention to the “explicit depiction” of the “implicit equation” in cinema, between what he sees as the true essence the medium – *light* – and vision itself, exemplified in the camera-eye image within *Emak Bakia*:

Perhaps it was inevitable that avant-garde filmmakers seeking the “true essence” of their medium would hit upon the “essence” of vision as well. Avant-garde filmmakers... did not necessarily make a conscious effort to equate the basic elements of cinema with the basic processes of visual perception. Whether they did so or not, their work has been influenced by an implicit equation between cinema and seeing.... The superimposed eye in the camera lens in Vertov’s *The Man with a Movie Camera* (1929) and Man Ray’s *Emak Bakia* (1926) is in fact an explicit depiction of this implicit equation.  
(Wees, 1992: 13)

In Figure 50, we see the strongest structural element in *Emak Bakia*: the repeated opening of closed eyes. After the first open eye of the camera, there are five further sequences where this action is depicted. The first time a single eye (male) opens within the car headlights, the next three incidences involve headshots of women’s faces opening their eyes, often bookended by entirely abstract light imagery. The last involves a woman, the famous model Kiki, with open eyes painted on her eyelids, which she then opens, as if she now has the gift, or curse, of perpetual perception (see the last two stills in Figure 50). Or perhaps, she has finally found a way to inhabit both sides of the camera, or both sides of her own perceptual processes, inner and outer vision, at once. Her face then dissolves into the same fluid abstraction with which the film began.

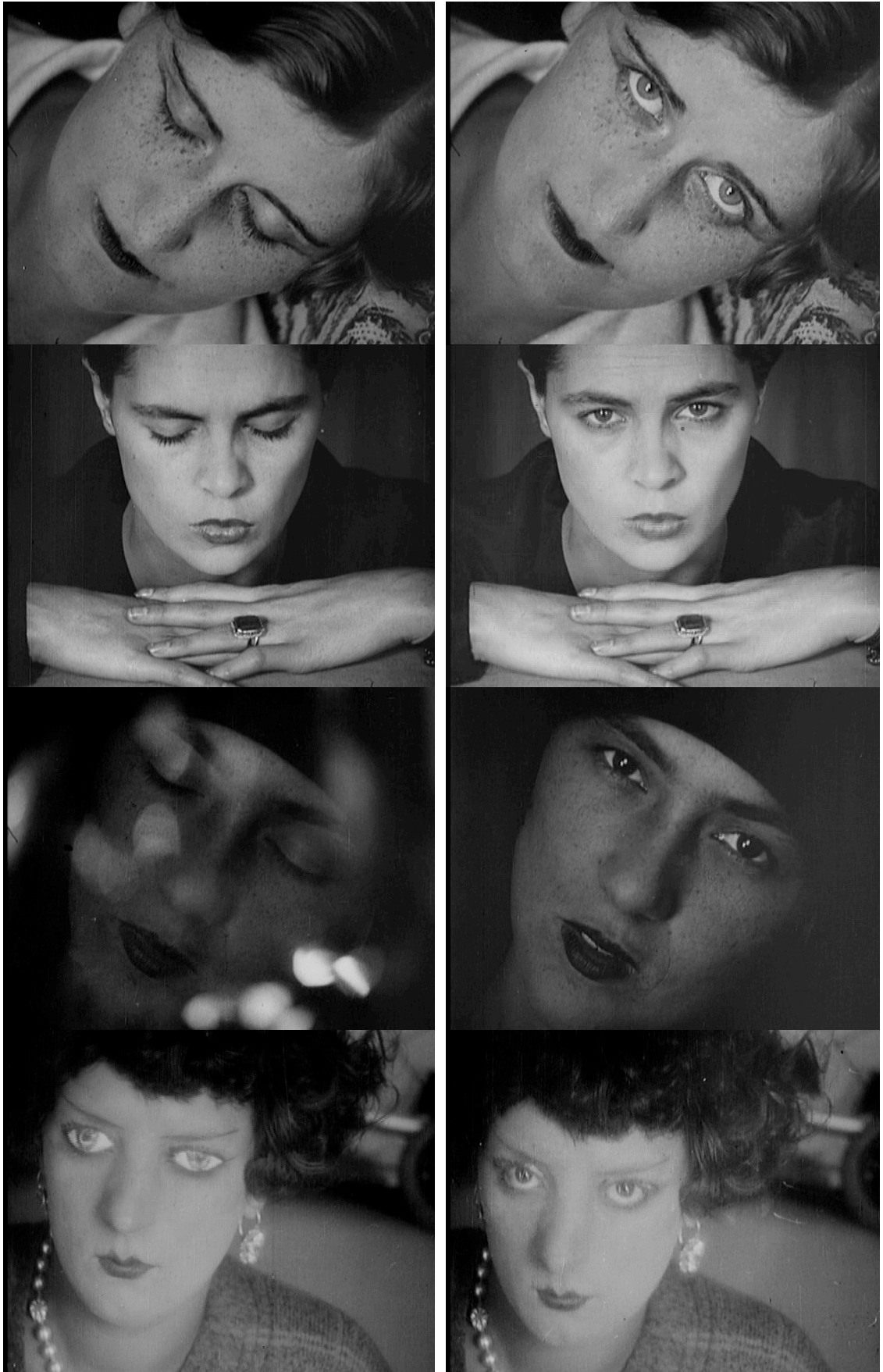


Fig. 50. *Emak Bakia* (1926)

These *eyes closed, eyes open* sequences mirror the *camera-eye* and *headlight-eye* images. They can be read as an oscillation between dualities, Man Ray attempting to restore to us a less objective and pre-scientific form of vision, in which light/dark, inner/outer, dream/reality, perception/imagination, reality/camera, mirror/lens, self and other are entangled. He uses the *vision of vision* with the light and dark of the black and white medium to communicate that to us. The film asks the viewer to look at vision and then at vision being transformed, through glass and light-reactive film. When Man Ray said of *Emak Bakia* that it is "purely optical, made to appeal only to the eyes ... the result of a way of thinking as well as of seeing", he offered a provocatively short précis of the complex concerns he was clearly exploring in this film (Knowles, 2009: 118).

What is so unusual in *Emak Bakia* is the extent to which the sense of catoptrical experimentation behind the film artefact is made visible to us, his "improvisations" or "automatic cinema". Man Ray offers an opportunity to participate through his experimentation, both luminous and perceptual. We become participants, or witnesses, to a kind of Surrealist séance in which anything might happen. Viewing becomes the *witnessing* of one long experiment, carefully orchestrated to contain a structured line of enquiry. The subject of this enquiry is, broadly, *seeing*. The experimental substance of the film is *light*, and the means Man Ray used to explore both substance and subject were *catoptric*, creating the strange sensation that the film extends outwards beyond the screen image and connects us to the processes behind it.

The number of experimental catoptric techniques used in the making of *Emak Bakia* is extraordinary: superimpositions, double exposures, rayograms (photograms) made directly on the film strip, filmed rotating light-refracting prisms and glass crystals, blurring, soft focus, filming through various glass objects and water, throwing the camera in the air, temporal shifts and temporal reversals, slow motion, perspective inversions, animation, filming of rotating objects on a turn-table, and night filming of electric lights. It is as if, in the making of the film, Man Ray constantly asked himself, "now how can I use the camera to transform *that?*" A starched collar, perhaps symbolising constraint and convention, becomes transformed into something beautiful and balletic, yet not something abstract. A sea becomes sky. The film is full of transformations. As Man Ray described it:

This film tries to indicate the essentials in contemporary photography. It is not an 'abstract' film or a story-teller; its reasons for being are its inventions of light-forms and movements, while the more objective parts interrupt the monotony of abstract inventions or serve as punctuation.

Man Ray, *Close Up*, 1927 in (Donald et al., 1998: 44-48)

The word *abstract* has been overused about this film. Above, Man Ray himself denied that it is abstract, while describing his light catoptrics as "abstract inventions". Knowles describes Man Ray's work as an "oscillation between abstraction and figuration" (Knowles, 2009: 73). Yet the light sequences are not abstract for Man Ray, since there is no *other thing* for them to be abstracted from. The subject matter is filmed light, his *prima materia*. That what we see has been transformed through the means of the film and the camera, does not mean that they have in any way become abstract, they have not become anything *else*.

In her discussion of *Le Retour à la raison*, Knowles acknowledged the palpable feeling of experimentation, coming closer to a reading of the film as process rather than artefact:

These strategies, even whilst they foreground tactility and tangibility, nonetheless give rise to a paradoxical effect in which presence is played against absence and the images refer less to themselves than to the process that was used to create them.  
(Knowles, 2009: 73)

The subject of the film therefore is both seeing *and* experiment. As viewers, we are placed *almost* inside Man Ray's visual laboratory, peering through a murky window at the miraculous experiments being conducted, voyeurs from outside.

Malcolm Le Grice argued that Man Ray's photogram techniques "draw attention to the material nature of the film itself and the images on it as a photochemical reality" (Le Grice, 1977: 35). Le Grice saw the photogram technique as a foreshadowing of later concerns with the materiality of film.<sup>97</sup> It is true that some experimental filmmakers have centred their practice on the material qualities of celluloid film, but there is no evidence whatsoever that the materiality of film was a major concern for Man Ray. I suggest his concerns were with wider experimentation, including the matter of film, but also, an alchemical-catoptrical experimentation with light, sight and the recorded image itself.

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<sup>97</sup> On Man Ray's first experiments with the filmstrip – as an example of direct interaction with the film medium, and its subsequent journey through 20th century film theory, see (Elcott, 2008).

The poet Robert Desnos, a key figure in the surrealist circle, provided the shooting script for Man Ray's third film, *L'Etoile de Mer* (1928, 17m). Desnos's involvement in this film was greater than previously supposed. He provided the scenario and instructions for particular shots to accompany his poem and Man Ray subsequently interpreted and shot the film, following Desnos's script closely (Kuenzli, 2007: 99).

Desnos had a particular interest in alchemy and trance states. One year after Man Ray completed *L'Etoile de Mer*, Desnos published *Le Mystere d' Abraham Juif*, an article on the legendary, mainly fictitious alchemist Nicolas Flamel (ca. 1330–1417). The article appeared in Georges Bataille's journal *Documents* in 1929 (Conley, 2003: 8, Warlick, 2001: 94-100), relating Flamel's encounter with Abraham the Jew. The article abounds in alchemical symbolism and transformations (Warlick, 2001: 95). When Desnos wrote the script for *L'Etoile de Mer*, he was thus steeped in mysticism and actively participating in regular Surrealist séances, a living example of surrealism as a way of life.

With such a partner as script writer, *L'Etoile de Mer* has invited alchemical interpretations which have focussed on the film's pictorial content, its symbolic and allegorical alchemical references.<sup>98</sup> Inez Hedges identified alchemical and occult elements within the film:

The "mer" of the title is the dangerous sea on which the alchemist sets out, searching for the unification of the elements, represented as male and female. The starfish is the androgynous symbol that lies at the end of that search; enclosed in glass, the alchemist's vessel, it is a combination of the feminine elements of earth and water (as fish), and the masculine air and fire (as star). With its five points, it resembles the hermaphrodite that stands at the end of the alchemical operation.  
(Hedges, 1996: 101)

However, it is difficult to identify any such alchemical storyline or sequential transformation process in the film itself. I doubt that Desnos constructed the story with such a contrived symbolic structure or such obvious metaphysical objectives. Hedges identifies the book upon which the woman places her foot as an alchemical text, the woman ascending the stairs with a knife as an alchemical "sundering" by sword, the sequence of glass objects as alchemical vessels, the glass jar holding the starfish itself an

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<sup>98</sup> See (Kuenzli, 2007), (Hedges, 1996) and (Magrini, 2001) for alchemical readings. Several writers have focussed on a scene in which the man goes upstairs with the woman, undresses and lays down. He then takes leave of her. Sitney interpreted this as a "fear of sex", Rabinovitz as the "castrating nature of woman's active sexuality" and Thiber as "A primordial expression of man's fear of female sexuality" (Thiber). (Hedges, 1996: 102) The erotic meaning of this scene has been overstated. I read its eroticism, if there is any, to be related to the alchemical union of opposites.

alchemical vessel. Her reading of the *starfish* in the film ultimately draws heavily upon a Jungian understanding of alchemy as a psychological quest for individuation:

The star is associated with the seventeenth card of Tarot. Which represents the final stages of the alchemist's spiritual journey.... Jung links the starfish to the myth of psychic regeneration.  
(Hedges, 1996: 106)

Hedges equates the female character with the *soror mystica*, or mystical sister: a female alchemist depicted working alongside a male. This idea mirrors the *sun-sol* and *moon-luna* coupling as a male-female couple or hermaphrodite, commonly seen in alchemical diagrams (see fig. 51). The *soror mystica* phrase gained currency through Jung's *Psychology and Alchemy* (1944), but the idea is much older (Jung, 1953: 73).<sup>99</sup> Images of the *soror mystica* in the alchemical laboratory are common, notably in the *Mutus Liber* (see Chapter 3.3 and fig. 23 above), widely circulated within French occult circles (McLean, 1991: 52). Desnos's interest in Nicolas Flamel may also have coloured his script.<sup>100</sup> The current legend ends with Flamel and his own *soror mystica*, Perenelle, becoming immortal after finding the elixir of life together.



Fig. 51. The protagonist and his *soror mystica*, *L'Etoile de Mer* (1928)

<sup>99</sup> Jung probably drew the idea from his reading of Zosimos of Panopolis (ca. 300 A.D.), who dedicated his encyclopaedia of esoteric alchemy to his "spiritual sister", Theosebeia (Linden, 2003: 8, 50). Jung also cites the examples of Nicholas Flamel and Peronelle, Simon Magus and Helen (1963: 153). He reproduces several plates from the *Mutus Liber* (1953). See also (Jung, 1967: 73).

<sup>100</sup> Desnos cited Grillot de Givry's widely circulated *Le Musée des sorciers, mages et alchimistes* (1929), as a source for his discussion of alchemical imagery. His article on Flamel also drew on Fulcanelli's earlier *Le Mystère des cathédrales et l'interprétation esotérique des symboles hermétiques du Grand-Oeuvre* (1926), which discusses Abraham the Jew, the original source text from which Nicolas Flamel supposedly based his discoveries. Desnos also claimed he and Flamel shared the same Parisian neighbourhood.

While images in *L'Etoile de Mer* are borrowed from alchemical symbolism, the catoptrical metaphor at its heart is the relationship between the earthly and the celestial: an alchemy of celestial correspondence and a psychoanalytical reading of the alchemical process of *sublimation*.



Fig. 52. The starfish in the vessel *L'Etoile de Mer* (1928)

In Figure 52, the male protagonist gazes at the starfish he has captured inside a glass vessel. An atmosphere of fascinated longing permeates the scene. Kuenzli argues Desnos in fact *sublimated* his idealised love for Yvonne George, a Belgian cabaret singer, into the starfish. Desnos said of the starfish that it was the embodiment of “a love well lost” (2007: 99), while his wife, Youki (Lucie Badoul) claimed Desnos loved her in a “supra-terrestrial” manner and that he “sublimated her into the star” (Desnos, 1999: 131). Whether or not Desnos intended to sublimate Yvonne George, the male protagonist of the film certainly performs an alchemical-psychoanalytical *sublimation*, projecting his yearnings into the captured sea-star.

In alchemical practice, *sublimation*<sup>101</sup> was:

The deposition of crystals in the cool upper part of the vessel containing heated solid material in its lower part ... likened to the upward flight of swans, doves and other birds. The process was sometimes called ‘exaltation’, or ‘elevation’,

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<sup>101</sup> See 5.1 below for further discussion of the stages of alchemical change.

and when repeated many times it was supposed to furnish the 'quintessence' of the material concerned.  
(Read, 1936: 138)

It was considered a transformation of *elevation*, and then condensed to a higher state of matter. The term was appropriated by psychoanalysts. Freudians considered sublimation to be a sexual drive sublimated into everyday action. Jung considered it a more positive, mystical transformation, in which "the distillate is subjected to sundry distillations so that the soul or spirit shall be extracted in its purest form" (1953: 124). Jung's view of sublimation directly opposed Freud's:

Sublimatio is part of the royal art where the true gold is made. Of this Freud knows nothing, worse still, he barricades all the paths that could lead to true sublimatio.....It is not a voluntary and forcible channelling of instinct into a spurious field of application, but an alchemical transformation for which fire and prima materia are needed. Sublimatio is a great mystery.  
(Jung, 1973: 171)

It is probable that Desnos would have been more closely aligned with the Jungian interpretation. He had been analysed by René Allendy, a psychoanalyst with strong Jungian sympathies who was interested in Paracelsan theories of correspondence.<sup>102</sup> If, for Desnos, the starfish was the singer Yvonne George sublimated, he transformed her into what we might consider a more rarefied substance, a more highly prized version. This links to Ficino's idea that earthly love could lead to the transcendent. An alchemical visual system of correspondence links the sublimated woman and the starfish with the realm of the celestial, and an upward looking "exalted" state.

The idea of celestial/earthly correspondence is thus embedded within *L'Etoile de Mer*. The starfish, the sea-star, embodies the invisible, non-material idealistic qualities of the protagonist's imagined muse, held in an earthly reality. The earth bound sea-star, imprisoned within an alchemical jar, has its mirror in the stars above. The male protagonist's ideal of the feminine is presented as celestial, something he knew he could never reach nor possess. In the film, Man Ray actualises this metaphor, filming both the starfish (fig. 52 above) and the stars at night (fig. 53):

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<sup>102</sup> René Allendy's degree dissertation was on 'Alchemy and medicine'. He also published a book on Paracelsus, *Paracelse, le medicin maudit* (1937). Alongside psychoanalysis he practiced homoeopathy and studied esotericism and numerology. He wrote extensively on psychoanalysis.



Fig. 53. The stars at night, *L'Etoile de Mer* (1928)

Man Ray's approach in filming *L'Etoile de Mer* extended the catoptrical correspondences. He abandoned the reckless visual experimentation of *Emak Bakia*, preferring to use one predominant optical technique. In the opening scene, an oval glass door opens onto the world of the film. At the end the same happens in reverse, the glass door closes. The process of sublimation happens, therefore, within a world encased in the glass alchemical vessel. Much of the film is shot through an uneven gelatine filter, producing images which look as if they belong in a blown glass vessel (see fig. 54).<sup>103</sup> So our point of view is from within some kind of interiority, shrouded in blurry glass, seeing what is inside with us, or looking outward, through glass. The catoptric intermediation of the glass/gelatin distances the viewer and prevents him/her from seeing external reality clearly.

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<sup>103</sup> Exactly how this effect was achieved remains mysterious. Several authors claim it was shot through a "gelatin filter", while one suggested it was shot through "Vaseline" on the lens. I myself have tested shooting *sharp* images from this film through a thin glass hand-blown round glass vessel and the resulting blur is very similar to *L'Etoile de Mer*.



Fig. 54. The female protagonist shot through a filter, *L'Etoile de Mer* (1928)

The camera, as it oscillates between blurred shots and sharp focus, is always in sharp focus when trained upon the starfish; as if the point of view of the camera itself were situated within the vessel. Within the twenty scenes in which the woman appears, she is blurred in fifteen (see fig. 54), and in sharp focus only when partially seen, dressed in costume, or when she appears with the starfish. There is only one brief scene, where we see the woman's face, asleep, in sharp focus. In contrast, the starfish is always in sharp focus, except in the opening scene *before* the film title. The viewpoint of the film is that only the sublimated, elevated version of the woman (the starfish) can ever really be clearly seen, everything else is a passing glimpse. The *reality* of the woman is outside the point of view, seen through distorting glass, as if looking outward at her from inside the alchemical glass vessel within which she has been sublimated.

After this film was made, Desnos described it as follows:

The dark operations with which [Man Ray] has constituted an alchemy of appearances... with the help of inventions that owe less to science than to inspiration.  
(Schwarz and Ray, 1977: 160)

## 4.2 *The alchemical subjective in the films of Patrick Bokanowski*

The work of the contemporary French filmmaker Patrick Bokanowski (1943- present) carries certain important concerns of both early cinema and the Surrealist filmmakers into the present era.<sup>104</sup> A concern for the subjective psychology of the image, a rejection of the tools of conventional camera representation, his use of “eyes closed” drawing, a sense of the absurd, and a painterly, dream-like and visually distorted world of imaging are all characteristic of his work. Bokanowski is also one of the foremost practitioners of modern experimental catoptrics within filmmaking. I focus on this element here.

Between 1972 and 2013 Bokanowski produced eight experimental shorts, two documentaries and one experimental feature, *L'Ange*, five years in the making and completed in 1982.

From 1962 to 1966 he studied photography, optics and chemistry under Henri Dimier (1899–1986),<sup>105</sup> a painter who, according to Bokanowski, specialised in optics and perspective systems. Bokanowski later made two documentaries, one about Dimier. *La Part Du Hasard* (The Role of Chance, 1982) explored Dimier’s techniques of creative spontaneity, liberty, fantasy and chance. His second documentary subject was the psychotherapist Colette Aboulker-Muscat (1909-2003)<sup>106</sup> in *Le Reve Eveille* (The Waking Dream, 2003). An important collaborator in his filmmaking is his wife, Michelle Bokanowski, a respected sound artist who produces the soundtracks for his films, none of which contain spoken dialogue (other than the documentaries).

Bokanowski’s work is complex and difficult to categorise. His work sometimes has strong theatrical and apparently narrative elements, yet it is often visually abstract.

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<sup>104</sup> The writer and film historian Dominique Noguez has written on Bokanowski in French, and discussed his films in *Éloge du cinéma expérimental* (1979; reprint 1999, 2010). In English, his work is not found in the standard reference texts on experimental film, other than a passing mention by Martine Beugnet in *Avante Garde Film*. There is an interview in Scott Macdonald’s *Critical Cinema* series (MacDonald, 1998) and a discussion of *L'Ange* by the Quay brothers in (Elder, 2013b: 8-15). Siegfried Zielinski is one of few academics to have seriously engaged with his work, writing a festival catalogue essay (in German) and regularly speaking about and screening his film *L'Ange*.

<sup>105</sup> Dimier was a French painter who trained at the École des Beaux-Arts in Paris. His circle included Sergei Diaghilev, Jean Cocteau, Serge Lifar, Igor Markevitch and Marie-Laure de Noailles (a wealthy patron who also financed Man Ray’s film *Les Mystères du Château de Dé*). The subject of his drawings were “endless metamorphoses”, and he often used “random processes” to stimulate his imagination (Sainte-Croix, 2011).

