Distilling Sir Harrison Birtwistle's

Multidimensional Musical Objects in “Harrison's Clocks”

by

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ABSTRACT

This document endeavors to provide a contextual, analytical, and interpretive framework of Sir Harrison Birtwistle's *Harrison's Clocks.* First, I investigate the background and influences of Birtwistle and how they come together to shape his compositional works. This is achieved through a biographical sketch of the composer, an overview of John Harrison, the influence of early 20th century visual artists on Birtwistle's works, as well as a comparison between Klee's artistic techniques and Birtwistle's own compositional techniques. Next, I analyze each of the five movements of *Harrison's Clocks*, looking into the ways that Birtwistle's mechanisms control multiple dimensions of musical parameters (such as duration, register, and intervals) especially through the motives of oscillation and periodicity. By breaking down each movement of *Harrison's Clocks* to their simplest mechanisms, this paper seeks to show how, through repetition, superimposition, and juxtaposition, Birtwistle created a perpetually evolving, yet familiar musical landscape. Finally, I guide the prospective performer in the preparation of the work through observations of the "Stravinskian" approach to expression and in the more tactile, practical concerns of rehearsing and preparing the work. In addition to this document, I prepared and performed a lecture-recital titled *Inner Being: Exploring the Perception of Multidimensional Musical Objects Through the Lens of Visual Art in Sir Harrison Birtwistle's Harrison's Clocks*, which details the relationship between the techniques utilized by several early 20th century visual artists and their technical application in Birtwistle's compositional approach. This lecture-recital concludes with a complete performance of *Harrison's Clocks*.

I presented a doctoral lecture-recital in addition to this research paper. This was the state of Arizona's premiere of Birtwistle's *Harrison's Clocks* and was performed in Katzin Concert Hall at Arizona State University on September 20, 2024. The lecture-recital was titled: *Inner Being: Exploring the Perception of Multi-Dimensional Musical Objects Through the Lens of Visual Art in Sir Harrison Birtwistle's Harrison's Clocks*. For access, please visit: https://www.youtube.com/watch?v=jRO6vB-Tmzs&ab_channel=KatzinConcertHallASUMusic%2CDanceandTheatre.

ACKNOWLEDGMENTS

When one studies a work of art, it leaves an impact, no matter how small on the observer. This particular project was very intense, and more often than not, gave me the sense I was trying to find my way out of Daedalus' labyrinth. It is not often that one can say that a piece of music changes who you are and shows you a new way of seeing the world, but the process of experiencing this music was one of those occasions.

I am grateful to the members of my committee Dr. Baruch Meir, Dr. Gabriel Bolaños, and Dr. Cathal Breslin for their investment, interest, and insight in this project. I am especially grateful to Dr. Meir for his guidance, kindness, and encouragement throughout my time at ASU.

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For their infinite love, encouragement, and support since the outset of this journey, I am especially grateful to my family who encouraged me to stick to the path, even when it was difficult. I am thankful for my friends who have also been a constant source of goodwill and levity.

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TABLE OF CONTENTS

Page

LIST OF FIGURES

Figure Page

CHAPTER 1

INTRODUCTION

Perusing the Meadows School of the Arts library while studying for a performer's diploma at Southern Methodist University, I happened across the score for Sir Harrison Birtwistle's *Variations and Gigue Machine*. The way the music was layered on the page was intriguing to me, and I loved the title *Gigue Machine*. After checking out the score from the library, I tried to find recordings of these works to no avail. Fortunately for me and this project, a recording of another of his works was available and caught my eye: *Harrison's Clocks*. I was both astonished and transfixed by this piece and listened to both available recordings, one by Joanna MacGregor and the other by Nicholas Hodges, many times. This discovery inspired me to embark on this journey and culminated in the Sisyphean, yet immensely rewarding, doctoral project presented here.

Birtwistle explored numerous ideas which have their influence outside of music, and the integration of these ideas with *Harrison's Clocks* is explored in a lecture-recital associated with this project I presented in September of 2024. This can be accessed via the YouTube link on page ii. The lecture-recital shows a slightly different perspective on Birtwistle's interest in visual art than this document, focusing more on direct comparisons to particular artworks such as Paul Cézanne's *Mont-Sainte Victoire and the Viaduct of Arc River Valley*, Wassily Kandinsky's *Soft Pressure*, and Piet Mondrian's *Broadway Boogie Woogie*, and explores how the techniques utilized in these artworks influenced Birtwistle's compositional approach in *Harrison's Clocks*.