<sup>106</sup> Aboulker-Muscat was a psychotherapist born to a “Kabbalistic Jewish family”. She studied in Paris under Professor Desoille, who developed a method called “Reve Eveille Dirige” or “directed waking dream”. *The Encyclopedia of Mental Imagery* contains 2,100 mental imagery exercises from her work. Her own books include *Alone with the One*, a book of poems, and *Mea Culpa: Tales of Resurrection, a collection of cases of “possession”* (Epstein et al., 2012).

Many images are layered together, temporally and spatially distorted and manipulated, combined with drawings, photographs, animations and re-filming techniques. Film-time lurches from stop-frame animation, to semi-realistic film speed, to fix upon a still frame, jump backwards, repeat or accelerate. He frequently works with built film sets and actors, traditionally the tools of narrative filmmaking, and rarely used within the avant-garde filmmaking tradition. Yet his actors are masked to resemble puppets or grotesques, or appear to disintegrate before the eyes into luminous flows of liquid light. An absurdist scene resembling a trick comedy sketch from the silent film era is followed by an ethereal catoptrical explosion of transcendental light refraction. His films are full of contradictions, uncertain territories, mutating people, things, spaces and categories. A dream-like surrealism goes hand in hand with a pervading sense of claustrophobia and containment; the action within them seems to radiate inwards, like the rays of Newton's *star regulus*, toward the gravitational pull of the interiority of the film itself.

His films have been described as “surreal and ... beautifully absurd” (Rick Curnutte), as “transfixing, mysterious, and impenetrable... evoking the primal, spiritual landscapes that haunt our consciousness” (Pascual Espiritu), or “on the edge between optical and plastic art... testifying to a purely mental vision... affecting and metamorphosing reality” (Pierre Coulibeuf). As a filmmaker, Vincent Ostria has accurately described him as an “unclassifiable artist-chemist of celluloid”.<sup>107</sup>

Several scenes in his feature length film *L'Ange* drew visual inspiration, Bokanowski says, from the astrology manual *Les 360 degrés du zodiaque symbolizes par l'image et par la cabbale* (360 degrees of the Zodiac, symbolized by images and the Cabala, 1939) by Janduz (1874-1954).<sup>108</sup> Janduz interpreted the zodiac from a Cabalistic perspective, illustrating the alignment of personality traits with the distance of the various planets from the sun. Each of twelve astrological signs had 0-29 degrees and Janduz described a *situation* for each, with illustrations by Claude Lhuer (Janduz; Duzéa, 1977). Some of these image-ideas related directly to scenes later realised by Bokanowski.

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<sup>107</sup> See (Curnutte, 2003), Espiritu's review of *L'Ange* (Espiritu, 2006), Coulibeuf's catalogue entry for *Lightcone* (Coulibeuf, 2013) and Ostria in *Cahiers du Cinema* (Ostria, 1985).

<sup>108</sup> Illustrated by Claude Lhuer. Janduz's real name was Jeanne Duzéa. She published several tracts on astrology and founded an astrological school in Paris.

When referring specifically to film, Bokanowski says he learned a lot by watching the animator Jean Mutschler<sup>109</sup> at work. “For me cinema started with cartoons, making ‘cels’, drawings or photos on transparencies, and then filming them” (MacDonald, 1998: 268). He also admires the early filmmakers, especially Chaplin, and Buster Keaton’s early films (MacDonald, 1998: 268, Bokanowski, 1982b). More recently, in talking about *Battelements Solaires* (2008), he cites some of the early mid-century “abstract” filmmakers, Hans Richter and Len Lye, as a starting point for this particular film (Bokanowski, 2008a).

Bokanowski’s visual catoptrics were already evident as an aesthetic concern in his first film *La Femme qui se poudre* (1972). This film uses a distorting lens, high contrast illumination and back-lighting. It also contains sequences reminiscent of the light-play and visual distortions in Man Ray’s *Retour a la raison*, *Emak Bakia* and *L’Etoile de mer*. He uses optical visual manipulation in almost all his subsequent films. The only article written by Bokanowski himself about his work is a critique of visual fidelity and describes his particular use of special lenses and mirrors (Bokanowski, 2007).

*L’Ange* (The Angel, 1982, 70m) is in several visually distinct parts, with the structure of an *ascension*, an upwards journey following a staircase, toward light. The film begins in darkness and ends on a still white frame. The intervening scenes are punctuated with images of hallways and a staircase, ultimately leading to the light source: the beam of the projector. After first seeing the staircase, we see a male figure repeatedly and compulsively lunging with a sword at a doll dangling from string. He is shown in a variety of temporal positions of stasis and motion, as Scott Macdonald notes, the sequence is visually reminiscent of Etienne Jules Marey’s chronotographs. This scene and the next are both derived from Bokanowski’s reading of Janduz. The entry for the 6<sup>th</sup> degree of Aquarius reads:

‘A man wearing a military uniform and wielding a sword hits his target, a bran doll hanging on the wall.’: Stubborn, impulsive, and boastful character. Despite real skills, one wastes a lot of efforts defending futile causes, especially when one is manipulated by flatterers. One must develop self-control and discerning faculties. Pent-up aggressiveness must be canalised in activities requiring physical strength and endurance. Janduz in (Janduz; Duzéa, 2014)

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<sup>109</sup> I can find little information about Jean Mutschler. The one film credit I can find is for the 1960 animation, *De NOE A ZOE*, which is available on a BFI compilation DVD. I have been unable to trace any further biographical information.

In a documentary about the making of this film, Bokanowski talks of “astrological characters... represented like a catalogue illustration of one particular character trait” (Bokanowski, 1982b). Repetition also characterises the next scene, where a man with no hands is unable to intervene as a jug of milk is repeatedly brought to him, and repeatedly falls from his desk. At times, the film seems stuck in a loop, as Bokanowski’s characters often are. According to Michelle Bokanowski, they are “stuck on one action, and only that one action” (Bokanowski, 1982a).

Other tightly constructed scenes follow. A man takes a bath in sped up silent-film speed, and gets dressed in reverse. This might be viewed as a cleansing, but for its bewildering comedy trickery, which lends it the early film feel of Chaplin or Méliès (and see fig. 57 above). We then enter a library containing nine masked librarians, all engaged in apparently pointless repetitive activities of filing and searching, until, at last, one of them finds the answer in a book. The librarians all file out and enter a fictive landscape, resembling the surface of a Lars Bo painting. Here, they miraculously arm themselves and break their way into a transparent box containing a naked woman. She is then shown, rather like a Man Ray nude, as a canvas for beams of light.

We then see light streaming as if from a projector, through a large round glass lens on a pedestal and through a second refracting prism (see fig. 60). We see a room illuminated in refracted patterns of emanating yellow-orange light. At one stage a hand enters to place a further lens into the path of the light. Light seems to be refracted through these lenses into space, and upon a curved round convex object that may be a mirror. The scene makes significant use of still frames, and is shot from almost every conceivable angle, through doorways, from the end of a hallway, from above and below. Bokanowski described his experiments with light while developing this scene:

We’re trying a version of Newton’s optical experiment that split light to demonstrate the colour spectrum. The more it’s focussed on the screen, the more dazzling this beam of light becomes. As we move forward we hear a muffled conversation... at the final door, there’s a scene... with giant characters caught in the constantly shifting beams, and constantly shifting blacks and whites. I haven’t worked out yet how to make these light beams ...I went to the Science Museum but it was too dark in there to film, so I’ll have to do tests to see how we can do it. You’ve seen the shifting light beams from a cinema projector... I’ll maybe film and superimpose them over this image.  
(Bokanowski, 1982b)

A figure finally emerges into the path of the light emanation, progressing upwards toward its source, always in silhouette. The figure is almost unrecognisable as such at

first, ascending the staircase amid a wash of yellow light. The camera looks up at the silhouettes of trees, as if emerging from some kind of underworld. Flowing particles of light seem to wash across the screen and, at the top of the stairs, flashes of white increase in frequency until only a still white frame is left.

Bokanowski's *L'Ange* is alchemical-cathoptric on a number of levels. Firstly, its central theme is fundamentally bound up with idea of the *higher* nature of light. It would be tempting to interpret the film as a Cabalistic ascent toward the light of divinity, as we have seen in the work of Khunrath (Chapter 3.3 above). The film can certainly be read as a progression through a number of stages toward a higher state of being: the name of the film, *L'Ange*, or *The Angel* is revealing in this respect. Images such as Stefan Michelspacher's alchemical *Cabala* (fig. 55) could almost be a structural blueprint for this film, representing stages of alchemical transformation on a rising staircase, leading to the emanating Godhead above, contained within an arc of astrological signification. Louise von Franz gives a Jungian interpretation of Michelspacher's image as showing the psychological growth of the individual, "analogous to the stages in the alchemical transformation of base matter into gold" (von Franz, 1980: 12).



Fig. 55. Steffan Michelspacher, *Cabala* (1616)

Discussing the film, Pascual Espiritu noted that “an underlying celestial entity continues to pervade the film's visual composition through... point source lighting... the luminosity, that, through light's integral optical properties of diffusion and diffraction, results in the formation of recursive, concentric rays that project a sunburst or halo effect throughout the film” (Espiritu, 2006). Bokanowski himself downplays suggestions of the film being a religious or mystical allegory. When Scott Macdonald suggested it progressed “from the demonic... toward the exalted”, Bokanowski would only concede that “you go from cellar to attic”, an upwards movement. He goes on to say that this ascent is from a “dark, shapeless, not very precise starting phase” progressing upwards toward the “precise.. extremely luminous” end (MacDonald, 1998). Bokanowski here links light with the creation of precise form, implicating light, growing in luminosity, in the progressive structural development of the film. For Bokanowski, structure and precision seem related to luminosity. This contains echoes of the theories of cosmogenesis put forward by Grosseteste (see 2.1), in which the formless was given form through the geometrical spreading of light rays.

The film is also a psychological narrative, drawing on Janduz's astrological book. Janduz defined 360 individual scenarios for states of character development, linked to specific moments in time, or degrees, of stellar influence. The film therefore seems to embrace an archaic catoptrical conjunction of light metaphysics and astrological (stellar) influence. Bokanowski's characters are stuck in a moment of time, unable to develop, doomed to a kind of repetitive fatalistic containment in their own present. This characterisation accurately reflects Janduz's descriptions of the astrological degrees as fatalistically determined by stellar positions, fixed and non-progressive, bound in a loop-like moment of time. The psychological progression of the individual begins to resemble a Cabalistic programme of staged spiritual development.

The film itself uses light in its capacity of emanation. Light emanates downwards, and is explored in a strictly optical sense. In the remarkable Newtonian light sequence before the final scene of ascension, the catoptrical apparatus and its light refraction is revealed:

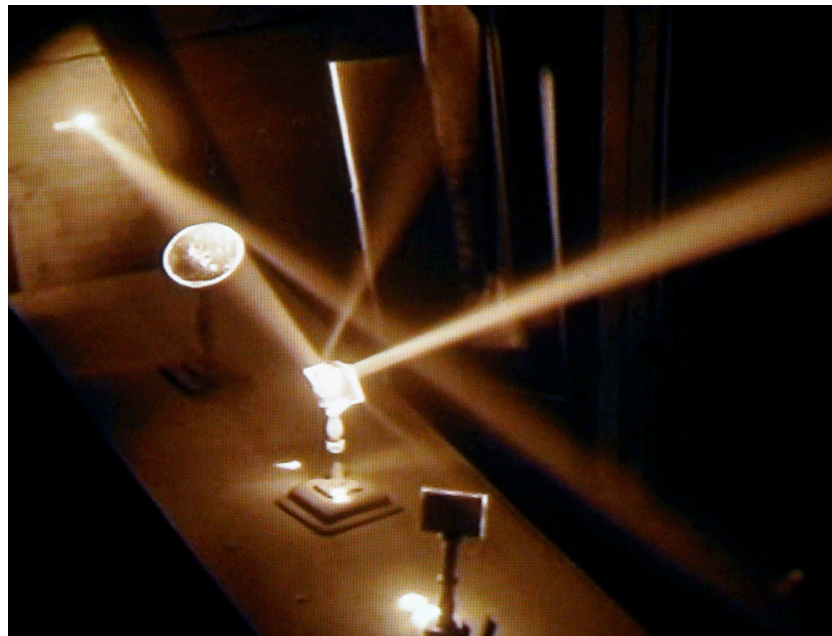




Fig. 56. Patrick Bokanowski, 2 film stills from *L'Ange* (1982)

The similarities between the two film stills shown in Figure 56 and the illustrations encountered in the literature of alchemical catoptrics are quite striking (see figs. 23, 27, 28, 31, 33-44).

Bokanowski says he does not draw directly upon alchemical sources and states that the relationship he sees between his work and alchemy is “only may be this: when we work, any kind of work, can we avoid to transform ourself?” (Bokanowski, 2013).<sup>110</sup> His conception of the alchemical is one of personal transformation rather than material process.

The similarities noted in Figure 60 can be accounted for in simple terms. The lenses, prisms and mirrors he uses to manipulate light in *L'Ange* are situated *outside* of the camera, effectively becoming a spatial extension of the catoptrical device of the camera. The light, passing through these external lenses, then passes through the camera's own lenses and mirrors, focussed on the chemical matter of the filmstrip. The final images, it must be remembered, are the result of a photo-chemical reaction, captured through a spatially distributed light manipulating device. This sequence of imagery shows the light refracting device, and captures both the refracted light beams themselves and the light source, a projector. The result is an inwardly emanating loop, much like his other characterisations within the film. The sequence loops from projector light to lens to

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<sup>110</sup> There are the frequent references to his filmmaking as ‘alchemical’ and his DVD covers include his description as an “artist-chemist of celluloid”, wording he presumably would have approved.

prism to camera (more lenses and mirrors) to imprint upon the filmstrip, which will subsequently be re-animated by projector light. This light, too, is somehow bound within a repetitive loop of time.

In *Optical Reflections*,<sup>111</sup> Bokanowski argues that the creativity of early cinema was partly due to the many painters who became involved in pursuing their aesthetic concerns through the film medium. This encouraged the development of a personal aesthetic style of imaging subsequently lost, or rather, “the project has been abandoned”. He argues that the increasing fidelity of the camera apparatus, as it developed, actually reduced the possibilities for free visual expression:

What one gained on the one side (simplification of the picture-taking) one had lost on the other because one had more or less forgotten about the consideration of the aspect of the image (individuality, the intrinsic style inherent in the image).

(Bokanowski, 2007)

He laments what he calls the “uniformity of the cinematic image” across world cultures, which “can only exacerbate the disappearance of artistic individuality”.

The prime reason for the lack of progress in this situation comes from the lenses used to take the picture...The principles underlying their design are not questioned, nor even discussed... Since 1870, progress has consisted of improving the combination of lenses... in order to achieve the same end, implicitly understood to be “a faithful image of reality”, of the “objective” and scientific reality... Directors, wanting to make an impact on their public, work with images that generate emotion. They have no use for an image labelled “scientific”. In fact, all their work is subjective in nature, work born of an artistic conviction. And the instrument by which they achieve this ought to be able to bring about that intrinsically “pictorial” quality of the image.

(Bokanowski, 2007)

In French, “objectif” means both *lens* and *objective*. Bokanowski argues for a camera that has a “subjective” capability of vision. By this he means one in which the operator has control over all the things that have been removed from the operator’s control: perspective shifts, diffusions, luminosity shifts, colour changes, multiple perspectives and viewpoints etc., leading to a “psychological optics”. Some of these capabilities are available today in the digital domain, but, importantly, they exist mostly as complex technical tools in the software-based post-production environment. It is rare to find any kind of unconventional image manipulation tools in professional camera systems, where the drive toward increasing representational fidelity is unrelenting. An artist, wishing to work with Bokanowski’s more “subjective” form of imaging, can usually only imagine

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<sup>111</sup> First published in *Revue et corrigé* N°8 in 1991. I refer to the 2007 updated and translation version.

these alternate possibilities while shooting, perhaps to execute them in post-production. This control is not available through the camera viewfinder, unless using one of a limited range of standardised special effects lenses and filters. This is a central issue for Bokanowski and he returns to it in his 1998 interview with Scott MacDonald:

I could not and cannot work with the immediate images produced by a camera. Modern optics handicap me; the picture they produce is too simple and not meaningful enough.  
(MacDonald, 1998: 265)

Bokanowski cites Henri Dimier, whom he describes as “a great connoisseur and lover of optical phenomena and of different methods for representing perspective” (2007), for stimulating his optical experiments. He thanks Dimier for his ideas in the credits to *La Plage* (1992). David Hockney’s use of multiple viewpoints is one example Bokanowski gives of the successful use of alternative optical techniques.

Bokanowski discusses several catoptrical experimental processes for creating and using “photographic subjectives” in *Optical Reflections*:

- Use of antique “uncorrected” lenses mounted on the front of a wooden box, projecting onto tracing paper in the rear.
- Multiple layered perspective shots.
- The building of sets with altered visual perspectives.
- Filming the reflected oscillations of mercury.
- Filming reflected images in handmade polished metal mirrors with ‘sculpted’ irregular surfaces.
- Using blown glass to create transparent forms to shoot through.
- A “moldable” mirror surface applied to a sheet of lead, which can be adapted while shooting to suit the subject.
- An 80 mirror structure (fig. 62) that can be manipulated to give a variety of different effects.

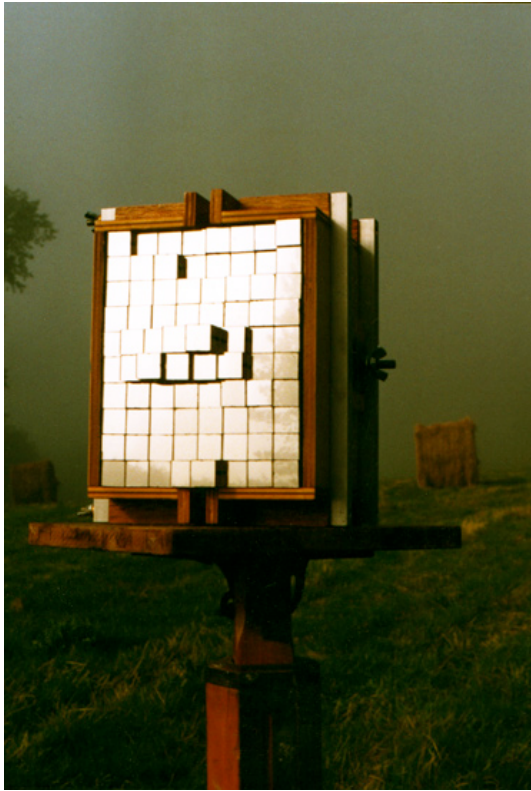


Fig. 57. Patrick Bokanowski, *80 mirror device* (undated)

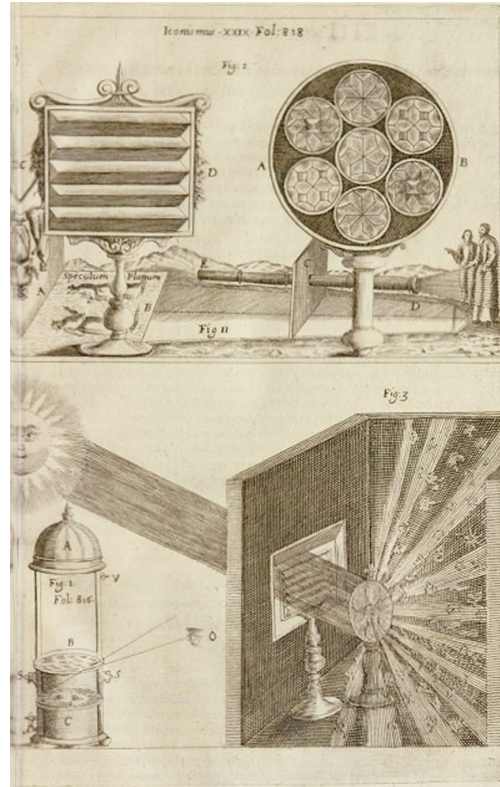


Fig. 28. Athanasius Kircher *Ars magna lucis...* (1646)

There are striking similarities between some of Bokanowski's devices and those illustrated by Athanasius Kircher (fig. 57 and top of fig. 28). Bokanowski's catoptrical imaging tools have a striking physical presence and handmade character. They operate as handmade lenses through which he can filter reality into a more personal and "subjective" vision at the moment of image capture. These tools also seem to allow him to see images more psychologically, in the present as they are happening, a "photographic subjective" form of seeing (2007). Doubtless, each of Kircher's devices would have had a similarly unique image-making or projecting quality, full of variations, fluctuations, uncertainties and distortions. According to the Quay Brothers it's as though the film *L'Ange* were "seen through a kind of magnificently flayed retina" (Elder, 2013b: 10). Many of Kircher's devices also operate outside the image chamber (see figs. 26 and 27 above). Once imaging catoptrics became boxed and manufactured within the camera (which, after all, is really just a very much smaller image chamber), the creative deviations and optical transformations of these devices began to ossify into an increasingly standardised idea of how images should look. Bokanowski places his imaging optics once again outside the camera (or chamber), freeing the catoptric mechanism of image transformation from this standardisation and opening up possibilities for imaging that may not have been seen for several hundred years.

Two of Bokanowski's 1990s films make the greatest use of these techniques.