The second chapter, *Formation*, is an exploration of the context of Birtwistle's artistic motivations and inspirations. Birtwistle's initial inspiration occurred after

reading Dava Sobel's book, Longitude. This work documents John Harrison's endeavor to solve the greatest scientific problem of his time – determining longitude at sea. Harrison's success in building the first chronometer, and thus solving the "Longitude Problem", motivated Birtwistle to explore the idea of creating complex musical timepieces.

Additionally, Birtwistle speaks extensively in interviews about the influence of visual art in his music – specifically how early 20th century artists used paint itself as the subject. This idea of material as subject is fundamental to modernism. In interviews, Paul Klee is repeatedly referenced as an important inspiration for Birtwistle. Through these visual artists' influence, Birtwistle established the idea of musical objects. These compositional objects are simply one perspective or representation of the totality of a musical idea. Through what Birtwistle calls mechanisms, he is able to explore every dimension of these musical ideas by controlling specific ranges of pitch, register, and duration. This technique creates repeating musical objects which are technically the same, but undergo slight modifications to slowly reveal the complete musical idea. This creates a musical sensation of looking at musical material from multiple perspectives. Just as one cannot see all sides of a vase at once, the totality of these musical objects must be repeated in multiple ways in order to see their many dimensions.

In addition, this chapter on *Formation* also seeks to understand the underlying motives in *Harrison's Clocks*. These motives are twofold: oscillation and periodicity. These two motives are abstract – there is not necessarily a clear motive like that used in Beethoven, or themes which represent particular ideas as in Wagner's leitmotivs. The motive of oscillation is shared between any two pitches or two ideas which alternate back and forth and is inherently cyclical. This motive is even apparent on the

large scale of the composition, alternating the three faster toccata movements with the two interlude movements. Furthermore, the motive of periodicity functions often as a signpost or as a signal, serving as an act of reorientation. These are often single gestures, chimes, or punctuations which are repeated throughout *Harrison's Clocks*. Through these motives, Birtwistle contemplates repetition and how it can be used on the local and structural level.

The third chapter, *Examination*, analyzes each of the movements in *Harrison's Clocks* with respect to their musical mechanisms and how these mechanisms relate to their form. Although each movement often seems to have an overwhelming amount of material, each stem from only a few mechanisms which Birtwistle sets into motion at the outset. This chapter will show how these mechanisms are related to each other and function to impart a clear distinction of the dividal characteristics of each musical object and how they lead to their highly individual realizations. The aspect of simultaneity is central to Birtwistle's style and analyzing the context of the interactions of these mechanisms is essential to its understanding.

Finally, the fourth chapter, *Operation*, focuses on the relationship between the performer and *Harrison's Clocks* from both an interpretative and practical perspective. Birtwistle's music falls under the Stravinskian objective approach to expression where the performer "executes" the articulation and detail in the score, which in turn speaks for itself. The musical mechanisms and their objects within each movement have their own character and making the distinctions between objects through color and articulation rather than utilizing time or rubato as a means of expression, is of primary importance. Based on my experience, rehearsal strategies are also recommended. A performance of *Harrison's Clocks* is a significant undertaking which should not be underestimated.

CHAPTER 2

FORMATION

"The formula of the function is far away, but it is somewhere, the source and origin."[1]

– Paul Klee

Harrison's Clocks is the 104th published work of the English composer Sir Harrison Birtwistle (1934-2022), written between 1997-98. This was his first significant work for solo piano and was first performed by Joanna Macgregor in the same year on July 13th in the Pittville Pump Room in Cheltenham. The title, a reference to both Harrison Birtwistle's own name and to John Harrison and his creation of the longitudinal chronometers, underlined a particular fascination of Birtwistle's – the expression of musical time and its perception in the context of setting different musical objects against each other to create unique and perpetually evolving expressions.

Birtwistle's preoccupation with creating multidimensional and multitemporal compositional mechanisms has been at the heart of his music since his earliest published works. Musical objects, as stated by Birtwistle, are the output of these mechanisms. These mechanisms are essentially abstract formulas which output constantly renewing phrases. These phrases act as repetitions, but upon closer inspection, their details differ greatly from one other.

Central to his creative thinking was his study of the visual arts. His investigation and analysis of the visual arts was a key contributor to his understanding of how space and time interact in music. The ideas of the visual artists in the early 20th century, especially those of Paul Klee, Paul Cézanne, and Pablo Picasso, significantly impacted Birtwistle's compositional approach and contributed to his

[1] Paul Klee and Jürg Spiller, *The Thinking Eye: The Notebooks of Paul Klee*, (New York: G. Wittenborn, 1961), 59.

creative aesthetic. Although the two mediums of paint and sound are temporally contradictory, Birtwistle was able to take the visual formulations of art and integrate them into an sonic experience. His use of which through repetition can be observed in a manner similar to closely inspecting a visual artwork, penetrating into the details of the music.