Fig. 58. Patrick Bokanowski, film still from *La Plage* (1992)

*La Plage* (The Beach, 1992, 14m) is in four parts, each part filmed on a beach, with a powerful soundtrack by Michelle Bokanowski. The first part shows dark blue sea, its surface glowing with a ghostly light (fig. 58). Dark silhouetted human figures appear among the waves, a young child thrusts himself against the waves repeatedly. It is an everyday scene, but radically transformed into a moonlit world where figures are dark, the sea is impossibly blue, and the world is bathed in an unnatural luminosity. Bokanowski describes a complex range of mixing and compositing techniques used for the realisation of this scene:

There's a real cliff, shot at a precise time of day, as a storm broke. Then later, in the studio, I added to the cliff, for example, sun glints on barely moving water... then clouds moving at a different speed: trying out a range of different sunsets, clouds etc.. melding them together, maybe superimposed over a projected image of a bit of wall... it's enhanced, layer by layer.  
(Bokanowski, 2008b)

The second part shows people on the beach, with a blue and white sky layered over images of waves, as figures move across the frame, playing, or fishing. The longer third part uses the same subject, but glassily distorted, shot in one of Bokanowski's distorted polished metal mirrors. The imagery is relatively mundane, of people playing and picnicking on the beach, but now severely fractured and distorted. There is little camera movement and the movement behind the exterior lens animates the transformations. The *lens* changes several times, with fewer distortions, until we see sea waves without figures. Figure 59 shows how only a single point in the image is distorted, apparently

lifting a point on the sea horizon to resemble an island, or volcano, rising out of the sea, while the sky appears to be sucked down into it:

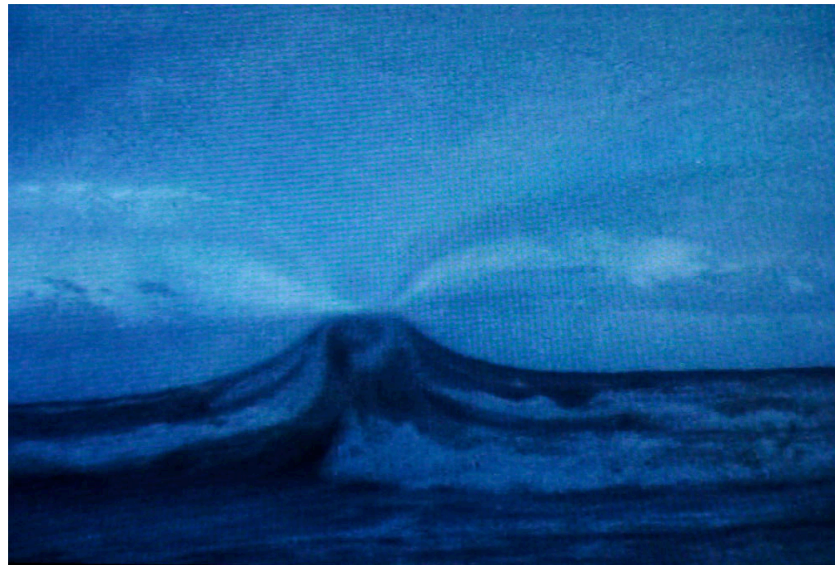


Fig. 59. Patrick Bokanowski, film still from *La Plage* (1992)



Fig 60. *Chaise* in distorting mirror (1992)

Figure 60 is a studio photograph of a chair reflected in one of Bokanowski's distorting mirrors, taken while testing mirrors for *La Plage* (Bokanowski, 2014). Bokanowski links these images to his practice of "yeux fermes" or *eyes closed* drawing (see fig 61), an *automatic* technique related to Surrealist writing practices and to Henri Dimier:

In the third section of 'La Plage', the characters are transformed, fractured, I couldn't have done that without doing those drawings before, the spatial construction would have been far more conventional.... even when I was trying to change and overturn the whole optical system, I was still rooted in convention. So maybe it helped, doing these kind of drawing exercises... Some are almost impressionist – although that wasn't the intention.. (Bokanowski, 2008b)



Fig 61. Patrick Bokanowski, *Yeux fermes* drawing (undated)<sup>112</sup>

The fourth part of the film uses a strong golden light, a luminous golden sea swirling behind the silhouettes of figures on the beach, flickering to red at times. The film's visual experimentation itself seems to have become the subject matter, a tool for the transformation of the mundane and realising his programme of "overturning" optical convention. As Dominique Noguez described the film for Bokanowski's 1994 retrospective in Paris:

It is composed like a painting, or, perhaps because of Michèle Bokanowski's contribution, like a piece of music. In *THE BEACH*, one no longer associates his work with Kafka or Isidore Ducasse, but rather with the light-filled drawings of Victor Hugo or Seurat, Tanguy or even Mir<sup>113</sup>. It's as if a period of nightmares had come to an end, and a new sense of something like serenity had taken over. (Noguez, 1994)

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<sup>112</sup> Bokanowski adds colour to these drawings after making them (Bokanowski, 2014).

<sup>113</sup> Presumably Joaquín Mir (1873 – 1940).

In *Au Bord du Lac* (By the Lake, 1993, 6m), the visual distortions take centre stage. Bokanowski used fifteen handcrafted polished metal mirrors to make this piece (Chodorov, 2013), creating images with the appearance of having been shot through pock-marked and rippled glass:



Fig. 62. Patrick Bokanowski, film still from *Au Bord du lac* (1993)

The film opens with a fluidly distorted still (fig. 63), reminiscent of one of Dali's melting surrealist works, with abstract forms flowing into one another across the screen:



Fig. 63. Patrick Bokanowski, film still from *Au Bord du lac* (1993)

Figures pass across the scene: a cyclist, people walking, boating, running, skateboarding in the park, people riding horses, playing handball, sunbathing by the lake. They are identifiable only through these characteristic movements. Viewed in isolation, any still frame appears as a coloured abstraction, almost impossible to decipher, and with characteristics of fluid movement reminiscent of Vincent van Gogh's *Starry Night* (1889). The camera and lens are still, the movement beyond the lens allows us to read

the scene. What we at once recognise as banal, almost bucolic scenes of everyday life and human leisure activity, are transformed into a world of endless mutating forms that seem to hover on the edge of the grotesque, establishing an at times uncomfortable tension between what we believe is represented and the visually mutating deformities of the image.

Some 15 years after the lens experiments in *Au Bord du Lac*, Bokanowski's catoptrical explorations took a different turn, in *Battements Solaires* (Solar Beats, 2008, 19m). He relied less on manipulating the means of image capture as a catoptrical tool, instead opting for an approach that relied more on the apparatus of projection. As with many of his films, the creation of *Battements Solaires* involved post-production "transformations", a word Bokanowski uses frequently to describe his processes. These are analogue interventions, manually using projectors and animation rigs as tools to combine and layer images, re-filming the results. Bokanowski originally set out to make an "abstract film", though he concedes that this film did not turn out "abstract" in the end. An experimental methodology was central to his process:

Rather than a script, I worked to a method, embarked on what's maybe a ridiculous word, an adventure... I set off on a kind of journey. I'd long been thinking about a continuous flow, making a film which would start with space or matter, that grows, thickens, continuously transforms and in which I place characters, scenes, or a story. I filmed a vast number of liquid elements, all kinds of fountains, explosions, water patterns made by propellers of boats sailing at different speeds, in rivers and at sea, and then a lot of fireworks...  
(Bokanowski, 2008a)

This description uses distinctly alchemical terminology, experimental and iterative in process, not scripted and predefined. Bokanowski's description of "space or matter" that "continuously transforms" reminds me of the alchemist's alembic, in which Bokanowski then places his characters, at times literally filling them with light, liquidity and luminous explosions. This film is certainly the most experimental of his films. It shares the preoccupation with light and visual transformation of his earlier films, and goes further in foregrounding the experimental process of *mixing luminous elements* in the search for something visually new. The many superimpositions within the film are not mere mixtures, but rather, a kind of transmutation of discreet elements into a new substance:

The film plays on the fact that assembling one, two or three kinds of materials, the sum of them isn't a superimposition of the three, but something new... I did an endless number of tests to find what I wanted... The elements are on film... in

the end, 2 hours of footage boils down to 18 minutes of film. I begin a process of testing and transforming... I also take some risks, not knowing where it will go... (Bokanowski, 2008a)

In *Battements Solaires*, we are not witnessing the experiment itself, but rather a sequence of carefully selected experimental results, documented transformations given to us as new, yet strangely familiar images. The multi-layered images that Bokanowski ultimately chose to compose the final film are not completely surrendered to the kind of image degradation that might be expected with such a method.<sup>114</sup> As with an alchemical experiment, the mixtures he makes are not quite random, but constructed experiments according to an objective. The point, according to Bokanowski, “is to arrive at imagery that verges on the unknown” (2008a). It would appear that a successful experimental outcome, in this context, is one in which the image retains a sense of recognised materiality, while hovering between realism and a kind of luminous transcendence. The images in *Battements Solaires* always seem to pull back as they reach the point of pure visual abstraction or fantasy, as if determined to remind us of their origination in filmed realities, of their permanent debt and connectivity to material nature.

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<sup>114</sup> I have experimented with similar processes of multiple image layering using multiple projectors, and with luma-keyed layerings in post production (which give similar, if more controlled, results). Results are in fact wildly unpredictable and hard to foresee, resulting in many confused and often degraded images. Bokanowski must have rejected a great number of image combinations and layerings before finding the particular combinations he arrives at within *Battements Solaires*.

## 5. Moving Image Works

My exploration of experimental processes with light and matter is at the heart of this research, elucidated in the alchemical historiography presented. Now I move on to describe the evolution of ideas and processes in the making of *Speculum*, a single channel film, and *Catoptrica*, a series of video performance experiments. My focus is on the reflexive correspondences between the making of these works and the textual research. DVDs are provided of both works.

### 5.1 *Speculum*

*Speculum* (2014, 17m) is a moving image work for single channel screening. The film, as a media artefact, represents a fixed point within my ongoing series of alchemical experiments with light, matter, images and sounds over three years. What is left retains its mutable nature as a media object. It is also, in a sense, a condensed residue of the ingredients and processes of its making.

In 2011, at the point of departure for *Speculum*, I was researching *alchemy*, its language of transformation and correspondences between alchemical processes and experimental film practice. I had not yet discovered the directly applicable alchemical practices related to light and catoptrics. The core of the textual research in these early stages explored how my filmmaking might be informed by wider alchemical themes. One was how transmutation, the transformation of one fundamental substance into another, happens through stages and sequential processes, involving multiple ingredients in a loop-like and repetitive experimental methodology. Adam McLean identified 109 distinct methods and processes in the literature of alchemy (2013a). There is in fact no consensus on the number of stages, nor their order (Read, 1936: 136-142). The key stages of alchemical change were recently categorised by Roberts:

- Breaking down or purification.
- A separation then joining together, alternations between 'body' and spirit' 'fixed' and 'volatile', often with numerous repetitions of any or all of these.
- The production of the 'white elixir' to transmute metals to silver.
- The production of the 'red elixir' to transmute metals to gold.
- Augmentation of the potency of the red elixir.
- Transmutation, where the elixir was applied to imperfect metals. (Roberts, 1994: 57)

Linden offers an alternative list of the key stages:

- Calcination – reduction to ash through heat.

- Conjunction – the union of two opposing principles.
  - Putrefaction – death, with implied resurrection.
  - Sublimation – the process of distillation.
  - Multiplication – Enhancing the potency of the stone or powder.
  - Projection – Combining the stone with base metals to affect a transmutation.
- (Linden, 2003: 17-19)

I was interested in working with these ideas, taking a sequential approach to image making. I would start with some kind of prime image substance and progress in distinct stages, each with a different transformative objective. The film would describe an arc of transformative processes, delineated into chapters to provide the overall framework. I retained this structuring principle through to the current version of *Speculum*.

Researching stages and processes of alchemical change through a survey of alchemical diagrams, I encountered images of the *Ripley Scroll*, doubtfully attributed to George Ripley of Bridlington (1415-1490).<sup>115</sup> This scroll interested me for its incredible richness of illustration and its symbolic complexity. It also related to my research on John Dee and his scryer, Edward Kelley. Dee often refers to Ripley, while Kelley became well known as an interpreter of Ripley's *Twelve Gates* (Rampling, 2008). There is strong circumstantial evidence to suggest that Dee himself commissioned the reproduction of some of these scrolls (McCallum, 1996: 75, Adams and Linden, 1998).<sup>116</sup> There are twenty one *Ripley Scrolls* in existence, dating from the early 16th century to the 17th century, sixteen of which are in the UK.<sup>117</sup>

The *Edinburgh Ripley Scroll*<sup>118</sup> is a densely illustrated alchemical diagram, over 5m long and 57 cms wide. The scroll describes a sequential series of alchemical processes, in four quartiles to be deciphered from top to bottom. Figure 73 and the pull-out diagram show the whole image sequence of the scroll. There is no real consensus around the meanings of the scrolls, nor how they may have been used.<sup>119</sup>

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<sup>115</sup> See *Appendix 1* for notes on Ripley, attribution of the scroll and relationship to Dee.

<sup>116</sup> At least three scrolls are dated 1588 and were produced in Lubeck, coincidental with Dee's presence there.

<sup>117</sup> A list of scrolls is available in (McLean, 2002).

<sup>118</sup> Given to the Royal College of Physicians (Edinburgh) in 1707 and currently held in the Sibbald Library.

<sup>119</sup> Key texts include MacCallum's 1996 article on the Ripley Scroll. (McCallum, 1996), citing Dr William Moncrieff (Moncrieff, 1876). Adam McLean's *Study Course on the Ripley Scroll* (self-published) is invaluable (McLean, 2002). Mclean is an independent researcher who runs *The Alchemy Website*, a substantial resource for researchers and the public (McLean, 2013b). Jennifer Rampling, an academic who has written on George Ripley, only mentions the Scrolls in passing due to their doubtful attribution. She is currently collecting material for a future book about the Ripley Scrolls (personal correspondence). The Ripley Scroll is discussed in terms of gender reversals by M.E.Warlick in *Art and Alchemy* (Wamberg, 2006: 115 - 128) and in terms of psychological allegory by Jung in *Psychology and Alchemy* (1944) (Jung, 1953). See also (Adams and Linden, 1998).



Fig. 64. *Inspecting the Yale Ripley Scroll* (Mellon MS 41, 16<sup>th</sup> c.)

My encounter with this scroll, and another version I later examined at Yale, occupied my research and practice for a year. The scrolls are seductive artefacts, containing a plethora of alchemical concepts elaborately illustrated using complex symbolism. Figure 64 shows just one quarter of the *Yale Scroll* and this is shown in context below. The meanings of the scrolls remain obscure and invite interpretation. The *Ripley Scrolls* were the most beguiling and elaborate alchemical manuscripts I encountered. I initially decided to structure a film around a close reading of the scroll, allowing my interpretations of its various sections to infuse the structure and content of the work.

In common perhaps with early modern alchemists, my attempts to decipher the scroll led to a degree of frustration. However, a close interpretation of its first seven stages provided the structural framework and much of the raw image material I later used in *Speculum*. The seven stages, or seals, came to take on meanings of their own, leading me away from my initial objective of an interpretation of the scroll and toward the creation

of something new that could be perceived as an alchemical-catoptrical diagram in its own right. I want to outline this experience as it was an important part in the genesis of *Speculum*.

The scroll's illustrations are complex. My research focussed on a close reading of the eight roundels contained within the first quartile of the *Edinburgh Ripley Scroll*:

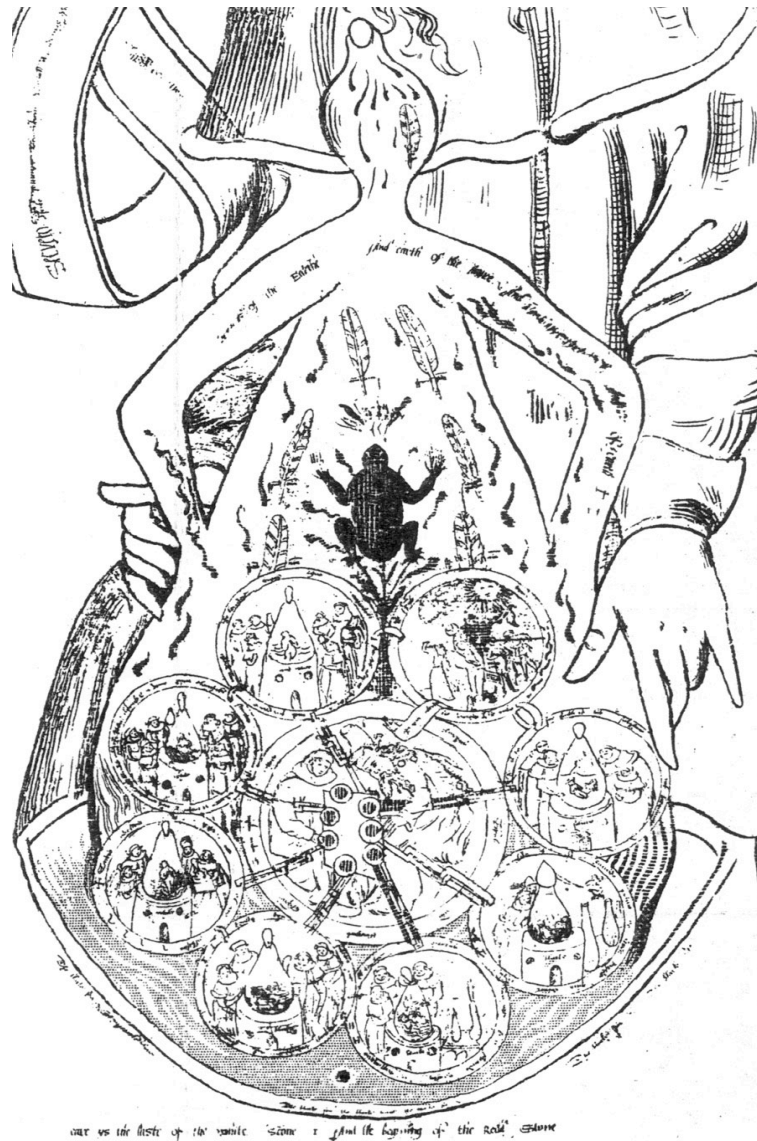


Fig. 65. *Edinburgh Ripley Scroll*, 1st quartile. (1876 photolithograph)

In this first quartile (fig. 65 above, in context below), the bearded figure of Hermes holds a double armed alchemical flask, resembling a human body or an egg in shape, establishing the idea of the flask as correspondent with the generative body. Enclosed in his open cloak, the distillation vessel, known as a *pelican*, allows the distillate to pour back into the flask containing the substance being heated. This method of circulatory

distillation later informed my image making processes, applying it as an iterative method for image transformation.

There are nine roundels inside the pelican flask. Above the nine roundels is a toad labelled “spus” (spiritus, spirit), spitting red fluid upwards. Drops of fluid descend from the top and sides of the flask (cooled distillate), with five feathers. Each feather is labelled “spus” (spiritus, spirit) and “aia” (anima, soul). The central roundel contains two figures, a monk and a Hermes figure, around a closed book with seven seals. Seven of the roundels are connected to the seven seals on the book. One additional roundel is connected to the book by means of a ribbon labelled “*prima materia*”, the first matter (top left fig. 67). All the roundels contain homunculi, usually a male and female, undergoing various kinds of change within a flask (fig. 66 shows the second seal). Each flask within each roundel is surrounded by varying numbers of monks and varying numbers of upright or inverted flasks. Figure 67 below shows all eight roundels in the *Edinburgh Ripley Scroll*.



Fig. 66. Second seal (third roundel), Yale Ripley Scroll (Mellon MS 41, 16<sup>th</sup> c.)

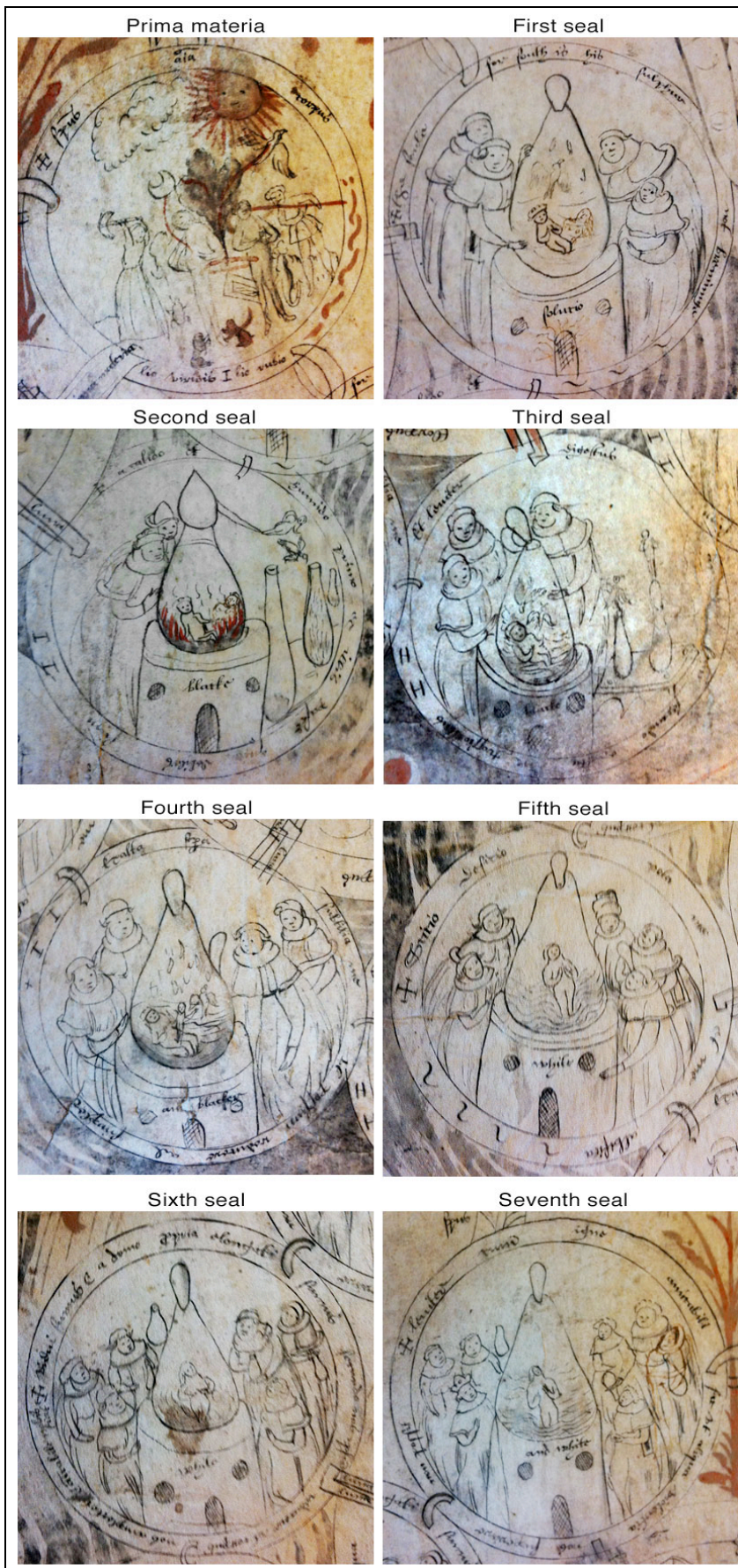


Fig. 67. The eight roundels, seven seals, *Edinburgh Ripley Scroll* (17<sup>th</sup> c.)