DEPICTION: BIOGRAPHY

Birtwistle was a modernist and an industrious, strong-willed composer whose music has the quality of an unstoppable, obstinate force paired with a peculiar and otherworldly beauty. His role models were the figures of Igor Stravinsky, Edgar Varèse, Anton Webern, Olivier Messiaen, and Pierre Boulez. In addition, less obvious Renaissance influences appear in his music, such as John Dowland and Guillaume de Machaut. His inspiration was both near to the present and far in the past, and out of this synthesis, he hewed music of "striking independence and authority."[2]

Harrison Birtwistle, born in Accrington, England in 1934, was the only child in a family of bakers. He took up the clarinet at age seven as his primary musical instrument, and after receiving a scholarship, attended the Royal Manchester College of Music for composition and clarinet. It was here that the "Manchester School" was born. Many noteworthy musicians were all coincidentally in Manchester at this time – these included Maxwell Davies, John Ogdon, Elgar Howarth, and Alexander Goehr.

After graduating, Birtwistle worked as a teacher for several years until 1965. It was in this year that he won a Harkness fellowship allowing him to study in the United States in recognition for his work for small ensemble, *Tragoedia*. It was

[2] Jonathan Cross, "Birtwistle, Sir Harrison." *Grove Music Online.* 2001, Accessed October 2, 2024. https://www-oxfordmusiconline-com.ezproxy1.lib.asu.edu/grovemusic/view/10.1093/gmo/9781561592630.001.0001/omo-9781561592630-e-0000003136.

immediately after winning this fellowship that Birtwistle sold his clarinets as a symbol of his dedication to composition.

After this period in the United States, he became involved with the National Theatre in London. During this time, he wrote many stage works such as *Oresteia* (1981). He was also known for his theatrical works, especially his stage works such as *Punch and Judy*, *The Mask of Orpheus*, *Gawain*, *The Second Mrs. Kong*, *The Last Supper*, and *The Minotaur*. It was for these works that Birtwistle became most known. *The Mask of Orpheus*, perhaps his magnum opus, took fifteen years to write and was completed in 1985. It is now recognized as one of the great masterworks of the 20th century and won the prestigious Grawemeyer award in 1987. He was knighted soon after in 1988 by Queen Elizabeth II.

In *The Mask of Orpheus*, Birtwistle managed to synthesize music, song, drama, myth, mime, and electronics all into a modern take of the Wagnerian ideal of the *gesamtkunstwerk*.[3] The opera itself is divided into 126 events, subdivided into groups of three. What is so unique about Birtwistle's use of narrative is that, as astutely observed by John Rockwell, "For Mr. Birtwistle, there is no 'main action… He has deliberately thwarted the narrative flow, or even the epic progression, of normal opera in favor of a dizzying montage of flashbacks, repetitions, reconsiderations and parallel actions."[4] Jonathan Cross notices that Birtwistle's use of myth frees him from a conventional narrative – the idea of linear time. Myth allowed him to focus on the ritual, repetitive structures, making the actual subject matter unimportant.[5]

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[3] Ibid.
[4] David Allen, "Harrison Birtwistle, Fiercely Modernist Composer, Dies at 87," *The New York Times,* April 18, 2022, https://www.nytimes.com/2022/04/18/arts/music/harrison-birtwistle-dead.html
[5] Cross, "Birtwistle, Sir Harrison."

This sense of drama and time is also explored in his instrumental works which have a theatrical and ritualistic thread through them as well. *The Triumph of Time* (1972) was another of Birtwistle's early successes. The title refers to the woodcut of the same name by Bruegel the Elder that depicts Time leading a procession followed by Death, while in the background a village goes on with its daily life. In this, Birtwistle found a potent analogy in the art for events occurring at different timescales in the background and foreground – a processional of independent events in succession. Birtwistle's concern for layering comes to the forefront in his *Earth Dances* (1986) where the orchestra is composed in six different "strata" as the composer refers to them. These strata evolve in separate time scales to each other.[6] *Panic* (1995) was the first piece of contemporary music for the BBC Last Night of the Proms. Broadcast to an audience of several million, it was met with bewilderment and confusion. When asked about accessibility in contemporary music for wider audiences, especially in the aftermath of *Panic*, Birtwistle only acknowledged that "I have an idea. I express it as clearly as I can."[7]