Fig. 67. *Yale Scroll*

Figure 66 and the second seal of Figure 67 depict the same operation, illustrating the varying quality of artwork between different scrolls and differing numbers of monks. In this stage a male and female are intertwined inside the vessel, being burned alive. A third luminous figure, attached to a bird in flight, escapes toward a waiting vessel. There are three vessels, three monks (two in the Edinburgh version), plus a strong fire. The text translates “And I am mildly and pleasantly digested therefore exalted among more gross things” (McLean, 2002).<sup>120</sup>

Short lines of text, some in English and some in Latin, are wrapped around each roundel. These texts form the introduction to the seven chapters of *Speculum*: their obscurity is evident:

	<b>Text</b>
<b>First Seal</b>	<i>“The soule, forsooth is his sulphur not burnninge”</i> and <i>“solutio”</i>
<b>Second Seal</b>	<i>“A calido et humido primo ex illis passie quam debilis sum”</i> Translated: “I have at first suffered so much from the hot and humid that I am weak”
<b>Third Seal</b>	<i>“Et leniter digestus amabile sum ideo exalta in grossioribus”</i> Translated: “And I am mildly and pleasantly digested therefore exalted among more gross things”
<b>Fourth Seal</b>	<i>“Exalta sepe (sepa) e subtilia me ut possum reducere ad simplex”</i> Translated: “Elevate and separate me subtly so that I can lead back/reduce to the simple”
<b>Fifth Seal</b>	<i>Scicio deficio pota me a albifica”</i> Translated: “I am weakened by being divided. Drink me and become white.”
<b>Sixth Seal</b>	<i>“Vidue sumus et a domo proprio elongati ideo nos ipsum reduce ut corpus nos amplectat et amicable nobis fiat”</i> Translated: “We are deprived and distant from our own home, therefore it having reduced us, so that the body embraces us and may become

<sup>120</sup> The following texts are from the Bodley Ripley Scroll (Ripley, Early 16th c.). Translations by Adam McLean. The texts on the Edinburgh scroll are almost identical.

	friendly to us.”
<b>Seventh Seal</b>	<p>“<i>Leniter cum igne amicabile fac ut aliqua violentia nos superare non possit</i>”</p> <p>Translated:</p> <p>“Heat gently with an amicable fire so that it cannot overcome us by some violence”</p>

According to McLean, the key to these texts is found in the *Visio Mystica*, attributed to Arnald of Villanova (1235 -1312)<sup>121</sup>, which appears to be the basis for the summary texts on the roundels. The *Visio Mystica*, written in old English, appears directly only on the *Yale Scroll* (Ripley, circa 1570). It describes a vision received by the author of an old man “shining and rising in brightness having in his hand a book shut and sealed with seven seals” (McLean, 2002: 25). This short extract, associated with the first seal, is typical:

The soul is sulphur not burning because it congeals Mercury [the Spirit] into the body of Luna or Sol, meeting it in the place of Nature and is drawn from the body. And the soul is the mediating between the body and the Spirit which binds and conjoins with an [un...ex...erable] conjunction when as the spirit cannot be united with the body but by the soul...  
*Visio Mystica* in (Ripley, circa 1570, McLean, 2002: 25).

So, the soul (sulphur) is essential in uniting the spirit (mercury) to the body (sun and moon, gold and silver). The soul (sulphur) acts as a mediating agent and allows the conjunction, without which, the spirit (mercury) is unable to enter the body (sun and moon, gold and silver). The “soul is sulphur not burning” implies sulphur in an unheated and non-volatile state. Another textual clue for the first seal is the word “solutio” (solution), written on the furnace beneath the flask.

The graphical elements of the first seal (fig. 69 below) are:

- Four monks looking into the flask.
- The flask contains a naked king and queen lying on the ground, entwined.
- A bird is rising directly vertically within the flask.
- Some drops appear to be falling within the flask.
- The fire beneath the furnace burns vividly with extensive flames.
- There is a “+” figure, probably denoting the four elements.
- A small up-ended flask (probably the prima materia) is the stopper.

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<sup>121</sup> This text is sometimes also known as the *Flos Florum*. A great number of alchemical texts were attributed to this author. Most of the works that now make up the Pseudo-Arnald Corpus are now considered to be apocryphal (Koertge, 2008b, Vol 8). McLean believes the *Visio Mystica* is most likely to have been written by an anonymous author in the early fifteenth century.



Fig. 69. The second roundel and first seal, *Edinburgh Ripley Scroll* (17<sup>th</sup> c.)

Each seal is placed within pictorial space and depicted processes like a matryoshka doll. The figures are contained within a flask, in a laboratory, within a roundel, wrapped in text, connected to a book, in a human or egg-like flask, inside the cloak of Hermes, within the scroll as a whole, containing several other sequential processes. Each depicted space is contained or hidden within another depicted space. As the eye moves across the scroll, a complex mental oscillation occurs between:

- Microcosm (homunculi within flasks) and macrocosm (body of Hermes).
- Fire, earth, air (feathers, birds) and water (drops).
- The concealed (book, cloak) and the revealed (glass, transparency).
- Spatial perspective inside and outside of the alembic, the book, the body, the mind and the laboratory.
- The fixed (seven seals, solid matter, stillness) and the mutating (seven roundels, various transformations, fire and vapour, movement).
- Ancient text (*Visio Mystica*) and the pictorial image.
- Imaginative vision (George Ripley's own *Vision* and the *Visio Mystica*) and material experiment.
- Philosophical idea and substantive matter.
- Meditation (Hermes and the monks) and practical experimentation.
- Obfuscation and clarity.

These themes framed my idea for making the film as the enactment of an experimental process rather than an attempt to create a fixed media object. I thought of the filmmaking as a process of oscillation, between texts and experimentation with images,

between pictorial elements and different perspectival spaces, between original image matter and transformed image matter. The film might be considered sequential in the same way as this scroll. Yet within its discrete sequential elements other processes could be layered, either explicitly or implicitly in its internal structure and the history of its making.

During the period of analysing the first quartile of the scroll and its associated texts I began making the film, provisionally titled *Four Seals*. This film interpreted the first four of the seven seals of the *Ripley Scroll*.

The roundels themselves could offer only clues and hints at actual processes and materials. This was not particularly problematic as I wanted to avoid literal visual analogy. Interpreting each roundel was necessarily subjective. I first sought a way of interpreting the texts by developing a parallel script of my own. I decided to imagine myself as the matter itself being transformed in each of the flasks, an idea suggested by the texts surrounding the roundels, which are written in the first person. Out of this process I wrote a series of short text passages on the transformation in each roundel.

To reflect the processes of circulatory distillation, transformation, translation and textual obfuscation, I applied similar methods to my own texts. The text passages themselves became the subject of further mistranslation processes as a form of textual transformation, making use of Google translate as a tool.<sup>122</sup> For each passage, I employed the following technique:

- My original text was translated into Latin using Google Translate, in order to reflect some of the *lost in translation* aspects the scroll texts, repeatedly translated, copied and misinterpreted over generations.
- This Latin text was then mixed back with the original lines in English, reflecting the idea of circulatory distillation within an alembic: the transformed text is mixed back with its origin.
- The mixed text was translated back into English using Google Translate. This is a new text compound resulting from mixture.
- The resulting text was edited, or distilled, to make some kind of grammatical sense, a new *purified* textual substance is created.
- I then recorded the final text as voice-over.

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<sup>122</sup> I used Google translate deliberately for its inaccuracy: it is unable to translate to or from Latin with any degree of sense effectiveness, due in part to its inability to establish context for passages submitted to it. This is a conscious use of *misprision*, introducing inevitable misunderstanding and compound error, a sense I shared in my own reading of the scroll's images and texts.

See appendix 5 for the original texts, the processes of their text transformations and the final script. These scripted sections helped inform my choice of imagery for the first draft of this film.

The *prima materia*<sup>123</sup> roundel contains an image of a naked man and woman attacked by various opposing forces, under the rays of the sun and moon (see fig. 72 top left). It is attached to the centre roundel containing the book of seven seals. This roundel describes what happens to the prime matter during the experimental processes that follow. For *Speculum*, I identified my own *prima materia* with images of the four elements (discussed in Chapter 3.2). I treated the four elements in a literal manner, filming these elements as they are found.

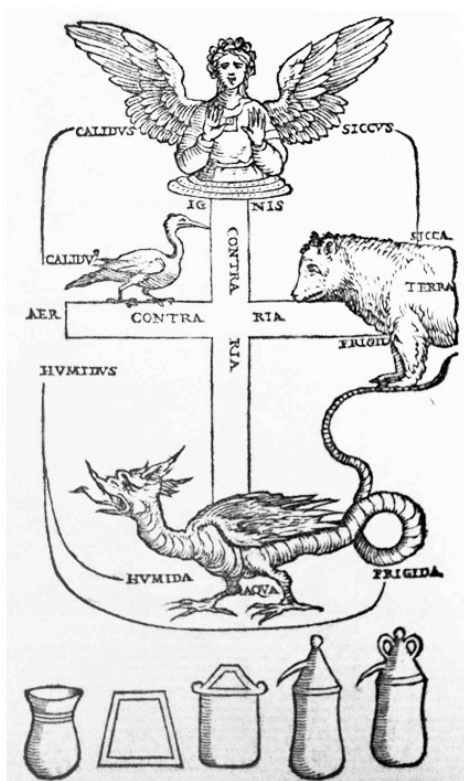


Fig. 70. Petrus Bonus, *Pretiosa margarita novella* (1557)

Figure 70 shows an octet of the interplay between fire, earth, air and water, together with hot, cold, humid and dry. These groupings begin to create a complex interplay of forces beyond those of opposing dualisms. The containment of oppositional/uniting pairs within a circle, or hermetic vessel, as seen in the *Ripley Scroll*, is a common alchemical motif. The effect of creating differing kinds of conjunction between the four elements becomes more than a *union of opposites* or a *chemical wedding* of two parties, it

<sup>123</sup> See Chapter 3.2 for a definition of this term.

becomes a zone of encounter in which complex transformations take place. I wished to explore this zone of encounter as an imagistic space through various experimental techniques for bringing the filmed elements together. Before making *Speculum*, in a previous work, *Diagram* (2011), I explored the simple juxtaposition of elemental images within a filmic diagrammatic space.

To what extent might traditional images of the elements hold archaic imaginative power? This subject fascinated Gaston Bachelard (1884-1962), the author of six poetic works on the four elements, studies which grew from his main body of work on scientific epistemology.<sup>124</sup> These works often refer to alchemy as an example of what he termed the “material imagination” at work. For Bachelard, the elements have particular qualities that activate psychological transitions away from rational objectivity and toward imaginative reverie, beyond any fixed symbolic and associative meanings. He saw this reverie as an active and wakeful awareness in which mankind’s relationship with matter and the elements takes on the nature of a creative force of imagination, the *material imagination*.<sup>125</sup>

The word *imagination* in Bachelard’s writing is linked to the state of reverie and to the *oneiric* (dream-like). These are dreams of wakefulness rather than of the unconscious or metaphysical. It can be related to Peirce’s idea of abduction, but Bachelard says it goes beyond the realms of the contrafactual “what if” hypothesising intrinsic to the rational imagination. Bachelard’s imagination seems to draw upon a “psychic layer” that brings unconscious influences, cultural constructs and “what if” hypothesising together in a freeform capacity of associative thought, activated in a process of mental reverie usually directed at a specific object, substance or element (Bachelard, 1964: 14).

His first significant work on the poetic imagination, *The Psychoanalysis of Fire*, had its genesis in an earlier investigation into the way early chemists were handicapped, as he saw it, by their orientation toward the four elements. “I realised that this kind of obsession with the four elements corresponded to some kind of human necessity” wrote Bachelard (Christofides, 1962). He had a conviction that a “psychoanalysis” of the elements was necessary to understand their pervasive influence on the human mind. In

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<sup>124</sup> These are *The Psychoanalysis of Fire* (1938), *Water and Dreams, an essay on the imagination of matter* (1942), *Air and Dreams, an essay on the imagination of movement* (1943), *Earth and Reveries of Will* (1948, 1949 - first published as two volumes, one ‘extraverted’, concerning earth and work and the other introverted concerning earth and repose), *Fragments of a Poetics of Fire* (1988, unfinished and published posthumously).

<sup>125</sup>

*Water and Dreams*, he described this as an oscillation between imagination and substance within a kind of embodied animism (Bachelard, 1983: 184).

This view has much in common with some of the archaic ideas explored previously – of bodily correspondences with elemental forces, Ficino’s celestial *magnetism* of certain forms of matter, Roger Bacon’s *multiplication of species* through human mediation, or the Paracelsian concept of matter and imagination bound together. Bachelard’s idea of the *material imagination* substantively differs in that he sees our relationship with the four elements as imaginative and poetic, rather than as a divine or celestial pre-ordained truth. This is a materialist perspective: non-metaphorical and non-transcendental. He saw material substance as an active provocation toward imagination. “The great dream of the alchemists” wrote Bachelard, “was one of substance” (Bachelard, 2002c: 254).

Bachelard’s writing on the elements expanded my thinking about the *elemental* images I filmed. My images, though sometimes drawn directly from the symbolic language of alchemical illustration, were not used as symbols or illustrations. I wanted to explore how these images could establish a felt correspondence between substantial matter and the associative “material imagination” of the viewer.

For example, I used the image of *fire* extensively; alchemically linked to the idea of transformation within processes of *sublimation* or *purification*. Bachelard identifies certain psychological aspects of fire:

Fire suggests the desire to change, to speed up the passage of time, to bring all of life to its conclusion, to its hereafter. In these circumstances the reverie... magnifies human destiny; it links the small to the great, the hearth to the volcano, the life of a log to the life of the world. The fascinated individual hears the call of the funeral pyre. For him destruction is more than a change, it is a renewal.

(Bachelard, 1964)

He thus links fire to love, sex, desire, death, digestion, purification and rebirth, a wilful desire to be annihilated and reborn, and the metaphor of the Phoenix. He describes its dialectical character as purifying or corrupting, illuminating or punishing, inwardly generative or destructive and consuming. Reading Bachelard on the imaginative *affect* of the elements echoed my own experience as a filmmaker: a process of oscillation between imagination, experiment, and the objective world of substance.

As previously explored (in 2.1 and 3.2), the four elements were considered by Grosseteste to be luminous in origin, one step closer to the *fiat lux* of creation,

possessing a more spiritualised quality than the material forms in which they were constituted. While their language differs on the exact mechanics of matter and its formation, Bacon, Dee, Ficino and Paracelsus all shared a belief in the four elements as underlying *material* properties of matter. Yet the elements were considered to occupy only a middle ranking position in the hierarchies of creation. According to Khunrath, “the sun generates the elements in the same way as a hen broods her eggs” (Szulakowska, 2000: 95-96) and Dee believed the elements were composed of prime matter and light. Dee’s *LVX*, Ficino’s *spiritus mundi* and his *seminal seeds*<sup>126</sup>, Bacon’s emanatory *species*, or Paracelsus’s *Archeus* were all seen as luminous precursors to the formation of the four elements. In alchemical thought, the interrogation of matter and its four elements would lead almost inevitably to questions about light.

My research and filmmaking took me on a similar journey. Filming the sequences for the first draft of *Speculum*, then entitled *Four Seals*, I captured images of:

- Lit rain at night (water and fire).
- Text images of my *Four Seals* script in Latin.
- Several people’s eyes looking into or through a glass vessel.
- Images of the *Edinburgh Ripley Scroll*.
- Heavy rain on a water surface.
- An egg suspended in both air and water (John Dee’s philosophical egg).
- A waterfall.
- Leaves and dirt suspended in water, sometimes stirred by hand.
- Air being blown through lit water.
- Seeds falling (air, the seminal seed of substance).
- Various types of fire and flame.
- Latin text of *Visio Mystica* from the *Yale Ripley Scroll*.
- Various types of smoke (air and fire).
- Sky reflected in water (air and water).
- Texts and diagrams being burned by magnified light or flame.
- The rising sun (gold, light, macrocosm).
- Dew on grass (celestial water).
- Dew on grass evaporated by magnified sunlight.
- Walking across earth.
- Seeds being burned by magnified sunlight (fire on the seminal seed).
- Seeds floating in water (water on the seminal seed).

These images formed the *prima materia* for my subsequent experiments.

While shooting my *prima materia*, I undertook a series of visual experiments, reflecting the processes of material transformation I was investigating. I had intended to apply a single experimental method to each seal in a methodical manner, but the complexity of

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<sup>126</sup> For a discussion on this, see Hiroshi Hirai’s chapter on Ficino’s concept of seeds and the formation of matter in *Marsilio Ficino: His Theology, His Philosophy, His Legacy* (Allen et al., 2002).

interpretation I had uncovered made me realise that multiple approaches would serve the film best. The following table lists some of the methods I used:

<b>Image substance</b>	<b>Method</b>	<b>Rationale and result</b>
Latin script text and lit rain. <i>Ripley Scroll</i> image and egg in water.	Overlay two the images with basic opacity blending.	Mixture; conjunction of text and image into a compound form.
Lit rain, egg, droplets, dew, sunrise, smoke.	Colour inversions Temporal reversals. Perspective flips and flops.	The image is attacked by opposites internal to itself, union of opposites, degradation and blackening ( <i>nigredo</i> ), circularity and repetition.
Eyes looking in to vessel.	Filmed peering through water filled glass bowl.	Literally, the effect of someone looking in, or of the substance looking out at the alchemist, creating a point of view.
Waterfall, water drops.	Projected onto a large paper screen outside and re-filmed while screen is set alight.	Sequential process 1: water literally burned by fire; re-filming creates the <i>residue</i> .
Waterfall being burned. See fig. 72 below.	Re-projected onto large paper screen outside and re-filmed while screen is set alight.	Sequential process 2: <i>residue</i> of first burning literally burned again while being projected.
Fire, smoke, sky reflected on water.	Projected onto a giant puffball mushroom in the studio and re-filmed.	The puffball, growing from earth, closely resembled a moon or planet, microcosm and macrocosm, earth and fire, air and water in conjunction.
Dew, images of <i>Ripley Scroll</i> , seed.	Magnified sunlight.	A means of luminous putrefaction or death for symbolic figures on the scroll. For dew and seed, evaporation, separation of the soul from body by calcination through light.
Dew. See fig. 71 below.	Projected outside onto rising smoke from a fire and re-filmed.	Layering of vapour (air) with dew (water) and fire (smoke), re-applying the body to the soul.
Waterfall, twice burned.	Projected again outside onto rising smoke from a fire and re-filmed.	Sequential process 3. Water image has undergone two transformations through burning and re-filming, this is the third. This time it is not burned, but vaporised.
Waterfall.	Reversed and projected through the cut-out shape of a glass vessel.	Volatility of fluid within a glass vessel rising and falling.
Fire.	Used to burn screen.	Fire rising, destruction of the image surface.
Waterfall.	Projected through distorting glass and re-filmed.	Purification through abstraction and image degradation, separation of light from form.

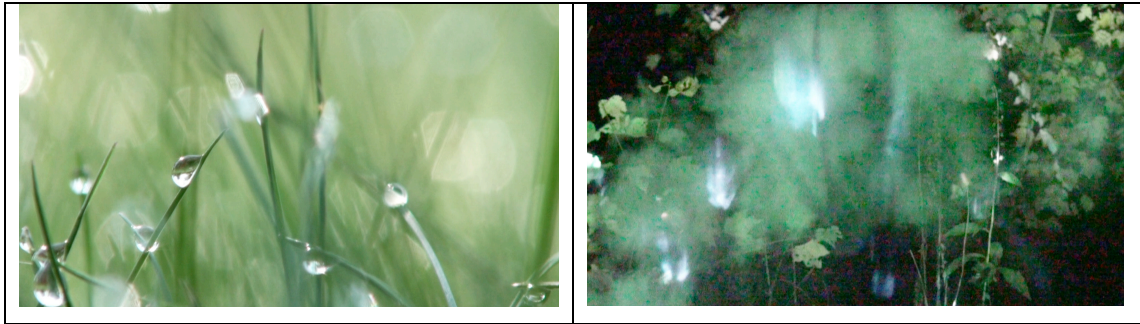


Fig. 71 *Speculum* (2014): image transformations.

A filmed dew sequence (left) is projected onto rising smoke at night, and re-filmed (right).



Fig. 72 *Speculum* (2014): image transformations.

A waterfall sequence is projected onto a paper screen at night, which is set alight, and re-filmed.

In exploring these methods as *transformations* I discovered techniques I considered analogous to those described in my alchemical sources (see 5.1 above). Some of the transformations were implicit to the technical processes of shooting and editing. I considered these as alchemical stages:

*Recording*: the transformational act of recording to media through a camera.

*Sampling*: the sampling of reality at a given number of frames per second.

*Selecting / Separating*: separation and selection of clips used in the edit.

*Editing / Combining*: linear or non-linear editing, the cut and paste.

*Reduction*: of colour, luminosity, time, size or contrast, and semantic content.

*Accentuation*: all that can be reduced might also be accentuated.

*Colourisation*: the manipulation of millions of colour values.

*Luma*: the manipulation of luminosity.

*Opacity layering:* the layering and opacity manipulation of clips.  
*Mixing:* conjunctions of different sources, times, locations, sounds.  
*Chemical processing:* The actual chemical manipulation of the film-strip  
*Information transforms:* manipulation of digital information at an abstract level.  
*Temporal transforms:* the manipulation of the flow of time.  
*Spatialisation:* spatial presentation in a cinema, gallery or project space.  
*Multiplication:* multiples (ie DVD), multi-mediality, still photographs, web.  
*Projection:* the showing of the work through methods of emanation.

In editing the sequences together I used a four part structure corresponding to my reading of the first four seals of the *Ripley Scroll*.

By May 2012 I had a first draft which dealt with four of the seven roundels intended as the structure of the film (included on the *Selected Works* DVD). *Four Seals* had successfully explored several experimental processes and I had begun to explore the relationship between alchemical states of change and my own practice. Working with the four elements, I experimented with light, projection and re-filming to manipulate imagery within a sequential structure. I also began to investigate the use of glass objects outside the lens.

Meanwhile, it became clear that research into the *Ripley Scroll* and its context could occupy an entire PhD. Discovering the catoptrical practices of alchemists and other filmmakers in my research offered more directly relevant correspondences to moving image practice. I wanted to reflect these new concerns, including elements of alchemical-catoptrical theory, new images arising from these texts, and greater attention toward glass and light itself. To slavishly follow the descriptions of the seven seals in the *Ripley Scroll* now felt needlessly constricting.

Realising my own scripted texts as spoken voice-over, while only hinting at their underlying meaning, seemed problematic. The scripting process had helped me find a *way in* to thinking about the scroll in terms of meaning and image, but their effect as voice-over seemed overly ponderous and poetic, overburdening the images with obscure meanings and weighing down the work. I decided to rewrite the soundtrack.

My most powerful images were those that had undergone some form of external non-digital mediation. Other image sequences were either too persistent or too obvious. The

structural form of a series of seven experimental stages conducted in an alembic worked well. The editing of the clips in the individual seals, one sequence after another, seemed repetitive. It lacked internal structure and did not allow for the reappearance of images in later stages of the experiment. The work also lacked pace and volatility, qualities I felt should be present. I wanted it to have a similar structural depth to that encountered in my alchemical source manuscripts. I felt such structure should exist not only in its overall shape, its macrocosm, but also within its distinct stages and individual ingredients, its microcosm.

From mid-2012, I approached the final edit as a further stage of experimental practice. I decided to reuse the results of the first set of experiments, further processing them, with new ingredients and methods added. This corresponds to the “rotational forces of distillation” advocated by Michael Maier (see Chapter 3.3)<sup>127</sup> in which the distillates are returned back into the ongoing experiment, along with new matter. Adding new textual and diagrammatic references reflected the way in which alchemists would consult and mix numerous text sources to inform their own experimental practice.