After he completed his appointment as the first Henry Purcell Professor of Composition at King's College, London (1994–2002), he continued to compose at his residence in Mere until his passing in April of 2022. The composer and conductor Oliver Knussen, another leading British figure of the contemporary music world, remarked on Birtwistle's style: "The point, it seems to me, is that however abstract or mechanical or (ir)rational the processes by which Harry arrives at his actual notes, in his hands they become a language capable of animating a huge range of characters

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[6] Ibid.
[7] Jill Lawless and Robert Barr, "Harrison Birtwistle, groundbreaking British composer, dies at 87," *The Washington Post,* April 19, 2022, https://www.washingtonpost.com/obituaries/2022/04/19/british-composer-harrison-birtwistle-dead/

and vivid, powerful atmospheres. That is surely why he is such an exceptional dramatic composer."

INSPIRATION: JOHN HARRISON'S CHRONOMETERS

The inspiration for Harrison Birtwistle to write *Harrison's Clocks* was a book by Dava Sobel, *Longitude*, written in 1995. The book tells the story of John Harrison, the son of an English carpenter, and his fascination and struggle to develop a clock which could solve the longitude problem by keeping accurate time, even while rocking at sea.

In 1714, the British government set a monetary reward for solving the longitude problem, known as the "Longitude Act", the reward being equal to a king's ransom. This king's ransom in 2024 dollars would be equivalent to about seven million dollars. The reward was implemented as an incentive to solve the problem which had stumped the greatest scientific minds, such as Galileo and Newton, for centuries. For sailors, not knowing their longitudinal coordinates could prove deadly. As soon as they lost sight of land, sailors had to use approximations to understand where they were. The ships would frequently be off from their intended position by many miles. In fact, the English Navy suffered a huge loss of life after several of their ships sank from not knowing their longitudinal coordinates and was the motivation for offering this reward.

The longitude problem is complex. Longitudinal lines go from pole to pole on the globe, while latitude lines run parallel to each other from East to West. The calculation of latitude is understood by measuring the height of the sun in the sky or the stars in the night from the horizon and has been long known. Longitude, however, was much more difficult to discern and had haunted men at sea for centuries. The trouble with measuring longitude is that it is informed by time. There are no natural

references from which to measure this. To know one's longitude, one must have the time at the current location and another location at the same time.

Having a clock would solve this issue, but the problem was that the clocks of the time used pendulums. These pendulums were unable to operate accurately on a rocking boat. Not only that, changes in temperature, barometric pressure, or variations of gravity from one latitude to another were significant factors which could affect the accuracy of a clock.[8] In order to create his chronometers, John Harrison had to grapple with each of these issues.

Harrison successfully developed his first clock (H-1) in 1735. It was successfully tested in 1737, however, due to political tensions within the Royal Board of Longitude, it was not until 1773 that he gained the reward.[9] In the interim, Harrison built three more clocks in an effort to grasp the prize and garner the recognition he deserved for his work. During this time, John Harrison invented several innovative and unique mechanisms that are still in use by horologists and other scientists to this day. This includes the bi-metallic strip which is used in temperature control devices.[10] John Harrison's clocks were a scientific triumph of this age and revolutionized the art of navigation.

Harrison's Clocks, while being an homage to John Harrison, is also interested in exploring its own sense of time. The "timepieces" (as Birtwistle refers to each of the five movements)[11] explore their own particular musical ideas, mechanisms, and gestures. Of the five timepieces, the first, third, and fifth are toccata movements which explore processes set in motion, and can be thought of as "ticking" movements.

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[8] Dava Sobel, *Longitude : The True Story of a Lone Genius Who Solved the Greatest Scientific Problem of His Time* (New York, New York: Bloomsbury, 2010), 6.
[9] Ibid., 10.
[10] Ibid., 103.
[11] Harrison Birtwistle. *Harrison's Clocks: For Piano Solo* (London: Boosey & Hawkes, 1998), ii.

According to Birtwistle, the sparse melodic content is similar to Bach's toccatas, which put melody on equal priority with harmony and rhythm.[12] The second and fourth movements, Birtwistle rather cryptically refers to as "chiming movements which are something else."[13] These timepieces are formally more complex and more focused on the perception of time, rather than an overt musical process.

In Michael Hall's interview with Birtwistle inquiring about *Harrison's Clocks*, Birtwistle said of the composition that "Each consists of a series of musical mechanisms which are meant to be as intricate as those found in a beautifully constructed clock."[14] There are elements which on the surface of the music might resemble a clock, but Birtwistle's interest is in considering how poetically the idea of clocks can inform compositional decisions – ones which are as intricate as those found in John Harrison's clocks. Specifically two processes are explored through *Harrison's Clocks*, that of ticking and chiming. In other words, the processes of oscillation and periodicity through time.