Creating the final version, I identified these experimental objectives:

- To refer to alchemical-catoptical source material in the search for internal structuring principles for each of the seven seals.
- To use the source material within *Four Seals* as *prima materia* for further development, a *circular distillation* of the material.
- To integrate my textual and diagrammatic research into John Dee, Heinrich Cornelius Agrippa von Nettesheim, Isaac Newton and others.
- To introduce new visual images, including dew, the peacock tail, colour and light refractions, flight and glass vessels.
- To increase the sense of volatility and pace.
- To further explore the use of external glass vessels in image processing.
- To revisit the soundtrack and voice-over.

I investigated the possibility of expanding my understanding of the seven stages by augmenting my reading of *Ripley Scroll* seals with Agrippa’s writings on the number *seven* (see Chapter 3.2). This number is pervasive in alchemical writings and diagrams, appearing as the seven metals, the seven astrological signs, seven planets, seven colour

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<sup>127</sup> Michael Maier attributed special qualities to the circle and to “rotational” or “circular” alchemical methods. He drew correspondences between the circularity of the sun, gold, the rays of sunlight and the perfection of nature. The circle was for him a symbol of the incorruptible See (Szulakowska, 2000: 155).

changes, seven processes, seven days of the week and seven angels. Agrippa goes further in defining and associating seven body parts, head orifices, birds, fish, animals, stones, knots and aromatics (Agrippa von Nettesheim, 1651: 193-195). For John Dee, the seven represented the cross of the four elements plus the trinity of Father, Son and Holy Ghost. In his consultations with angels, Dee received the instruction “In seven and by seven must you work all things” (Harkness, 1999: 182-183).

My analysis of ideas corresponding to the *seven* suggested many new possibilities for structural or imagistic rendering of the seven seals. However, in practice, this served to further confuse and complicate my attempts to interpret the seven seals. It resulted in what can only be described as a mental stasis through over-thinking the potential meanings of these seals. It was a method I abandoned in favour of other approaches.

I added a number of new image sequences to the mix of *prima materia*:

- New images of morning dew, shot in close-up.  
(The catoptrical celestial water containing celestial salt, the microcosm).
- A feather from a peacock’s tail, shot in close-up.  
(Colour changes in alchemical experiment, the rainbow, the colour spectrum).
- Hand gestures related to numbers and calculations.  
(Gesture correspondent with number and celestial influence).
- An arctic tern in flight.  
(Freed vapour, spirit, the unfixed).
- Godafoss – an Icelandic waterfall famous for consuming the pre-Christian gods.  
(Volatile water, the death of imagination, transition, macrocosm).
- The cross of the four elements burned into wood using sunlight.  
(Dee’s cross, the four elements created by light).
- A bird skeleton projected onto a hand and refilmed.  
(Putrefaction, flight, the body calcined by light and re-animated).
- The surface of an Arctic glacier.  
(Water, fixed, solidified).
- The bloody heart of a deer.  
(Dismemberment of the body/substance, internal/external, the human heart).
- Patterns of light refraction.  
(Referring to Bacon, Dee, Agrippa, Ficino, Marci et al).
- Milk dripped into water.  
(Albification, solution).

- Volcanic landscape in Iceland.  
(Paracelsus, vulcan, earthly/celestial correspondence, macrocosm).
- John Dee's grid of "Earthly Governors".  
(Mediating matter and spirit, the "middle interstices" of the Arcana Divina).
- Agrippa von Nettesheim's Hebrew letters related to sunlight.  
(Relating to the occult properties of sunlight).

I constructed the soundtrack for *Speculum* from seven sound sources:

1) The spoken texts of John Dee, using a modern English version I scripted from the *Monas Hieroglyphica*. These are heard throughout, repeated and sometimes layered. The script was read by John Lambert, a physicist, who was asked to read the texts as if trying to decipher their meaning.

2) Elemental sounds recorded on location: of fire, water, air (birds) and earth (walking). The sound is sometimes diegetic, but more often used to combine different visual and sonic elements (e.g. images of fire with the sound of water).

3) The spoken texts of the original *Four Seals* script re-recorded using a female voice whispering. Layered together, the whispering is deliberately indecipherable, a form of *concealed meaning*. This approach retained the original sonic *prima materia*, mirroring the deliberate obfuscation of alchemical texts.

4) Short passages used *sonifications* of radio waves from space. I used these sonifications as a humanly readable interpretation of fundamentally inaudible celestial rays.

5) The sound of glass. I used glass objects to make a wide range of images in *Speculum*. To sonify glass, I recorded the sound of a finger running around the rim of a range of wine glasses, layering these recordings together and tuning them.

6) A Tibetan singing bowl was used to add sonic structure to the sixth seal, accompanying the visual interpretation of Dee's sigils. The singing bowl is used in Tibetan Buddhist meditation practices.

7) The sound of rust being scraped from a rusty oil drum. Appearing only in the fifth seal, accompanying the frame by frame dissolution of the images, it relates to destruction and degradation.

I will now discuss how I embedded ideas of catoptrical/celestial correspondence, dew as a *prima materia*, microcosm and macrocosm, circularity, the colour stages of alchemical change, the rainbow and the colour spectrum, into *Speculum*.

As we have seen in Chapter 3.3 above, alchemists used dew as a *prima materia* in the making of a *celestial salt* which had a catoptrical relationship to pre-scientific concepts of light. I found that dew took on a privileged position within my research, embodying many catoptrical themes. As an image, shot in close-up, dew has significant optical characteristics, reflecting and refracting light and revealing the colour spectrum in sunlight. It was at one stage considered to be the origin of gemstones and pearls, alchemically coagulated into hardened form. Dew operates optically as an extreme convex mirror, capturing the wider world on its image surface. As can be seen in Figure 73, in its microcosm, it embodies the macrocosm of the world around it.



Fig. 73 *Speculum* (2014): dew on a blade of grass, reflecting and inverting the wider world.

Beginning a chapter devoted to Dew, Bachelard quotes the Polish poet Adam Mickiewicz:

And you will never know whether it is the water crystal rising from the earth  
into the sky, or the sky reclining its crystalline sphere upon your shadow  
(Bachelard, 2002b: 250)

As we have seen in Chapter 3.3 above, celestial dew was illustrated on the title page of Dee's *Monas Hieroglyphica* (fig.13 above). Dee also refers to it at the base of the diagram, in the biblical verse "May God give thee of the dew of heaven and of the fat of the earth. Gen. 27",<sup>128</sup> placing it beneath the symbol of the egg containing his *Monas* symbol (Dee, 1964). In alchemical texts dew manifests from the meteorological interstices between heaven and earth. It embodied aerial "celestial virtue", as it contained a highly prized salt and hidden properties of fecundity related to generative light, purification and regeneration. According to Bachelard, the alchemist "concentrates the dew in order to exalt it: he distils it and redistills it in order to eliminate superfluities and thus produce a pure germ, a purely germinative, absolute force." This in turn creates "reveries of power that forever accompany the action of the small upon the great" (2002a: 251). Bachelard points toward the use of dew, both materially and imaginatively, as a generative source, a substance imbued with correspondent power over the macrocosm. In contemporary advertising, images of dew are still strongly linked with ideas of freshness, rejuvenation, purity and renewal (Hahn et al., 2012: 79-98).

In filming the dew sequences, I used a macro lens in close-up, exploring its optical and light refracting properties. I shot some sequences of dew on the plant Lady's Mantle (*Alchemilla Vulgaris*, or *little alchemist*). This plant is also known as *Stellaria*, referring to its star-like leaf. It was highly prized among alchemists as a dew-collector.<sup>129</sup>

Between each dew sequence, I cut in a series of hand gestures, following Agrippa's instructions on the correct hand positions for the recitation of magical numbers (Agrippa von Nettesheim, 1651: 226-228 ). These are accompanied by a voiceover of John Dee's numerical interpretation of his *Monad* sigil. This sequence sets up a

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<sup>128</sup> The full passage of Genesis 27:28 is "Therefore God give thee of the dew of heaven, and the fatness of the earth, and plenty of corn and wine" (King James version) within the context of Isaac's blessing of his son Jacob, who had deceived him into thinking he is his other son, Esau.

<sup>129</sup> In fact, the idea that this plant appears to collect prolific quantities of dew is erroneous. *Alchemilla* excretes water on its leaves through guttation. I have been unable to trace references within alchemical literature under its common or Latin names, though identifying plant types in ancient manuscripts is notoriously difficult. John Parkinson, in his 1640 herbal *Theatrum Botanicum*, seems to be the earliest to state the alchemy claim "it is usually called Alchymilla by most writers, because some thinke the alkymists gave such commendations of it" (Parkinson, 1640: 538). See *The Western Herbal Tradition: 2000 years of medicinal plant knowledge* for a discussion of the naming of this plant and its uses (Tobyn et al., 2010, ch. 7).

correspondence between the celestial substance of dew, Dee's mathematical numerology relating to celestial forces and human gesture as a catoptrical device for manipulating such hidden forces. This also implies a continuum between abstract numerical reasoning, earthly substance, the body and celestial light. Number and gesture provide the structural framework for this sequence.

The peacock's tail is a common motif in alchemical illustrations and texts, sometimes depicted within the alchemical vessel (fig. 74 below) or fanning its feathers (in Khunrath's illustration, fig. 17 above). Its rainbow colours were used to denote the sequential colour changes observed within alchemical experiment or a specific stage mid-way through the process, wherein a series of rapidly changing colours are observed:

There are three basic colors. The Nigredo, or black, being the first sign of success, the second sign comes with Whiteness or Albedo, and the final Perfection, Tyrian Color or Rubedo, is when the final fixity is attained. There are other colors of importance such as green which symbolizes the living state, the life force.... and there are a number of other colors which are the fugitive colors, symbolized by the peacock's tail. They appear and they disappear.  
(Klossowski de Rola, 1998)

The appearance and disappearance of colour, inversions and transformations, are seen throughout *Speculum*.

The first seal shows peacock tail feathers to establish a relationship between the *prima materia* and its subsequent processes of visual change. The peacock feather progresses through the colour spectrum and represents an experimental circularity, also being related to vision itself, as the most luminous part of the feather is its *eye*.



Fig. 74. Salomon Trismosin, *Splendor Solis* (1582)



Fig. 75. Christoph Scheiner, (1619)

In Figure 75<sup>130</sup> the peacock's tail intersects various forms of light projection, relating to the rainbow and the colour spectrum, a subject of extensive commentary for the light philosophers. Newton studied the alchemist Eirenaeus Philalethes,<sup>131</sup> whose exposition of George Ripley's *Vision* contained a detailed account of the colour changes within alchemical experiment. Newton also described his own experimental success in reproducing the "peacock's tail" stage in alchemical experiment (Dobbs, 1975: 178-182). In his *Opticks*, Newton uses the peacock's tail feather to test the homogeneity of reflected coloured light and later describes seeing a "Circle of Colours like those in the Feather of a Peacock's Tail" (Newton, 1704: query 16: 347). The highly reflective peacock's tail, with its rainbow colours and its *eye*, itself possesses a catoptrical character. It also visibly *radiates* and *emanates*.

The second, third and fourth seals share a high degree of image content between them and use similar structural interventions. The latter involved methods of divination based on Dee's later writings, combined with techniques of catoptrical image manipulation applied to the raw material created during the making of *Four Seals*.

<sup>130</sup> This is not an alchemical treatise, but an optical one (Schiener, 1619).

<sup>131</sup> His real name was probably George Starkey (1628–1665).

The second seal refers to the *Ripley Scroll* in its realisation as a *scrolling* sequence. It opens with an inscription of the rectilinear cross upon wood by means of focussed sunlight. I took the form of the cross from those depicted in the *Edinburgh Ripley Scroll*. In *Speculum*, this *etching in light* relates to the opening theorems of Dee's *Monas Hieroglyphica*. For Dee, the cross was a geometric inscription of a generative point with four lines emanating from it, corresponding to the creation of the four elements. The cross, according to Dee, denotes a power of five, one for the central point, two, three four and five for the cross. This creates the numeral V, the central letter of LVX, or lux, meaning *light* (see Chapter 3.3).

I used new methods to transform the raw image substances. One was a process called *luma keying*. This is a digital catoptrical method that works with the luminance/light values within the data matrix of the image, allowing areas of darkness or luminosity to be keyed-out, or made transparent. A second image can be layered beneath the keyed image, showing through into the keyed-out areas of the first image. The result is an alchemical mixing in which the luminosity of the ingredients determines the final character of the compound image. It is a digital equivalent of the multi layered projection and re-filming techniques used by Patrick Bokanowski.

Further image processing involved re-filming through glass, external lenses and a crystal ball. I also worked with a glassblower<sup>132</sup> to make a series of alchemical vessels for use as external *lenses*. Figure 78 shows illustrations of laboratory equipment by Andreas Libavius (1555 – 1616) in *Alchymia* (1606), from which I drew most of the designs. Figure 79 (top left) also shows a replica I made of the *pelican* circulatory distillation vessel containing the seven seals depicted on the *Edinburgh Ripley Scroll* (see also fig. 70 above). I shot or re-filmed several sequences through these vessels, empty, filled with water or refracting sunlight. In Figure 78 below, the image on the left shows a water-filled vessel being diluted with milk, while on the right, pinhole sunlight is refracted through a water filled vessel, projected onto a screen with the aid of a mirror, and filmed.

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<sup>132</sup> Brian Jones and Norman Velch, Wearside Glass at the National Glass Centre, Sunderland, August 2012.

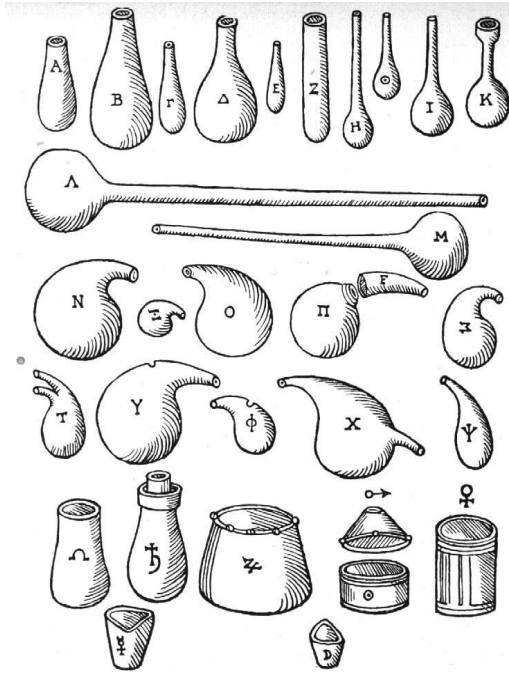


Fig. 76. Andreas Libavius, *Alchymia*, 1606



Fig. 77. Glass vessels made as 'lenses', 2012



Fig. 78 *Speculum* (2014): images shot using the glass vessels above.

In my search for structuring principles, my research into John Dee led me to examine his work following on from the *Monas Hieroglyphica*. Dee’s “Great Table” of the names of the “Angelic Governors” of earthly life, along with his Cabalistic technique of *gematria* formed the structuring principle of several chapters within *Speculum*.

Having established the context surrounding Dee’s angel conversations in Chapter 3.3 above, I turn to examine the Dee’s record of these visions and how I applied them in structuring *Speculum*. A full explication of Dee’s angel conversations requires a detailed account of his understanding of angelic hierarchies and has been adequately described elsewhere.<sup>133</sup> The most significant output was his “Great Table”, a 25 x 27 grid of 675 letters,<sup>134</sup> recording the *lingua adamica* given to him by the angels. Dee believed the “Great Table” (fig. 79) was the key to using the angelic language toward governing nature. The angels told Dee that all human knowledge, medicine, the four elements and the creatures, metals, stones and all matter, the joining together and dissolution of matter, transport, mechanical crafts and alchemical transmutation, were contained within the table (Dee, 1659: 179).

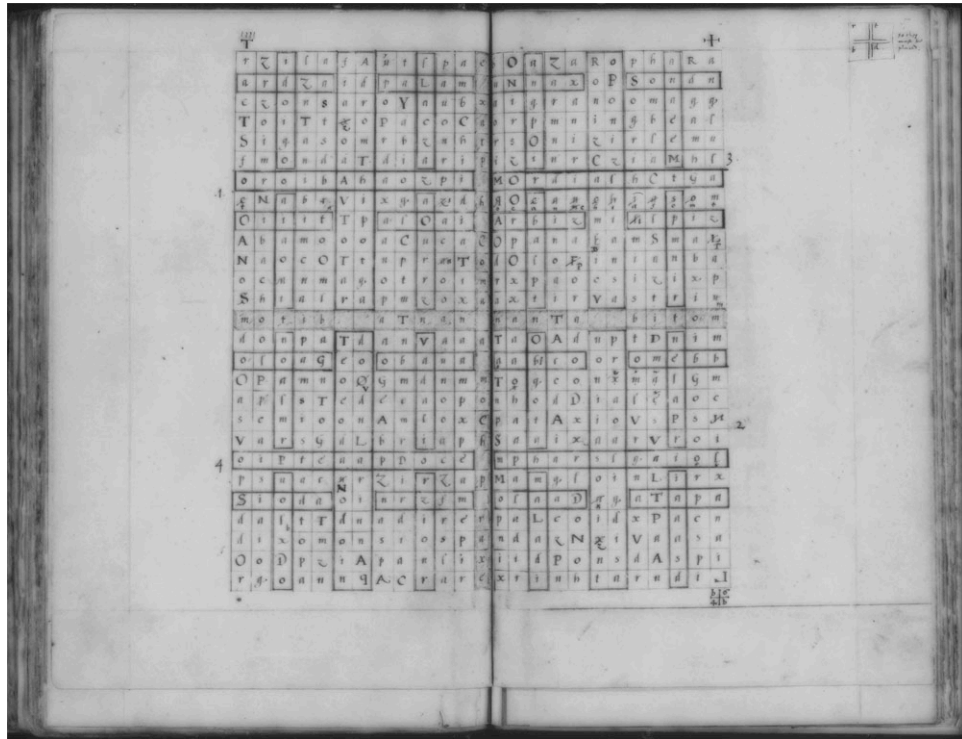


Fig. 79. John Dee, the *Great Table*, MS. Sloane 3191, 1584-1585

<sup>133</sup> *John Dee’s Conversations with Angels* is the definitive text (Harkness, 1999). Others include *John Dee’s Occultism* (Szonyi, 2004), *John Dee’s Actions with Spirits* (PhD thesis) (Whitby, 1988), and *Seeing the Word: John Dee and Renaissance Occultism* (Hakansson, 2001). Parry situates Dee’s angelic conversations within a biographical and political context within European Court circles and religious reformation (Parry, 2012).

<sup>134</sup> Contained in the *Liber scientiae auxilii et Victoriae Terrestris* (The Book of Knowledge, Aid, and Earthly Victory) and its companion *Tabula bonorum angelorum* (Sloane MS. 3191, British Library) 1584-1587.

The names of 91 “Earthly Governors” were given by means of directional sigils, which, when overlaid upon the Great Table, would reveal the seven letter true names of each of the Governors. Figure 80 shows how each sigil describes a movement across the grid of letters in order to spell out a seven letter word:

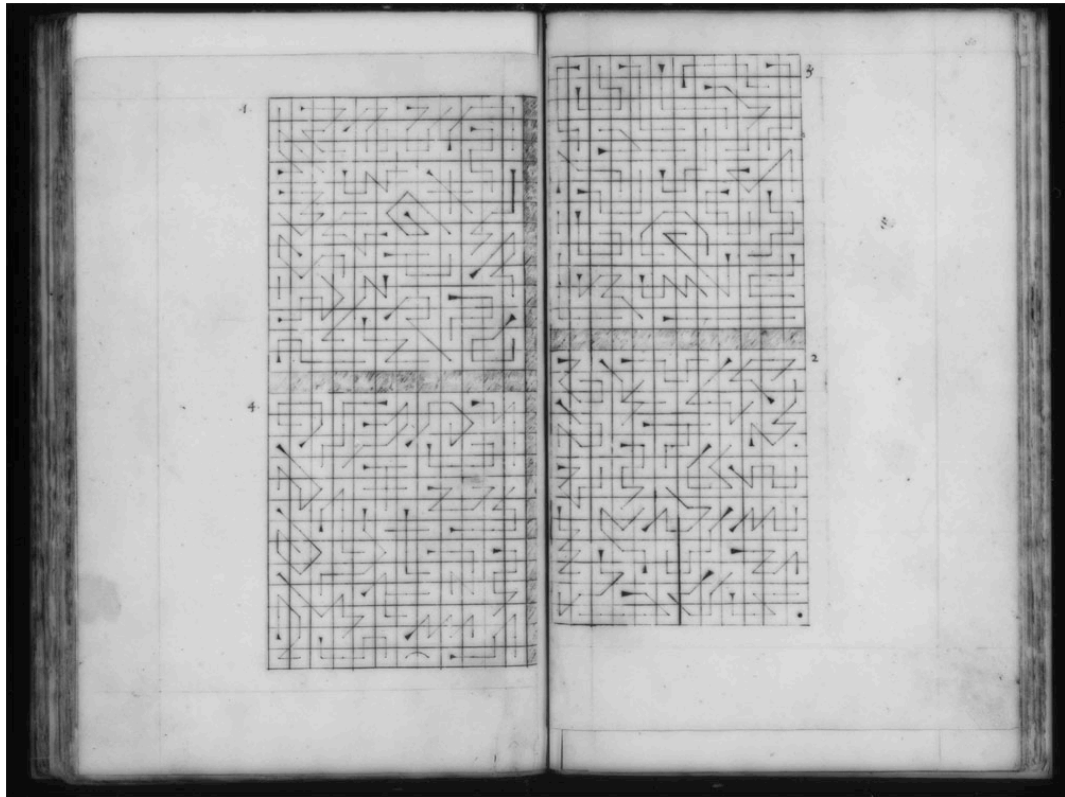


Fig. 80. John Dee, The table of sigils for the “*Earthly Governors*”, MS. Sloane 3191, 1584-1585

In Figure 81, the two tables have been layered together to reveal the names of the 91 Governors:

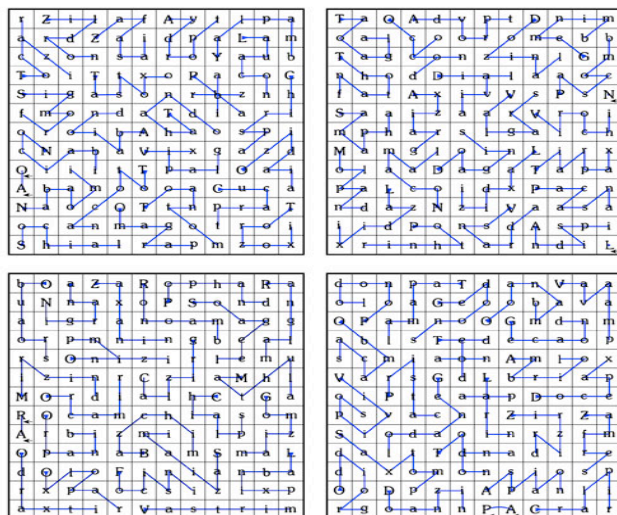


Fig. 81. Burns and Moore, the names of the *Earthly Governors*, 2010<sup>135</sup>

<sup>135</sup> See (Burns, 2010).

I was interested in the *Great Table* for its highly structured catoptrical-linguistic relationship to matter. The *Earthly Governors* were imagined by Dee to be the intermediaries between celestial angels and the earth. They governed geographical territories, their life and human governments. In the *Earthly Governors*, Dee believed he had found the true names of invisible spiritual entities that were lower in the angelic hierarchy: the causative agents in earthly matter and worldly affairs. The revelation of their *true names* would, he believed, give him the tools to conjure them.

Working with the *Great Table*, I used the names of the *Earthly Governors* to manipulate clip length, position in the edit, colour, temporal and perspective transformations. To convert the *true names* into useable numeric values I employed the Cabalistic method of *gematria*, substituting numbers for letters according to their position in the alphabet. *Gematria* was an interpretive technique that “reshaped and transformed the written text, decomposing or atomizing it” to reveal new meanings and correspondences through mathematical-textual transformations (Forshaw, 2013: 370).

Dee used *gematria* throughout his life to interpret letters, words and symbols as divine numbers, first evidenced in his *Monas Hieroglyphica* (Debus, 2004: 181). His mathematical exegesis of “LVX” in the cross of his *Monad* symbol is a good example of this practice (see Chapter 3.3). The letters were drawn out from the shape of the cross, and then interpreted mathematically and linguistically. References to *gematria*, plus two other Cabalistic techniques<sup>136</sup>, appear throughout his angel conversations.

I first placed all 91 seven letter words into a spreadsheet and calculated the number values for each letter. I then applied a multiplier to the value for each letter in order to create a value for specific clip attributes. In this way, each clip within seals two to four of *Speculum* has had one of Dee’s angelic *Earthly Governors* applied to it as a transformation. The following table shows the values created from the *true names* of the first ten Governors:

Name	Letter 1	Letter 2	Letter 3	Letter 4	Letter 5	Letter 6	Letter 7	Totals
Abaiond	1	2	1	9	15	14	4	<b>46</b>
Advorpt	1	4	22	15	18	16	20	<b>96</b>
Ambriol	1	13	2	18	9	15	12	<b>70</b>
Andispi	1	14	4	9	19	16	9	<b>72</b>
Aspiaon	1	19	16	9	1	15	14	<b>75</b>

<sup>136</sup> Dee also uses *notarikon* (where the letters of a word are taken as abbreviations for entire phrases) and *temurah* (where letters are transposed within a word).

Axziarg	1	24	26	9	1	18	7	<b>86</b>
Aydropt	1	25	4	18	15	16	20	<b>99</b>
Bazchim	2	1	26	3	8	9	13	<b>62</b>
Calzarg	3	1	12	26	9	18	7	<b>76</b>
Chialps	3	8	9	1	12	16	19	<b>68</b>

Out of these, I derived a set of transformations for each clip, one letter defining the value of a specific transformation or selection:

Colour / bw	Speed	Duration	Motion	Flip flop / straight	Clip	Sound	
8	15	0.1	0		1	11	9
8	31	0.2	1		2	45	39
8	100	0.6	1		1	28	24
8	108	0.6	0		2	21	18
8	146	0.9	0		0	32	28
8	185	1.1	0		0	17	14
8	192	1.2	1		1	45	39
15	8	0.0	0		1	30	26
23	8	0.0	1		1	17	14
23	62	0.4	0		1	43	38

I used the spreadsheet as a calculation tool to derive numbers giving a broad trajectory of acceleration through the different stages. For example, for the fourth seal, I wanted the duration of the clips to have greater volatility, so I used shorter durations and more extreme transformation values. For example, the calculation for the seventh letter “d” in “Abaiond” was  $4/26 \times 1.2$  giving a duration of 0.1s. The same calculation for the seventh letter in the second seal was  $4/26 \times 10$  resulting in a longer duration of 0.8s. I adjusted the mathematical rules and parameters for each seal. I also added and removed certain ingredients or clips within each different seal.

I used a process of divination to select the Governors I would refer to: writing out all 91 words on pieces of paper, scattering and gathering them, and using them in order. This method established the sequence of words consulted and therefore the sequence of images. After selection, I looked up the values for the chosen word in the spreadsheet, selected the relevant clip and applied the transformations suggested by the numerical values.

This process shares a methodology with the chance-based techniques of the surrealists, or Bokonowski’s *eyes closed* drawing discussed earlier. I found it personally liberating and it delivered surprising results and image combinations. Not all of these worked, so I chose not to follow the results slavishly. I continued to apply creative judgement after

laying my clips into the timeline, refining parameters and ingredients, selecting some image results and rejecting others.

I built the fifth seal around the alchemical ideas of *albification* (or whitening), division, mixture and liquidity. In the *Ripley Scroll*, the text accompanying the fifth seal reads: “I am weakened by being divided. Drink me and become white.”

I used my custom made replica of the *Edinburgh Ripley Scroll* circulatory distillation vessel, which I first filled with water and then dripped milk in from above. This sequence was then vertically inverted to give the impression of a white liquid, or smoke, *rising* through it. Interspersed between the vessel / white liquid are individual still frames from all the sequences that have been seen in the first four seals. The stills were extracted from the previous sequences, randomised in order, mixed and recompiled at 25 frames per second. One frame was taken out of every 9 frames, and extraction of 3,000 frames from the preceding 26,900 frames. This is a process of mathematical *putrefaction* as well as a *division*. Out of every 9 parts added to the experiment in the first four seals, only one part is added back in to the fifth stage. The original image is “weakened by being divided”.

This invokes ideas of separation (dividing video sequences into their individual frames or parts) and mixture (recombining all the frames in a new order). The sequence is further structured by using long durations of the rising white liquid and short bursts of recombined frames. This balance progressively shifts until the recombined frames occupy the greater duration. The result is a volatile visual compound composed of the extracted, *decomposed* parts of all that has gone before.


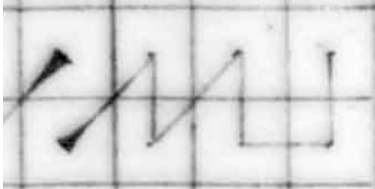
The sixth seal also uses Dee’s table of Governors and its associated sigils, but in a different way. Within the same manuscript, *Liber scientiae auxilii et Victoriae Terretris* (Dee, 1584-1585: f14a-17a), Dee tabulated the 91 Governors, their sigils and properties:

Liber Scientiarum, Auxilij, & Viciorum Terrarum Iris Liber Scientiarum								
91 Partium Terre Nomina ab Homnibus im- posita	91 Partium Terra- rum Nomina Divi- nitibus imposita	91 Divina Impo- sitionis Charac- teres Symme- trici	30 Bonorum Prin- cipum Aerebrum Ordnis Sphae- rica	Bonorum Minis- trorum in singulis Ordnibus Tri- partitum, Num- erum Totales	Bonorum Minis- trorum in singulis Ordnibus Tri- partitum, Num- erum Totales	12 Angeli Reges, ipsi 30 Ordini- bus predominanti- tes, qui 12 etiam tribus Angeli sunt	12 Tribus Populi Israelitici in Dispersione	4 Plaga Mundi, Tribus Dis- persis assigna- te
1	Aegyptus Occident.	⌘	Ordo 1 <sup>a</sup> LIL	1 7209	14931	9 ZARILG	Nephtalim	Oriens dexter.
2	Syria Pascomb.	⌘		2 2360		11 ZINGGEN	Zabulon	Occid. dexter.
3	Mesopotamia Vulgars.	⌘		3 5362		7 ALPVDVS	Isacama's	Occid. Sinister.

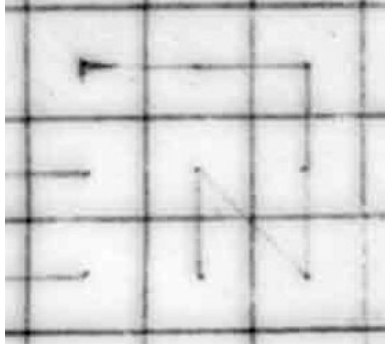
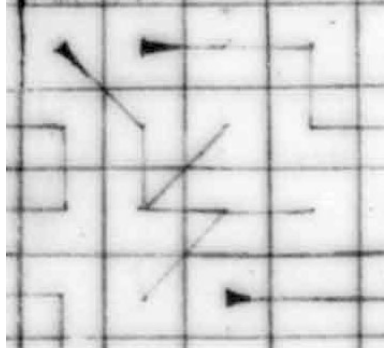


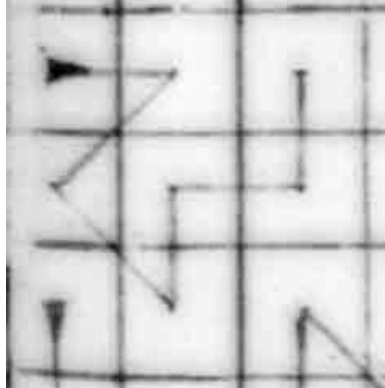
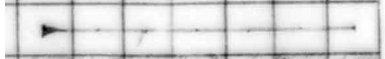
Fig. 82. John Dee, The first three of 91 sigils tabulated, MS. Sloane 3191, 1584-1585

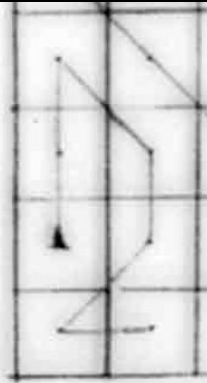
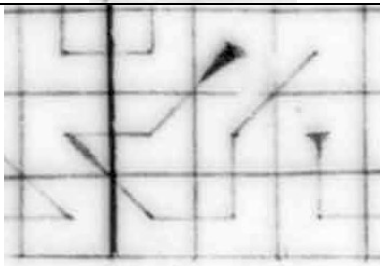
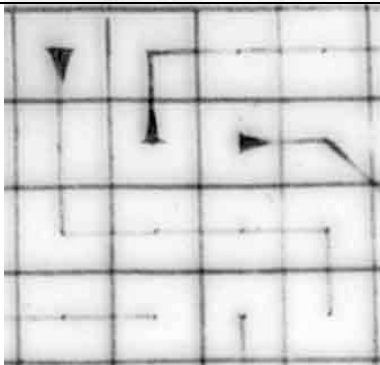
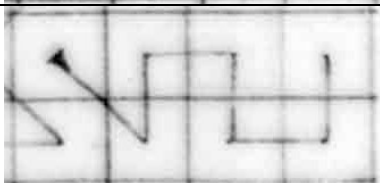
In Figure 82, the first column gives the geographic region governed, the second gives the true name of the Governor, and the third reveals its sigil. Other properties relating to their position and signification within the angelic hierarchy are given in the other six columns.<sup>137</sup>

I used 12 of these sigils to structure the fifth seal sequence:

Name	Sigil	Screen Grid	Image
Andispi		2x4	Close-up smoke and fire.
Tiarpax		2x4	Previous image sequences projected and re-filmed through the base of a glass vessel.

<sup>137</sup> The 9 columns are labelled as follows: 1: Part of the earth imposed by man, 2: Part of the earth imposed by God, 3: Divinely ordained symmetric characters, 4: Ordered sphere of good and noble Ayres, 5: Number of Good Ministers ordered in 3 parts, 6: Total of all Good Ministers Ruling the 30 orders and also the 12 tribes, 8: Tribes of the people of Israel Dispersed, 9: Quarter of the Earth to which the dispersed tribes are assigned (James, 2009, Book 4).

Zirzid		3x3	Fire projected upon a giant puffball.
Occodon		4x4	Fire and smoke.
Aspiaon		2x3	Eye looking in to vessel.
Advorpt		2x3	Dew, projected onto smoke at night and re-filmed.
Samapha		3x3	Rushing water with flying bird overlay using luma key.
Vastrim		1x7	Deer heart.

Oddiorg		4x2	Inverted smoke, black becomes white.
Vsnarda		3x4	Smoking twigs, ice and light layered together using luma keying.
Ronoamb		4x4	Previous image sequences projected and re-filmed through a crystal ball.
Virochi		2x4	Sunlight refractions shot through a rotating round antique glass carboy.

I first divided the screen space to match the proportions of the sigil's grid structure (ie 2x4, 4x4 etc.), as can be seen in Figure 83. I then edited my chosen image into the individual squares in sequential order, mirroring the way they were given to Dee, letter by letter. As I brought each square sequentially into the timeline, I began with its first frame, the original starting time of the clip. This created a sense of temporal shift in the overall screen image as each part is revealed in sequence, but appears displaced in time.

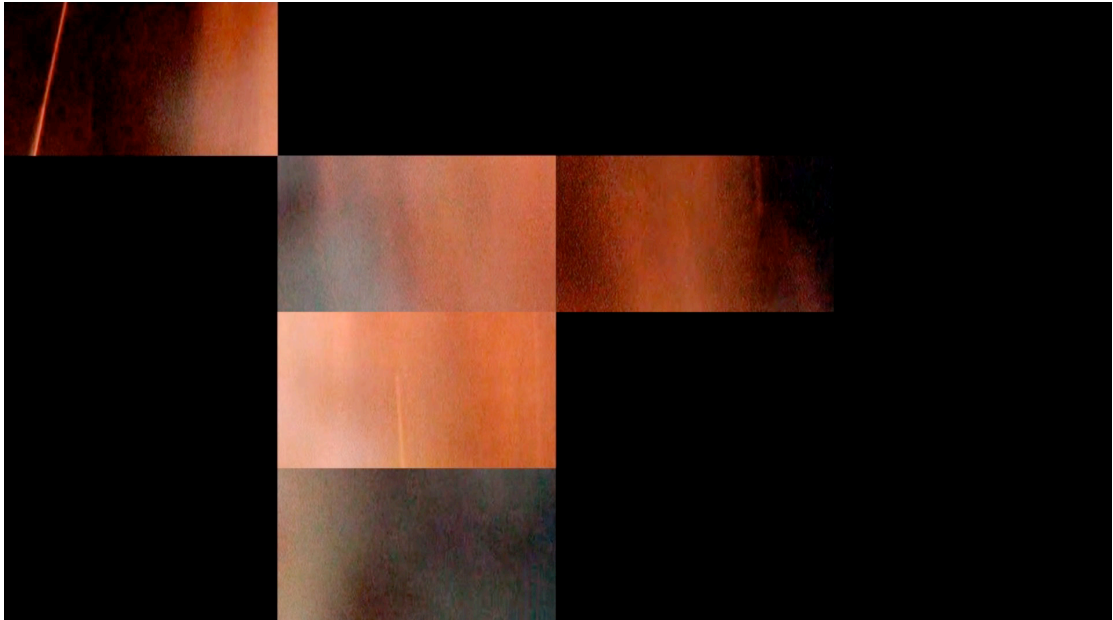


Fig. 83 *Speculum* (2014): the sigil *Occodon* above, being constructed on a 4x 4 grid.

The structural use of these sigils represents a 20<sup>th</sup> century form of inscription of matter in the form of light, linked, through the motions of a sigil, to the catoptrical practices of John Dee and Edward Kelley in 1584. A complex trajectory of ideas is embodied in this method, a kind of catoptrical reflection and refraction of Dee's original light across the centuries:

- Rays from the sun are refracted in Dee's showstone in May 1584.
- Kelley sees them, and catoptrically converts them to visions.
- Dee interrogates and records the catoptrical visions.
- Dee formulates them into tables of words and sigils in a manuscript.
- That manuscript survives into the 21<sup>st</sup> century and enters my research.
- The sigils are refracted back through a modern showstone (camera), filmed in May 2013.
- Through the catoptrical medium of the filmmaker the sigils are structurally inscribed in light, in images of matter.

This is a catoptrical-alchemical process in itself. It is interesting to speculate about what might remain of Dee's original rays of sunlight in the *Speculum* of today.

The seventh and last seal deals with visible light. I filmed sunlight, refracted through a variety of glass vessels, some filled with liquids. No post-production interventions or transformations were applied to these images. The images are of light falling upon white surfaces, revealing the colour spectrum in several sequences.

During the first part of the sequence, a series of Hebrew letters derived from Agrippa's numerology of the sun are interspersed through the images of light. Figure 84 shows the Hebrew letters used. The rationale for using Agrippa's letters has already been discussed in Chapter 3.2. In his preface to a series of tables relating to the seven planets, Agrippa describes the *Table of the Sun*:

The fourth table is of the Sun, and is made of a square of six, and contains thirty six numbers, whereof six in every side, and Diameter, produce III. and the sum of all is 666. There are over it divine names with an Intelligency to what is good, and spirit to what is evil, and out of it are drawn Characters of the Sun, and of the spirits thereof.

*De occulta philosophia* in (Agrippa von Nettesheim, 1651: 240-241)

Hebrew characters were considered to possess an inherent numerical value, linking letters with divine numbers, astrological signification and divinity. From the very earliest Jewish Kabbalah texts, the view was established that God had inscribed the "Divine Names" in the Hebrew alphabet, with each letter "corresponding to a different principle of creation with its own distinctive power" (Forshaw, 2013: 366). As a consequence, Hebrew was very widely used within later alchemical Christian Cabala texts.

*The Table of the Sun in his compass.*

*In Hebrew notes.*

6	32	3	34	25	1
7	11	27	28	8	30
19	14	16	15	23	24
18	20	22	21	17	13
25	29	10	9	26	12
36	5	33	4	2	31

א	ל	ה	ל	ר	ג	ל	ב	ו
ל	ח	כ	ח	כ	ז	י	א	ז
כ	כ	נ	י	ה	ו	י	ד	ט
י	י	כ	א	כ	ב	כ	י	ח
י	כ	ו	ט	י	ט	כ	ה	ה
ל	ב	ד	ל	נ	ה	ל	ו	ו

Fig. 84. *De occulta philosophia libri tres* (1533)<sup>138</sup>

<sup>138</sup> In (Agrippa von Nettesheim, 1651: 246)

The seventh seal draws the experiment to a close. The film progressed from its opening shot of the moon, through the experimental processes I applied to my *prima materia* of the four elements, to finish with abstract light refractions. This conclusion to the film mirrors the historical trajectory of this research, from the earliest light philosophers and their theories of luminous cosmogenesis through alchemical-catoptrical explorations of light and matter, to Newton's *Opticks* and the light spectrum.

### **Speculum – final review**

*Speculum* is an intense, mesmerising and densely imagistic work. For any viewer uninitiated in the complex historiography of alchemy, many of the references it embodies are hidden and obscure. In this sense, *Speculum* is not a work *about* alchemy, but a work *of* alchemy. In its imagery, it deliberately mirrors the enigma of many alchemical works, inscribing only traces of the image-transformational experiments undertaken. As a film, it might claim to fulfil the modern day role of an alchemical diagram, drawing together the knowledge of its author and illustrating contemporary experiments in light and image matter, yet remaining wilfully rooted in archaic and discredited ideas. It is an occult film in the true meaning of the word: much lies hidden and unrevealed beneath its surface. Like a cipher script, even its main vocal protagonist (reading Dee's texts) ponderously struggles to decipher his own text within the film. Structured as seven *seals*, rather than seven chapters, the viewer is invited to break them open, to look behind and within its surfaces.

*Speculum* is diagrammatic in structure, fixing images in time, as residues of its own making. Like the *Ripley Scroll*, it can be read as a hierarchical progression through seven stages of transformation, beginning with a literal image of the moon, progressing through experimental transformations and mixtures of image substances, to end with light. If each frame were taken in turn, laid out on a scroll from top to bottom, *Speculum* could be read diagrammatically, with quantified time flattened. The experimental practice of Alchemy was a physically enacted four dimensional experience, and its texts and diagrams are two dimensional artefacts of this practice. *Speculum* exists in a similar relationship to the physical practices of image-transformation used in its making: it is the densely compressed media artefact of a process of experimental re-enactment.

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Fig. 85 *Speculum* (2014): still image from the third seal

In making *Speculum*, I drew on historical sources for my experimental methodology, re-discovering and revising a number of archaic ideas and processes of transformation. The means of practice and filmic representation used were inaccessible to the original alchemists, an inaccessibility mirrored across time, as the original context for these methods is equally unrecoverable for the modern viewer of *Speculum*. A tension therefore oscillates throughout the work: between historicism and the contemporary, between the dead and the living. Figure 85 shows a photocopy of an original Ripley Scroll image, in which the depicted figures are first destroyed (a *calcination*) through the catoptrical application of focussed sunlight. The entire image is then reduced to ash and smoke by the application of fire. It is a transformation of the historical referent through a re-enactment of the processes it depicts, while offering a rebirth into a new kind of media artefact. In this way, the film fulfils one of the aims of alchemy, a re-animation of the *caput mortuum*<sup>139</sup> in a transmogrified state. Cinema intrinsically represents this capacity for re-animating the dead: every still frame of a film is dead, a fixed and unmoving moment in time, its artificial life is perceived only through its means of temporal display. In *Speculum*, such re-animation extends further through a re-visioning of historical traditions of practice long considered redundant.

Only brief glimpses of complex transformational processes are offered within the film. It is in considering *time* that the film's diagrammatic and illustrative analogy ends, as

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<sup>139</sup> Literally, 'dead head'. In Alchemy, this denotes the lifeless residue left in the flask.

contemplative duration is dictated by the filmmaker rather than the viewer. In *Speculum*, duration is diagrammatically compressed and experimentally manipulated as a quantified substance, used to enact visible processes of transformation. The overall pace of the film is fast and volatile, with most images lasting no more than three seconds and many lasting for only a single frame (1/25<sup>th</sup> of a second). This creates a temporal-visual intensity of rapidly changing, fleeting or mutating images and sounds. One image of fire, lasting a fraction of second, is followed by another of water, also lasting a fraction of a second. All four elements sometimes appear within a single second of screen time. The effect mirrors the transformational volatility of alchemical mixtures: transformation becomes a function of time. Two common alchemical terms, the *fixed* and the *volatile*, are in fact descriptions of durational change. When a substance is *fixed* (a still frame), it has ceased to transform: the passing of time has lost its agency. When it is *volatile* (a projected film), it changes rapidly: differing degrees of transformation are perceived based on the degree of difference between one frame and the next, actualised by the passing of time. Within *Speculum*, difference and duration are used specifically for their transformational agency. Time is used as a mutable quantity, binding durational quantities to degrees of perceived transformation, and generating varying levels of fixity and volatility in the perceived image.