Indeed, Birtwistle writes five timepieces – not directly representative of John Harrison's four chronometers. It is a title and idea which is reminiscent of Satie – notably *Trois morceaux en forme de poire* (*Three pieces in the shape of a pear*) in which there are actually seven pieces, not three. In regard to the reason for the punning title, Birtwistle responded to Hall that "Well, because of the name Harrison, and because they were highly intricate mechanisms, these clocks got my juices going."[15] Although inspired by John Harrison and his clocks – there is no direct representation of any clock. These are Harrison Birtwistle's clocks.

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[12] Michael Hall, *Harrison Birtwistle in Recent Years* (London: Robson, 1998), 149.
[13] Cross, Jonathan. Linear notes for Harrison Birtwistle, *The Axe Manual*, Nicolas Hodges, Claire Edwardes, Metronome 2004, MET CD 1074 CD, 12.
[14] Hall, 148.
[15] Ibid., 149.

MATERIALIZATION: MATERIAL AS SUBJECT

Birtwistle frequently refers to himself as a "1910s modernist" and that he was influenced by many of the ideas of those times. On the artists which fascinated Birtwistle most, he said, "they all use the subject matter to express paint and painting, rather than the other way round… I've never consciously formulated it, and I'm much more interested in it than a lot of things in music."[16] Birtistle was interested in the visual arts and its musical manifestation can be found in three particular areas: Cézanne's emphasis of form and color, Klee's work in formulating the mechanics of organic material, and the Cubist's combination of multiple perspectives.

Paul Cézanne was one of the first figures in visual art to move away from naturalism, focusing his artistic energy into colors and geometric forms as opposed to directly copying nature. Cézanne realized that "... the sun cannot simply be reproduced but must rather be expressed by some other means… by colour."[17]

The *Mont-Sainte Victoire* series of paintings, as pointed out by Jonathan Cross,[18] clearly show this gradual transformation of Cézanne's ideas. This series of paintings and watercolors, all produced between 1887 and 1906, incorporate Mont-Sainte Victoire, a location near Cézanne's hometown in Aix-en-Provence.[19] Over time, Cézanne's focus on the mountain shifted from expressing the mountain and the landscape around it, to using the mountain to convey and express geometry and color. The artist's understanding of the whole can only be fully appreciated in the context of all the versions, where no one version has a greater authority over any other.[20] Examples of this include painting the mountain from a different angle, in a

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[16] Jonathan Cross, *Harrison Birtwistle: Man, Mind, Music* (Ithaca, N.Y: Cornell University Press, 2000), 14.
[17] Hajo Düchting, *Paul Cézanne, 1839-1906: Nature into Art* (Köln: Taschen, 1999), 199.
[18] Ibid., 15.
[19] Düchting, *Paul Cézanne*, 11.
[20] Ibid., 17.

different season, or at a different time of day. In a similar vein, Birtwistle views his musical materials as objects which can be "viewed" by the listener from multiple perspectives.

This pursuit of changing perspective in Birtwistle's music is further exemplified through the teachings of Paul Klee, who carefully documented his methods, lectures, and processes. This record gives a keen insight on Klee's values as an artist and his thoughts on the "non-representational" kinds of art. By extension, Birtwistle has stated many times his fascination with Klee and even referred to the *Pedagogical Sketchbook* as a "creative bible" in his earlier years.[21]

In interviews, Birtwistle frequently talks about the ideas of the dividual and the individual which originates with Klee. Klee's concept of the individual and the dividual, which is a way of exploring nature to its smallest practical division, and finding the essence of these smallest dividual components. something which is individual is made up of "dividual" components. Another way to think about this would be subdivisions. These subdivisions or dividual components are what make up an "individual" product. For example, Klee shows in his book the relationship of individual and dividual in relation to a forest, which is made of trees, which are made up of leaves, branches, twigs, and a trunk, which is made up of wood, fibers, and wrinkles in the bark.[22] The control of these dividual aspects, Klee teaches, can be added to a continuously individual outcome, or unique result. These ideas were inspired by his deep study of nature.

Klee further specifies that these dividual elements can infinitely be made more and more detailed. However, he tempers this by saying in art, "We must eliminate this

[21] Ibid., 20.
[22] Klee and Spiller, *The Thinking Eye*, 266.

relativity by defining the scene of action with fixed limits."[23] He states that creatively, one must have a divisional limit. In nature, the dividual can become more and more precise, but in art, there must be a point of limitation.