*Speculum* was shot and edited digitally rather than on analogue film. Experimentation in the chemical processing of film has its obvious analogue in the practical chemical experimentation of alchemy. This alchemical way of working with the filmstrip has been previously explored by other filmmakers, notably in James Witney's *Dwija* (1973) and Jurgen Reble's *Materia Obscura* (2009). The choice to work digitally within *Speculum* situates it in a different territory: it seeks to examine specific potentialities of the digital in relation to alchemical transformation. The digital image is a form of inverse projection, a transformation from luminous reality into a world of structured data and electrical polarities, allowing for controlled and numerically quantified software manipulation. This underlying digital layer, previously explored in the preliminary stages of this research as a transformational mediality through information theory (see p.5) has an equivalence to Ficino's *quinta essentia*, the alchemical quintessence underpinning the visual manifestations of the image. It operates as a catoptrical mirror, reflecting the image of reality back upon itself in a virtual, transformed state. The numerical manipulations applied to clips throughout *Speculum* are catoptrical transformations of this data layer, using divination and the number values of Dee's *Great Table* to define fine-grained clip parameter values and edit decisions. Applied at this

level, many of the resulting image transformations remain unpredictable. Working digitally further allowed a deeper manipulation of the temporal geometries of the images, an effect seen within the scrolling format of the second seal and the sigil based grid structuring of the fifth seal. These sequences go beyond the traditional montage sequencing intrinsic to analogue film to allow temporal-image transformations to be geometrically embedded and layered within each film frame.

The images used as *prima materia* within *Speculum* retain strong ties to the substantial, to their nature as light reflecting from material realities into the camera. In its first seal, a moon crosses the screen, cuts to images of light refraction in dew droplets, a series of numerical hand gestures, and images of the peacock's tail, with a voiceover of John Dee's numerological calculations. These images appear at first to be substantial and symbolic, establishing the film's overall themes of celestial correspondence, light refraction, number, colour, and alchemical symbolism. As the film progresses, transformations in their substance accelerate, their representational bonds to substantial reality loosen, and the images become ambiguous and harder to read. The Italian film critic, Francesco Cazzin, in his review of this film<sup>140</sup> said of *Speculum* "it composes itself, but in composing itself it decomposes; and it decomposes by composing itself... so as to have a surplus of images, and it is this surplus which, by surpassing the film, exerts a performative power on actual reality." The images in the film break from their representational and symbolic forms to exist as what Cazzin terms the "film-trace", a discrete imprint, or residue, which is neither a deferment *to* something, nor a difference *from* something. Within *Speculum*, this is a further unfolding transformation: each image, which may first have been seen as representational or symbolic, is returned back to the film to be treated as something substantial in itself, its intrinsic qualities as a recorded image becoming the subject of experiment. A territory of uncertainty is conjured for the viewer, as the film oscillates between representation, symbolism, and transformation, a constantly mutating context for how the images within *Speculum* might be read.

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<sup>140</sup> Francesco Cazzin reviewed this film on his website *L'Emerge Del Possibile*, on 16/05/2015. The article was translated from the Italian by Silvana Vitale and can be found in full here: [http://www.ashrowan.com/works/speculum/reviews/Speculum\\_Francesco\\_Cazzin\\_translated\\_by\\_Silvana\\_Vitale.html](http://www.ashrowan.com/works/speculum/reviews/Speculum_Francesco_Cazzin_translated_by_Silvana_Vitale.html)

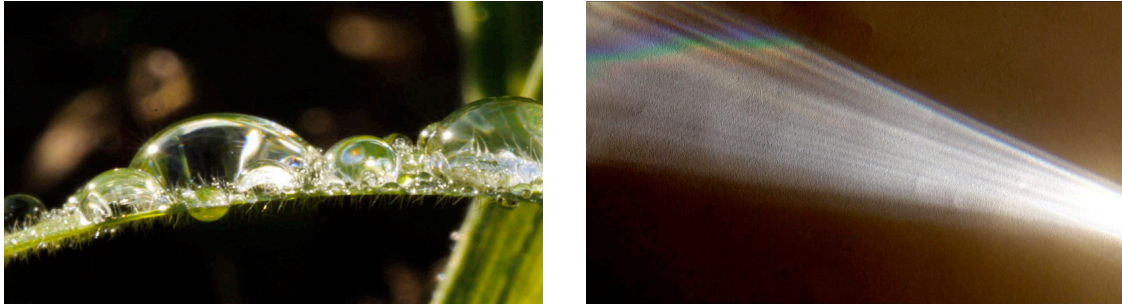


Fig. 86 *Speculum* (2014): first and last seal

During the making of *Speculum*, the principal subject for my filmmaking became *light*: refracted light in dew drops are seen in the first seal, and light progressively becomes the dominant imagery by the last seal (Fig. 86). Light is treated as something substantial in itself. I was more interested in exploring its emanatory and generative qualities than in its capacity to illuminate matter. Matter, where it meets light, becomes its host and mediator, and is often subsequently transformed by its mediation. To do this, the film employs a range of manual catoptrical methods: filming and projecting through glass vessels, mirrors and water lenses, while layering these within multiple stages of projection and re-filming. Increasingly complex and indecipherable layers of virtuality are generated within some image sequences, as if the film itself were being projected within a hall of mirrors. These catoptrical methods were used for their luminous transformational agency upon the imagistic *prima materia*. Such processes were usually of a significant duration, yet they are obscured from view: the catoptrical traces are often fleeting images in the finished film.

In a diagrammatical sense, the film also reflects a fundamental concern with *seeing*, with *observable* alchemical change, similar to the depictions of alchemical experiments taking place inside the transparent glass of an alembic. This may place the viewer in the position of witness, looking in but uninvolved in the actual experiment. They are nonetheless fully participant in the light issuing *from* the film. This point is taken up by Cazzin in his review, writing “the light refracts on the film and returns to reality, permeating and performing it.” The light is recorded through a camera, inscribed into the virtual body of the film. In refracting back outward into reality, the light takes on its own creative agency, “to make cinema the cradle of reality – reality which, once modified by the light refracting on the film, would owe its very essence, or even better its genesis, to the film.” This view identifies the central, generative role of light within *Speculum*. It was once accepted that the cosmogenesis of the macrocosmic universe was

based on the emanation of light. Within the contained macrocosm of cinema, and the microcosm of each individual film, this theory of luminous cosmogenesis is still applicable. It is light that creates the reality of cinema.

Does *Speculum* succeed in its ambitions? The alchemists may have been convinced there was a *Philosopher's Stone* to be found, and this history was laden with unachieved and unachievable objectives. Alchemy's ultimate success is to be found instead in its iterative processes, theories, tangents, chance discoveries and footnotes. Its real legacy is in its language and methodologies of transformation, a set of ideas and practices that still have currency today. *Speculum* is a new iteration, a re-visioning of these ideas in a new form. Implicit in all of this is the idea of positive failure: *Speculum* is an artefact, or residue, of an ongoing process. The title, *Speculum*, is the Latin word for mirror and its title graphic is taken from John Dee's own handwriting of this word. In contemporary life, a *speculum* is also a mirrored medical tool for looking inside the human body cavity, especially within gynaecology. In this sense, *Speculum* denotes a mirror that is an enquiry into the self, both inside and outside, reminiscent of Della Porta, pointing his sword at the mirror (fig. 11). The film oscillates, catoptrically, across a vast span of time and ideas, as if signalling in light, back and forth, between the deep past and the present.

## 5.2 *Catoptrica*



Fig. 87. *Catoptrica III*, Iceland, 2013

*Catoptrica* are a series of live multi-projector experiments developed through four live performances between 2011 and 2013: *Catoptrica I, II, III* and *IV*. My objective was to explore the idea of the *live catoptrical experiment*.<sup>141</sup> Each performance combined digital projectors, mirrors, glass objects, glass vessels and live video feedback with video sequences of the four elements as *prima materia*. Figure 87 shows a performance in an ex herring factory in Iceland<sup>142</sup>, now used as a contemporary art space. This performance lasted two hours, with projections of *fire, earth, air* and *water* on three walls and the ceiling. A video camera connected to a fifth projector provided a video feedback loop, while I used glass objects, mirrors and coloured water lenses to manually intervene in the projector beams.

Each performance was set up as a *laboratory*. A subtitle I have used in addressing these works is “a laboratory of failure”. My emphasis was on live experimentation, a performance realisation of some of the working methods I had explored in making

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<sup>141</sup> For other artists working with projection based performance, see the 16mm film performance groups *Metamkine* and *Nominoe* (France), Bruce McClure (USA), *Collective-iz* (UK), Greg Pope (UK/Norway), Guy Sherwin (UK), Peter Campus (USA), Nicky Hamlyn (UK), Dan Graham (USA), Malcolm Le Grice (UK), Sami Van Ingen (Finland), Jürgen Reble and Thomas Köner (Germany) and Anthony McCall (UK/USA).

<sup>142</sup> Verksmiðjan á Hjalteyri, Akureyri, Iceland.

*Speculum*.<sup>143</sup> Pre-cinematic manifestations of this idea can be seen in the early projection work of Della Porta and Kircher previously discussed (Chapter 3).

*Catoptrica* draws upon the heritage of alchemical catoptrical experiment. In its realisation, the work relies upon the technology of the projector, a fundamentally catoptrical device consisting of a light source, image feed, mirrors and lenses. The earliest use of the word *projection*<sup>144</sup> in fact stems from late 15<sup>th</sup> century alchemical texts. Projection was defined as the moment in which the *Philosopher's Stone* (usually a red stone or powder) would be *projected* onto base metals in order to facilitate a transmutation into gold. *Projection* is the act of casting something forward in anticipation of an effect. Roger Bacon defined alchemy as:

A science teaching how to make and compound a certain medicine, which is called Elixir, the which when it is cast upon mettals and imperfect bodies doth fully perfect them in the verie *projection*.  
*Mirror of Alchimy*, 1541 in (Bacon, 1597)<sup>145</sup>

Projection is historically associated with ideas around the transmutation of matter from one thing into another, enacted through the process of releasing, or *casting forth* one substance into another. In the alchemical sense, it is also an active emanation of substances, light, desires and ideas. This gives rise to its Freudian psychological meaning of the “projection” of psychological traits from one person onto another. Projection has evolved a complex web of meanings, fundamentally concerned with material transmutation, light, the luminous image, psychology and the anticipation of imagined futures. This complexity reflects Grosseteste’s emanatory cosmogony, Al-Kindi’s network of forces, and Roger Bacon’s *multiplication of species* previously discussed (3.2). Bacon saw light as the carrier of *species* that are multiplied by their mediation, through objects, light or thought itself. In this, Bacon offers early clues about the power of the projected cinematic image. I used video projectors in *Catoptrica* as an emanatory light source, drawing on Bacon’s idea of *species*; the images are *multiplied* by means of rays. Dominique Païni examines relationships between ancient conceptions of luminous vision and cinematic projection, echoing Bacon:

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<sup>143</sup> *Catoptrica* can also be considered a form of “expanded cinema”, a term coined by Jonas Mekas in 1965, which has also been used to describe early light-play using cinematic apparatus, dating back to 1917 (Rees et al., 2011: 21). See *Expanded Cinema: Art, Performance, Film* (Rees et al., 2011), Gene Youngblood’s *Expanded Cinema* (Youngblood and Fuller, 1970), Sami van Ingen’s *Moving Shadows* (van Ingen, 2012).

<sup>144</sup> Projection is derived from the Latin *proiectum*, meaning “something thrown forth”. Its first use in the sense of “casting an image on a screen” is recorded in 1865.

<sup>145</sup> Bacon lived in the 13<sup>th</sup> c. but this work first appeared in Nuremberg in 1541 as *De Alchemia*, in Latin.

Light no longer encounters an image, nor bathes it, nor illuminates it. Light penetrates it at first, then transports it, duplicates it in dematerializing it, sometimes temporalizing and sublimating it.  
(Païni 2004: 27)

So, if modern projection uses light to “transport, duplicate, dematerialise, temporalise and sublimate” the image, it is in itself an alchemical vessel for transformation.

The projected image, encountering a *reflective* surface, shows us grotesques and homunculi in equal measure. What makes this possible is spatial scale, the geometry of light rays, lens ratios and distance from the light source. Through projection, the macrocosm can be diminished to tiny proportions, or the microcosm multiplied to huge scale. What is volatile might be made fixed, and the fixed re-animated. Bacon imagined the potential:

Glasses and Perspectives may be framed, to make one thing appear many, one man an Army, the Sun and Moon to be as many as we please... And by the same Reason one thing may in appearance be multiplied to an infinity ... Glasses so cast, that things at hand may appear at distance, and things at distance, as hard at hand ... By the framing of Glasses, bodies of the largest bulk, may in appearance be contracted to a minute volume, things little in themselves show great, while others tall and lofty appear low and creeping, things creeping and low, high and mighty, things private and hidden to be clear and manifest.  
*De Mirabili Potestate Artis at Naturae*, 1542 in (Bacon, 1659)<sup>146</sup>

In the “luminous transport” of images, Païni notes the projector’s own catoptrical correspondence with sunlight, “to look at the projector” is to “confront the sun” writes Païni, citing Bacon’s prescient imagination of a screen upon which light rays could be projected without damaging the eye (2004).

I used multiple projectors in *Catoptrica* to reflect ideas of emanation, the *multiplication of species*, and the projector light as correspondent with solar or celestial light. I also used multiple projections to create compound images by layering them onto a single screen surface, plus mirrors in the projector beams to manually mix one image with another.

In *Catoptrica* I used a number of catoptrical methods to intervene in the projectors’ rays, external to the fundamentally catoptrical characteristics of the projector mechanisms

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<sup>146</sup> Probably first published in Paris in 1542 (Power, 2006). An early edition is Oronce Finé’s 1551 version known as *Epistola de Secretis Operibus Artis et Naturae, et de Nullitate Magiae* (Letter on the Secret Workings of Art and Nature, and the Vanity of Magic), part of a treatise on optics and burning mirrors that reproduces the work of Claudio Celestino on catoptrical celestial causality. See also (Mannoni, 2000: 18).

themselves. These were carried out manually over the duration of each live experiment and included:

- Static floor mounted mirrors positioned within the space and used to direct parts of a projected image onto other images, or to other areas of the space, including floor and ceiling.
- The use of smaller mobile mirrors, hand held, similarly used to direct parts of a projected image.
- Refractive glass objects used to distort images and to refract their light.
- Alchemical glass vessels used to refract and distort.
- Coloured liquids added to glass vessel lenses live.
- Red, yellow, green and blue coloured gels to colourise images and projected light.
- A live video camera connected to a projector to create video feedback between the projected image and itself.
- Shadow projection used to create areas of darkness in an image into which other images might be directed.



Fig. 88. *Catoptrica IV*, Edinburgh International Festival, 2013

Figure 88 shows my laboratory working area: alchemical vessels, dyed liquid and glass objects used in the projector beam. Each performance was durational, designed to allow the audience to witness the visual experiment. It was important to me that these were

*unplanned experiments*, starting with a set of image ingredients and exploring what could be done with the space itself and the catoptrical tools I had. Each experiment became irreproducible as it unfolded, as complex layers and spatial arrangements of non-synchronous images emerged. Most performance events in the area of expanded cinema are highly structured.<sup>147</sup> I wanted *Catoptrica* to remain *unstructured*, retaining a live quality of unpredictability and failure, an experience of *process* unfolding within a *light laboratory*.

In *Catoptrica I* (*Alchemy Film and Moving Image Festival*, Scotland, 2011), four projectors were used, each showing a 20 minute loop of *fire, earth, air* or *water*. I worked with a female assistant,<sup>148</sup> as my *soror mystica* (see the discussion of *L'Etoile de Mer* in Chapter 4.1), who worked with me in manipulating glass objects: glasses, bowls and glass ashtrays,<sup>149</sup> plus a variety of mirrors in front of the projector lenses.

This basic format has been preserved through the three subsequent experiments. The soundtrack was a live sound-art performance by James Wyness,<sup>150</sup> drawn from field recordings of the *four elements*.

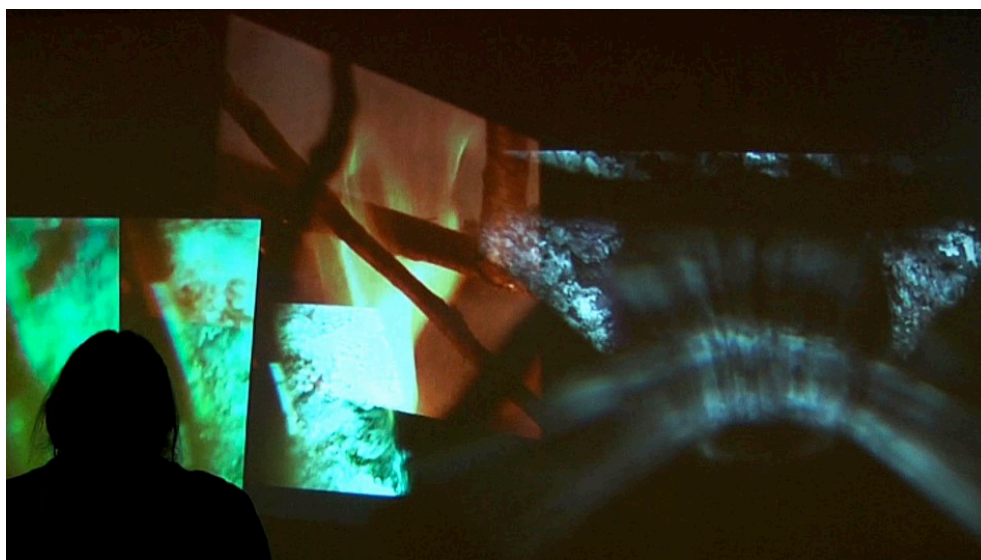


Fig. 89. *Catoptrica II*, *Inspace*, Edinburgh, 2011

I used video feedback for the first time in *Catoptrica II* (*Inspace*, Edinburgh, 2011, fig. 89), with a live camera connected to a fifth projector. This enabled me to create video

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<sup>147</sup> A difficulty for this kind of work is its relationship with host venues and audience expectations of spectacle. Most *expanded cinema* performances I have attended (Nominoe, Metamkine, Sami van Ingen, Nicky Hamlyn, Thomas Israel, Malcolm Le Grice, Collective-iz, Jurgen Reble and Ryoichi Kurokawa) have been structured toward clear audio-visual objectives, often orientated toward a sense of spectacle.

<sup>148</sup> Bridie Ashrowan, my wife.

<sup>149</sup> Stan Brakhage began his light film *The Text of Light*, with light refractions through a glass ashtray. In the making of the film, other glass objects - vases and a crystal ball, were added to his light refracting toolkit.

<sup>150</sup> See (Wyness, 2014).

feedback, a tool for the *multiplication* of images, reflecting alchemical processes of circulatory distillation. I pointed the camera at its own projected image, layering others onto it using mirrors. I also experimented for the first time with shadow projection. This created complex layers of duplication and a sense of the image imploding into itself.

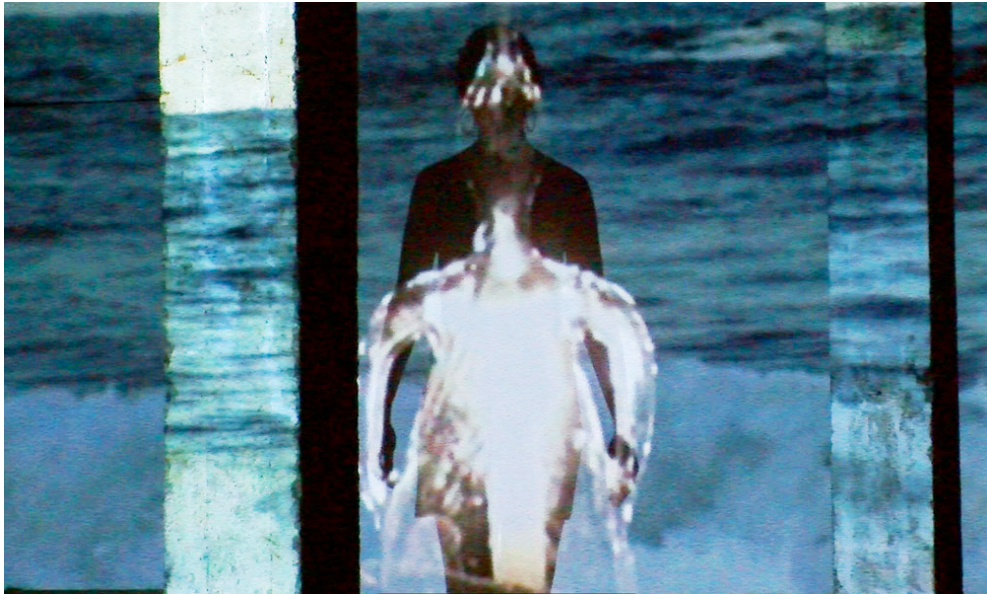


Fig. 90. *Catoptrica III*, Iceland, 2013

*Catoptrica III* (*Verksmiðjan á Hjalteyri*, Iceland, 2013) took place in a vast factory space containing a striking columnar architecture. Figure 90 shows an alchemical vessel, modelled on the *Ripley Scroll* alembic, which I filled with light by lighting a candle behind it. I performed and filmed this action live with a projector connected to the camera. As I did so, my assistant created a shadow of her body inside a projection of water. Her body shadow created the silhouette within which I then projected the lit vessel. This is a complex image and refers to the body as an alchemical vessel for metaphysical light, the macrocosm within the microcosm.

The venue for *Catoptrica III* gave me the opportunity to work at a large scale, combining the architecture of the space with video feedback. This facilitated greater experimentation with shadow projections which I in-filled with other projections. For example, I filled the silhouette of my assistant with her own image using a live camera from a different angle, or using close-ups of her hands or face.

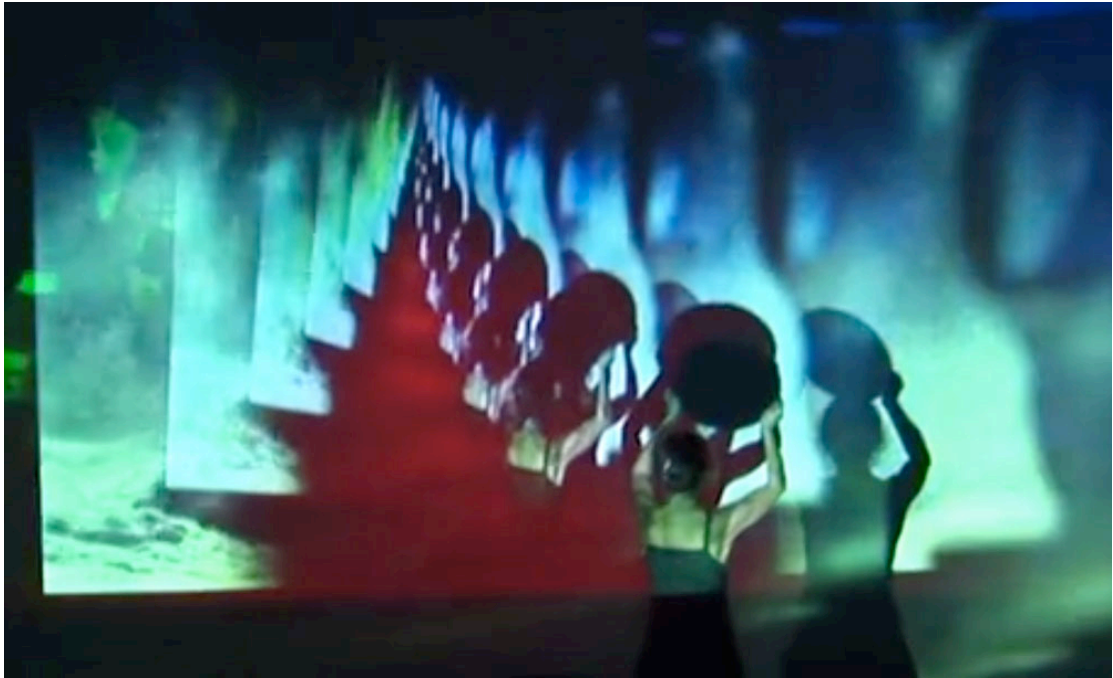


Fig. 91. *Catoptrica IV*, Edinburgh International Festival, 2013

*Catoptrica IV* (Edinburgh International Festival, August 2013) introduced a number of alchemical glass vessels as lenses. These allowed for new experiments in using coloured dyes in water, added to the vessels live. Figure 91 shows a projection of water, filtered through a vessel containing red dye, a projection of fire filtered through a green gel filter, my assistant holding a round mirror (reflecting an image onto the back wall) and a live video feedback loop. I developed the use of shadow projection, using the shadow as a *vessel* for masked video projection. For example, I filled the shadow of a round mirror with a ball of refracted light, itself reflected into the camera lens from the projector light using a mirror, while a glass object in front of the camera lens further refracted the incoming image.



Fig. 92. *Catoptrica IV*, Edinburgh International Festival, 2013

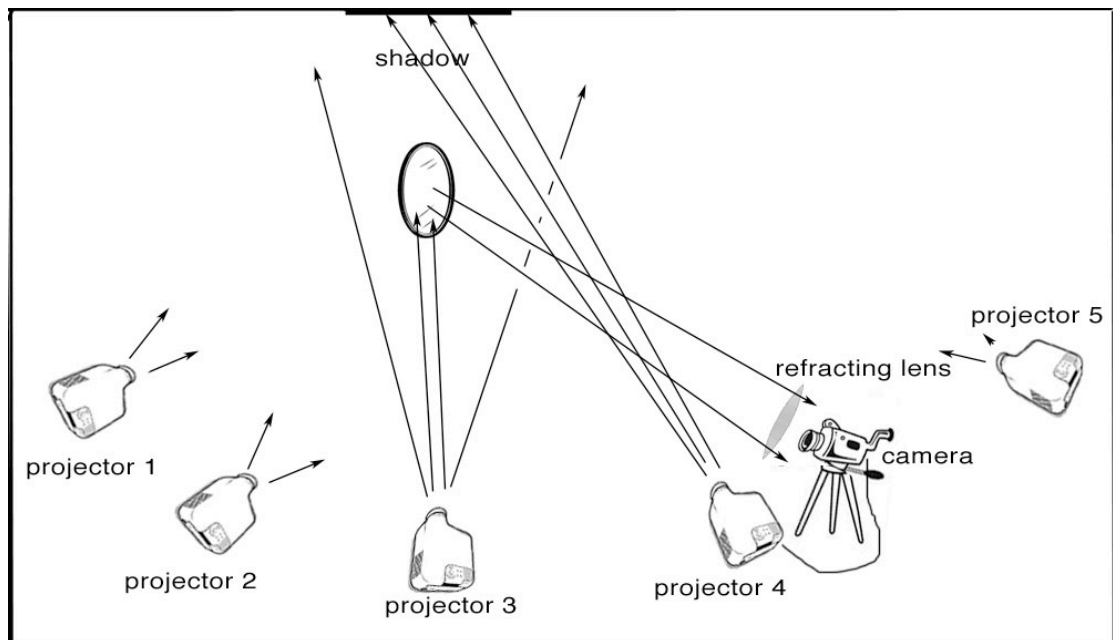


Fig. 93. *Catoptrica 4* diagram, 2013

Figure 93 shows the set up used to create the image in Figure 92. Images of water from projector 3 were reflected into the camera lens from a round mirror, through a hand held glass refractor. The camera input was simultaneously re-projected through projector 4 into the shadow cast by the originating reflecting mirror. An image of fire from projector 2 filled the body shadow of my *soror mystica* on the surface of water.

As Païni writes, “time is consubstantial with the projected image” (2004: 23). The idea of time and duration as a substance of these experiments became acutely apparent. The dictates of time and space availability for the performances also informed the character of each piece. *Catoptrica II* unfolded in a gallery called *Inspace*, which describes itself as an *experimental lab*. In this iteration we were able to work over the duration of a whole day, with people wandering in and out and without the pressure to produce any kind of visual spectacle. In many ways this was the most favourable temporal situation for this kind of practice. In contrast, for *Catoptrica IV* at *Edinburgh International Festival* we had a 20 minute slot, with a fixed fee paying audience. This constraint necessitated a more performance based approach, enacting a number of pre-tested experiments developed in rehearsal.

*Catoptrica* explored ways in which projected imagery of the four elements could be manipulated live using catoptrical means. It demonstrates the use of various optical interventions related to the history of alchemical catoptrical practice, updated through digital projection and video feedback in the context of a *light laboratory*. The work led to an increasing fascination with light, and how the projected image might be split into its luminous components, distorted and manipulated. The most challenging aspect was the spatial context for these works. The shape of the venue, its projection surfaces, ambient light levels, scale, laboratory set-up time, allowed duration, and audience expectation of spectacle all influenced the kind of experiments that could be realised. Experiments in my studio, where it is possible to set up and adjust projector positions over a period of days, and where the projectors are within 4m of the projection surface, allow a more finely grained degree of control, producing subtle prismatic and spectral effects. These effects are difficult to reproduce in a large space without access to high luminosity projectors and significant set-up time.

The complexity that emerged out of my set-ups was difficult to assimilate. Working with five projectors, a feedback camera, various mirrors, glass vessels and coloured gels, with four different image loops, introduced a high number of variables. This is consistent with historical alchemical practice: issues we take for granted in chemical practice today, such as the careful weighing and measuring of pure ingredients, the use of uncontaminated vessels and controlled environments, were rarely considered. Alchemical experimental guidelines are invariably silent on instructions that would allow any form of accuracy or experimental reproducibility, leading to a high degree of subjectivity in their interpretation. My experience with *Catoptrica* reflected this. Certain

experiments, even if methodically rehearsed, produced widely differing results. A glass object positioned at a slightly different angle, a slight shift in camera zoom, or a tiny adjustment in hand-held mirror angles can result in dramatic changes when working at scale. The non-synchronous projection of the four elements source material also meant that luminosity, colour and contrast were forever changing within the overlapping projector beams. True to the spirit of experimental alchemical practice, this results in unique temporal images that are only very rarely reproducible.

I intend to continue developing *Catoptrica* as an experimental practice. In future iterations of the work, I will aim for a more structured approach to introducing new variables, making situations more manageable. I intend to follow the model of durational live art<sup>151</sup> as a template for showing the work, instead of *performance*. Experimentation with light refracting effects could be more effective by using higher luminosity projectors in smaller spaces. This would enable me to split images into their spectral colours and layer them, something I have only been able to achieve within a studio environment. The sounds I have use are unprocessed ambient recordings of the four elements. It would be useful to consider how similar processes of live sonic transformation might also be applied.

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<sup>151</sup> Informed by my experience of watching performance art groups, such as *Black Market International*, who frequently undertake *actions* for 12 hours within a given space, allowing a slow experimental unfolding of the work as they transform the space they are in.

## 6. Conclusion

I started this research aiming to arrive at a “deeper understanding of what it means to experiment with the substance of light in a transformative, luminous, meaning-making capacity”. In order to do this, I have excavated a range of historical ideas and images as the basis for the reflexive practice outlined above. My enquiry into transformation has included an examination of the catoptrical experiments of alchemists, uncovering a range of pre-scientific transformational practices, and exploring the contextual thinking and meaning-making involved in them. This has led to a transformation in my own praxis, in my thinking and methods. Ideas drawn from the historical research offered new contexts for thinking about light, transformation and the signification of images, resulting in new forms of catoptrical filmic experimentation that in turn opened out further questions and areas of historical research.

My first experiments in catoptrical manipulation of the projected image created a significant shift in my thinking. From initially considering the image as a carrier of meaning or representation, I later arrived at an understanding of the image as a residue, or trace, of transformational change. The images I filmed began to take on a non-representational quality in my thinking, becoming substantial, my own experimental *prima materia*. This transformed my sense of attachment to what an image might refer to, represent or mean, into a fascination for what an image might *become*, and how it might do so. It is in considering *becoming*, through experimental intervention, that I began to participate in the kind of psychological projections that alchemists had employed in their own practices. I imagined future states, such as the transformation of water to fire, and employed catoptrical processes to try to achieve them. Meaning-making shifted from its embodiment within the image to its embodiment in the processes of transformation behind the image, or applied to it. That which was changing took on a greater signification than that which was fixed, in the visible transformation of the in-between space between one image and another, activated through the compression of duration. The transformative qualities of degree, difference, time, colour, form, fluidity and volatility came to represent the primary locus of meaning in my work, becoming a mirror for transformation of the self as much as a site of intellectual and creative experimentation.

A re-thinking of my understanding of light arose from my encounter with the catoptrical light metaphysics embodied in the historical research, adding a historical and philosophical meta-narrative to my thinking about light. Light became associated with number, symbol and substance, alongside its hidden, or occult, properties of reflection, emanation, transformation, multiplication and generation. A concern with the manipulation of light, as the carrier of the image, further displaced ideas of representation or abstraction. Light itself cannot be captured by a camera, but the substantial traces it leaves can be. And these traces can be reanimated and transformed through the mechanism of filming, catoptrical experiment and projection. Light, and its traces, is now central to my visual thinking, transformed from passive illumination to become an active subject in my filmmaking.

My encounters with historical material have also been transformative, providing the genesis and much of the subject matter for the films I make. My historical reading has become a positive interrogation, seeking out concepts, processes and structures to re-enact in the contemporary context of my filmmaking practice. I have been personally drawn to archaic ideas left at the margins of scientific history, as redundant and sometimes disregarded artefacts of imagination. Reading and reflecting on these has fostered a new speculative and prospecting approach, lending a novel imaginative agency to my work. Ideas actively emanate from texts and images, across time, into the present moment, offering the possibility for a revivification of the forgotten and the dead. To bring such ideas forward, positioning them in a new context, is not nostalgic in its objective, but used as a means to suggest new possibilities for the present.

These shifts in thinking have generated a significant change in my filmmaking methods, while experimentation with method has equally inflected my thinking. Moving away from the creation of artistic *artefacts* toward the placing of *experimental process* at the heart of my work, I will now highlight how the historical research has informed the development of specific methods and processes within my practice.

Ideas of circulatory distillation in the *Ripley Scroll* and Maier's alchemy, plus Fludd's Cabalistic hierarchy of divine emanation directly suggested the strategies of progressive and sequential transformation I applied to my source imagery. These influences are seen at a structural level within both *Speculum* and *Catoptrica*, and they suggested the loop-like, repetitive and sequential processes I used in the creation of the source imagery. The layered structural framework of *Speculum* reflects the kind of diagrammatical

structural space in alchemical illustration. The alchemical methods of *calcination*, *conjunction*, *putrefaction*, *sublimation*, *multiplication* and *projection* are further processes closely mirrored in my methods of visual experiment. Man Ray's use of cinematic experimentation provided an anchor for this thinking in my practice.

The specialised area of alchemical catoptrics led me to consider the representational image as a form of luminous *prima materia*, a substance subject to catoptrical manipulation. The technologies of alchemical catoptrics suggested new practical possibilities for working outside the camera, using glass objects, mirrors, water lenses, vessels, projection and re-filming as tools to work directly with light.

The illustrations of Athanasius Kircher's catoptrical devices directly informed the setups I employed in filming abstract light sequences, working with pinhole sunlight in a darkened space through light refracting glass objects, plus the use of the projector as a light source in my re-filming experiments. Della Porta's solar distillation illustrations first suggested the use of the unique glass vessels I created for experiments in filming and refracting light through these forms, as lenses. The use of burning glasses, with their *magic natural fire*, illustrated in *Le Fèvre*, the *Arcana Divina* and *Chemical Moonshine* were employed in the irradiation of dew and the *solar calcination* of several image sequences in *Speculum*. The influence of Marci and Newton's splitting of the light spectrum can be seen in the last sequence of *Speculum*.

I employed these techniques as a means of challenging the fidelity and representational veracity of the camera image. The work of Patrick Bokanowski, using manual distortion tools for image manipulation outside the camera, and post-filming, acted as a mirror and stimulus for these concerns. These have been liberating discoveries, encouraging a sense of detachment from the image with its symbolic associations and fostering a new freedom of experimentation with their underlying form: *light*.

My choice of *prima materia* imagery was informed by theories of cosmogenesis, the relationship between divine emanatory light and the material world. These theories provided the structuring principle of *Speculum*, plus the projection performance work *Catoptrica*, conceived as a form of live emanatory creation. Promoted by Al Kindi and Grosseteste and carried forward in the work of Paracelsus, Dee and later alchemists, the theory suggested a hierarchy of creation, from light, down through the four elements, to corporeal matter. Images of the four elements, as *intermediary* forms between light and

matter were the central image material of *Catoptrica* and dominate the source imagery in *Speculum*. The alchemical signification of *dew*, as a catoptrical substance belonging to the interstices between the corporeal and the luminous, led me to use this image, informed by its discussion and depiction within the *Mutus Liber*, Dee, Beuther, the *Arcana Divina* and *Chemical Moonshine*.

There are a number of conceptual correspondences with moving image practice that can be identified. The principal difference between the camera and the catoptrical apparatus discussed in this research is that the camera deals with *reflected* light directed at a material substrate, whereas catoptrical apparatus worked largely with *direct* light. It takes only a small catoptrical shift to substitute the directly exposed *matter* of the alchemists for the indirectly exposed *image of matter* in filmmaking to uncover the conceptual and methodological correspondences between these practices.

The camera itself is a contained catoptrical collection of lenses and mirrors, a miniaturised version of the lens and mirror apparatus illustrated in the research. The camera concentrates reflected light on its receiving substrate, irradiating and impregnating it. The filmed image becomes light embodied within physical substance, through processes of capture and transformation, whether on chemical film-strip, or, in the case of the digital image, as physically encoded magnetic and electrical polarities. A direct correspondence exists between this and the alchemical search for substances that would be *magnetic* toward light. The experiments conducted by Le Fèvre and Newton in the fixing of light within antimony or Dee's *Monad* are a similarly *encoded* inscription of light.

The equation between light and vision is at the heart of filmmaking practice. For centuries, the mechanics of vision and the action of light were confused and undifferentiated. To *see* is to experience light's volatile transformative action upon matter. To then film something, a seamless act of mechanical light capture and seeing, is to alchemically *fix* that volatility in a temporally contained set of images, where time itself becomes mutably substantiated in matter.

The *fixing* of the *volatile* qualities of light is an alchemical method with its mirror in the ideas of Ficino and Dee, with their belief that signs and symbols could embody specific agencies of light. The recorded image has a similar quality, of light materially fixed in matter as an image, possessing a latent agency upon the surrounding world. Dee's

process of geometric manipulation of his Monad was designed to reveal further levels of signification, extracting LVX (light) from the elemental cross. This corresponds to the methods of image manipulation, editing and presentation used within moving image practice to manipulate the signification of the image.

Roger Bacon's *multiplication of species* theory has a cinematic character based on the movement of light. The mediation of *species* emanating from forms to and through the camera, is a transformative device. It is through projection or screen display that new, mediated and *multiplied* species follow geometric lines of light emanation. In *projection*, the final stage of the alchemical process and the alchemical origin of the word, image matter (a microcosm of its referent) is re-animated in the form of projected, *emanating* light. Luminous images are *multiplied* at scale from a material substrate. They are "multiplied", as Bacon said, "by mediation".

The Christian theological underpinning of most of the catoptrical practice discussed in this research can be an obstacle to apprehending its full implications. Dee's angelology, the Paracelsian hierarchies of creation, Khunrath's Christological catoptrics or the Cabalistic emanations of Fludd, while highly imaginative, are underpinned by a committed theistic belief in a divine creator. That the luminous transport of divinity into matter could be accomplished by catoptrical means can be accepted theoretically, but as a non-theistic reader of these texts, it is difficult to fully enter into this idea. I do not claim any direct correspondence with such belief systems, but the notion of emanatory light as a central, generative agency does have an analogous relation to the idea of *projection*.

If projection is a form of meaningful luminous emanation, then it is also Creator-like, a celestial catoptrical experience held within the alchemical alembic of the cinema, populated by homunculi ingesting light. Within the ritual space of the cinema, the viewer becomes a reflexive catoptrical mediator, filtering the flow of images through their intellectual and imaginative faculties to deliver meaning back to the image. This opens out the possibility for an understanding of images as products of catoptrical practice in a wider way. The human being is catoptrical, a mediator of light, reflecting back what he or she sees through the creation of images. In this way, any image, processed through the hand of the artist, embodies the *multiplication of species* of which Bacon speaks. The image in turn multiplies its own species through the eyes of its beholders. It is luminous emanation as a form of creative *sight*, as explored by Fludd. This sequence of processes

resembles the metaphysical hierarchies of light and form promoted by philosophical alchemists such as Dee, Khunrath and Fludd. In the process of filmmaking through to its final projection and viewing, archaic beliefs in the Paraclesian idea that light, matter, thought, imagination and agency are inextricably bound together are enacted.

Ficino's belief in the physical embodiment of celestial light in physical objects is more applicable in a filmic sense than ever it may have been for his magical talismans and statues. His desire to capture the *spiritus mundi*, permeating all the known world, can be seen as ideologically analogous to the filmmaker's desire to capture meaning.

Filmmaking is a manifestation of the desire to capture, manipulate and transform the *spiritus mundi* of our age. Matter is the medium within which these images are written, light is the medium by which they are both received and actualised. It is through vision that they are ingested. Filmed images capture and reflect a contemporary form of the *spiritus mundi*. They have agency upon it and within those who ingest them. This is a similar ideological position to that taken by Ficino in the fifteenth century.

This thesis has presented a genealogy of alchemical-catoptrical practice, a previously under researched tradition that interrogated the potential transformative relationships between light and matter. The research conducted has involved source manuscript research and includes original translations of short passages from Giovanni Battista Della Porta, John Dee and Athanasius Kircher, plus substantial translations of the *Arcana Divina* and *Das Zweyte Silentium Dei*. Bringing these new sources together with the extant research available from other authors is a substantive contribution to knowledge in its own right.

In the chapters on Man Ray and Patrick Bokanowski, I demonstrated that the terms, practical methods and esoteric philosophies surrounding alchemical catoptrical practice can be used as a language of transformation and an interpretative framework for reading the work of other moving image artists. Through the wide contextual research I have undertaken I am confident that this exploration of correspondences between alchemy, catoptrics, and moving image practice is original and has not been explored by previous authors. The research is applicable within the domain of media archaeology, exploring the conceptual and philosophical basis of its technologies, and arguing that the motive root of experimental moving image practice can be found mirrored in the ideas of early light philosophers and catoptrical alchemists.

The creation of *Speculum* and *Catoptrica* reveal that these archaic ideas have not exhausted their vitality, offering a rich territory for continuing creative exploration. Reinvigorating or disrupting the present through the archaeology of old ideas has a long history. Examples can be found in Ficino's translation of the Hermetic corpus in the 14<sup>th</sup> c., the surrealist exploration of the alchemical occult, Jung's alchemical scholarship in aid of psychoanalysis, or Brakhage and Frampton's use of Grosseteste.

In excavating these ideas, I have demonstrated how they can lead to original images, novel filmic structures, new modes of presentation and ways of working. My filmmaking, and that of certain other experimental filmmakers, reflects the processes of *luminous transformation* explored within the historical research. This is an original context for the restitution of archaic ideas in a modern context, and a means of rehabilitating these ideas in contemporary discourse.

In terms of further research, the historical review of alchemical catoptrics could be significantly extended by exploring further connections within the genealogy, tracing the work of other thinkers connected to those discussed. Starting points for this work would include Pico Della Mirandola, Michael Sendivogius (a student of Dee and an important figure for Newton), Eirenaeus Philalethes (George Starkey), Giambattista Vico (whose works do not exist in English translation), Ketmia Vere, Oswald Croll, Alexander Van Suchten and Stephan Michelspacher.

There was a unique nexus of philosophical-alchemical thinkers around Rudolph II in Prague (late 16<sup>th</sup> c.), many of whom shared an interest in light. From these sources, rooted in the works of Dee, catoptrical practice emerged and flourished throughout the 17<sup>th</sup> c., particularly in the illustrated works published by the De Bry family (Chapter 3.3) in Oppenheim and Frankfurt. I believe it would be rewarding to further research this particular context (Prague and Germany, 1580-1680), tracing catoptrical practices up to Von Tschirnhaus.

Further useful work could also be conducted into tracing the transmission and translocation of the more esoteric philosophies presented into the modern age, through the Rosicrucian movement, the theosophists, the romantics, and the Golden Dawn.

The application of catoptrical methods, their diagrammatic structures and philosophical ideas, offer many further avenues of exploration and inspiration in my filmmaking

practice. In particular, I believe a deeper reading of the illustrative work of Robert Fludd and Michael Maier could lead to a number of new film ideas. Dee continues to be a primary source. My next film project will involve a more focussed exploration of light forms, and light *as a substance*, an extension of the imagery and processes developed within the last seal of *Speculum*.

During the course of this research, I have uncovered a range of moving image practitioners whose work might be described and interpreted using a catoptrical-alchemical framework (listed in the introduction). It is my intention to pursue further study of these filmmakers within the context of a book project: *The Alchemy of Experimental Film*.

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