Birtwistle takes this concept of the individual and dividual in his music creating what he calls musical mechanisms. These mechanisms are abstract formulas which control separate musical parameters (such as pitch, interval, duration, and register). Each of these dividual aspects are variables of a total equation (or mechanism), and the output is what Birtwistle refers to as a musical object. Each of these musical objects are individual from each other, varying slightly at the dividual level, but function at the same time as a repetition.

Figure 1.1 is an example of Birtwistle's implementation of Klee's idea of the dividual and the individual. In this example, the dimensions which change in every subsequent object (or variation) are the interval between two notes (dictated by their shared pitch field), the interval of the partition on the high notes (an interval class of 5, 6, or 7 below the high note), the timing between the two subgroups, and the timing between each individual object. The shape of the object is always an upward leap followed by an immediate descent – the second group in the object is a descent. Each of these subcomponents are dividual elements that, when added together, create an individual musical object. Figure 1.1 shows three complete iterations of this object in the right hand in mm. 14, 15, and 16-17.

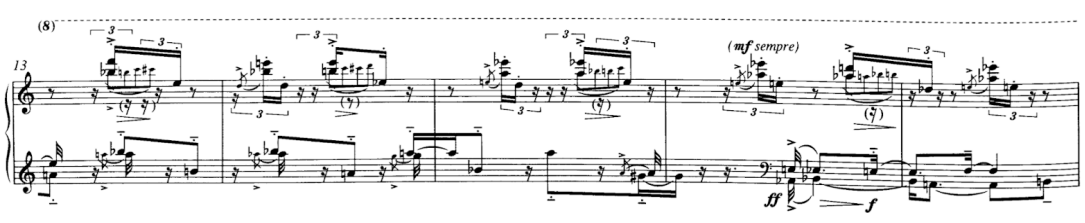

Fig. 1.1, Birtwistle, Harrison's Clocks, III, mm. 13-17

[23] Ibid., 266.

The perception is a repetition, but on closer inspection, each of the products of these mechanisms produces an individual, unique, musical object from the others. Any variation within these constraints does not affect the perception of what the object is.

Going beyond this dividual-individual relationship for generating single musical objects through compositional mechanisms, Birtwistle was interested in the relationship of several of these mechanisms and how they can interact with each other. The visual analogy can be clearly seen through the early Cubist painters.

Both Cubists Pablo Picasso and Georges Braque were inspired by the later works of Cézanne. They continued this tradition forward into the early 20th century. The Cubists were preoccupied with finding a way to express multiple viewpoints of a subject simultaneously through form and color. To them, and many artists of that time, abstraction was a way of finding the inner essence of an object.

Interestingly, the scientific discoveries of the early 20th century also coincided with these artist's interest in simultaneity. The new discoveries of X-rays and radioactivity and in particular, Albert Einstein's *Theory of Relativity* published in 1905, transformed the traditional ideas of matter and space and offered a view of reality beneath the surface of objects.[24] Henri Poincaré's discussions of the means to represent a four-dimensional object additionally inspired the idea to combine multiple viewpoints at once.[25]

This fascination with multiple perspectives also manifested itself in the musical culture of the time. In the early 20th century, polytonality would combine music of multiple tonalities at once. This fascinated composers such as Bela Bartók

[24] Linda Dalrymple Henderson, *The Fourth Dimension and Non-Euclidean Geometry in Modern Art*. Revised edition. (Cambridge, Massachusetts: The MIT Press, 2013), 25.
[25] Ibid.

and Igor Stravinsky. Claude Debussy was inspired to layer different kinds of music together by the Indonesian gamelan ensembles at the 1889 Paris World's Fair. Composers such as Chalres Ives, Elliott Carter, and Karlheinz Stockhausen created music with multiple ensembles playing simultaneously by independent yet precisely controlled and relational tempi.

The precedent to Birtwistle's mechanisms is partially inspired by Stravinsky's *Symphonies of Wind Instruments*, which is in a "mosaic", known as block form.[26] In the piano literature, Virgil Thompson's piano sonatas frequently use block form, and later explorations of this idea can be found in Stockhausen's moment form,[27] and in Boulez's later works, including *sur Incises*. In essence, the form of a work consists of an accumulation of juxtapositions of multiple complete musical units. There is no transition in between these blocks. For Birtwistle, these blocks are referred to as musical objects which are created by an underlying processes in his musical mechanisms.

All of *Harrison's Clocks* are composed to an exact standard: every individual musical object is dictated by a mechanism, which functions as a formula. The mechanisms are processes which control every detail of the objects, and every result is an authentic possible result, as in each of Cézanne's paintings of *Mont-Sainte Victoire*.

These mechanisms create different expressions of their fundamental ideas – constantly changing perspective and creating small changes to explore the essence of their material. Birtwistle explains, "I have to be strict with the ideas in order to hang

[26] Jonathan Cross, *The Stravinsky Legacy* (Cambridge, UK: Cambridge University Press, 1998), 70.
[27] Robert Adlington, *The Music of Harrison Birtwistle* (Cambridge, UK: Cambridge University Press, 2000), 96.

on to the essential, basic issue of what the piece is about."[28] To understand Birtwistle's technique, we can look at Klee's "Three-part polyphony"[29] (fig. 1.2). These are separate ideas and processes which are overlaid on each other. The overlaying and relationship of these processes onto one another is what makes the comparison to the Cubist's ideas so similar to those of Birtwistle (see fig. 2.11).

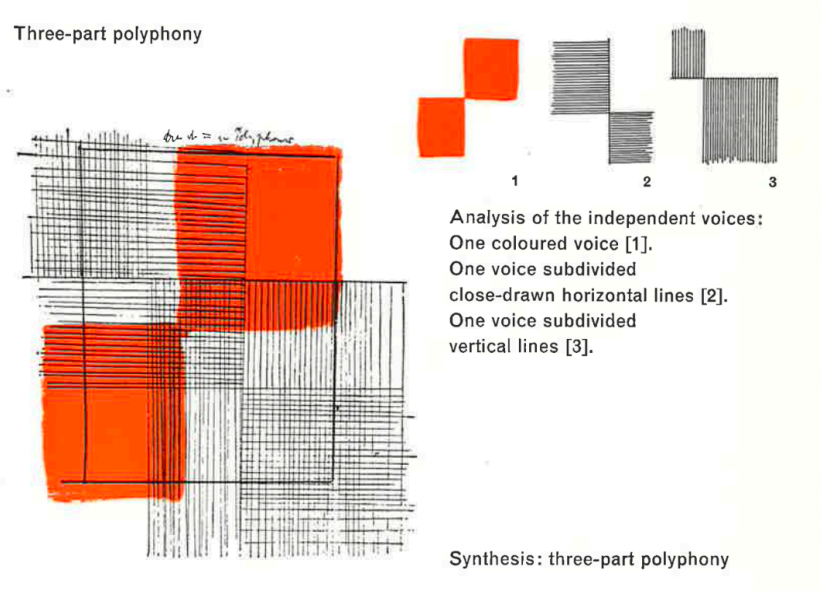

Fig. 1.2, Paul Klee, Notebooks: The Thinking Eye: "Three-part polyphony," Pencil and Watercolor, 261

This relationship of different objects over time is what Birtwistle describes as the form of his work, or the "journey". According to him, "The journey consists of a series of unrelated things, which means that you're simply making choices all the time, choices about where to look. It's to do with discontinuity. You have a continuum, but you're cutting things out of it while you look the other way."[30] On the importance of form, Klee said that "Form may never be regarded as a solution… but as a genesis, growth, essence. Form as movement, as action is a good thing.

[28] Birtwistle, Harrison. *Harrison Birtwistle: Wild Tracks: A Conversation Diary with Fiona Maddocks*. Interview by Fiona Maddocks. (London: Faber & Faber, 2014), 45.
[29] Klee and Spiller, 261.
[30] Hall, 145.

Formation is movement. Formation is life."[31] The result in music is a piece which is constantly evolving and changing. Birtwistle commented, "So how do you create something which is in a permanent state of exposition? This is what matters. This is what keeps me awake - metaphorically. This is what the battle is."[32] The listener nearly has the experience of building and composing the piece with Birtwistle.

CONTEXTUALIZATION: CAUSE AND ACTION

Important for Birtwistle was the consideration of context. How does the appearance of a particular musical idea affect what comes before, during, and after? This is related to Klee's consideration of "cause" in art as a way to generate movement. Klee speaks of "movement", not just in the context of a piece of art, but from a standpoint of action as a motivator. He specifies active, middle, and passive elements to movement in visual art.[33] Klee compares these relationships to the mechanics of a water wheel (fig. 1.3). The action of the waterfall (I) moves the wheel works, or belt (II). This in turn moves the hammer, which otherwise would be passive (III).[34]

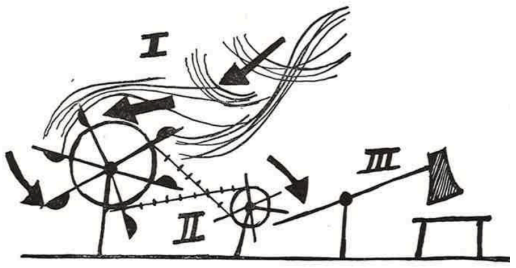

Fig 1.3, Paul Klee, Notebooks: The Thinking Eye: "The Water Mill," 346

[31] Klee and Spiller, 169.
[32] Birtwistle and Maddocks, *Wild Tracks*, 24.
[33] Klee and Spiller, 343.
[34] Ibid., 346.

In a similar way, the musical action in Birtwistle's music is the result of cause. For example, the work's opening gesture, a descending figure in the low register of the piano, followed by a short rest (clearing the pedal), and a *sfffz* major second at the bottom of the piano, is the action in which the rest of Birtwistle's musical timepieces operate (fig. 1.4). The action is the winding of the clock. In a clock or a music box a ratchet is turned, which tightens the spring box and imbues it with potential energy. When activated, the timepiece's internal function (gears) begin to operate, which in turn move the hands of the clock (exterior result) until the resultant kinetic energy is depleted, and the music breaks down and slows.

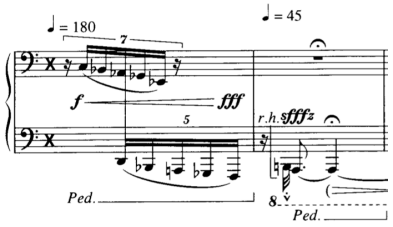

Fig. 1.4, Birtwistle, Harrison's Clocks, I, ms. 1-2

This setting action is related to one of Birtwistle's thoughts in his compositions - how to set context. "Those moments when you are setting up something are sacred… everything you do next is a result of that"[35] The opening gesture then sets a "context" in which the music functions. These opening gestures operate as a kind of ritornello, as stated by Birtwistle,[36] between the five "episodes" of *Harrison's Clocks*. Ritornello literally translates as "little return" and was developed in the baroque and renaissance. It is an idea or theme which occurs in between episodes or sections.[37] This micro-ritornello could be thought of as a signpost,

[35] Birtwistle and Maddocks, *Wild Tracks*, 23.
[36] Jonathan Cross, Linear notes for Harrison Birtwistle, *The Axe Manual, 12*
[37] Michael Talbot, "Ritornello," *Grove Music Online,* October 2. 2024. https://www-oxfordmusiconline-com.ezproxy1.lib.asu.edu/grovemusic/view/10.1093/gmo/9781561592630.001.0001/omo-9781561592630-e-0000023526.

signaling the beginning of each clock. This touches on one of the two motives of *Harrison's Clocks* – periodicity, or circularity.

More specifically, the cyclical tendencies in the five timepieces are demonstrated by different means. Some run out of momentum or break before they can properly finish - making an incomplete loop, some make a complete loop, while others break or run out of momentum before they can fully explore their loop. Each movement could loop around to itself from where it left off if it had the energy to do so, not unlike a music box. Each clock has the same starting place, but each timepiece goes on a different journey with the material. Each is governed by different functions and produces a unique result.

This cyclical idea, ending the same way as it begins, is idiomatic for Birtwistle. He explores these labyrinth-like ideas in much of his music.[38] Traditionally, a labyrinth is a complex structure which is a maze where the entrance and exit are the same. Four of the five movements demonstrate this. *Clock I* demonstrates an incomplete harmonic process – an additional section would have been needed to arrive at the starting point. *Clock II* demonstrates a journey around the note E, beginning and ending on a single E. *Clock III* ends with the same two mechanisms as it opens with. *Clock V* begins and ends with a similar pitch set and interval classes, using the same musical objects at the start as at the end. The only diversion is in *Clock IV* where it is restarted multiple times (as indicated by the repeated use of the "wind-up"), not alluding to any circular process, but one that is under a constant state of renewal.

The onomatopoeia "tick-tock" in essence is the continuous oscillation of two sounds, and is what *Harrison's Clocks* explores in detail. Therefore; it is not a

[38] Adlington, *The Music of Harrison Birtwistle*, 116.

particular interval which indicates its presence, not the direction of either up or down, the timing between attacks, the density, or the number of simultaneous mechanisms. It is the alternation between two sounds or ideas. In a way, all of the music is the same, but different details of the material are proliferated, creating rather different timepieces, occurring in widely different contexts. This sense of oscillation and periodicity is the underlying motive of *Harrison's Clocks*. Because of this, one is left with an impression that all the timepieces in *Harrison's Clocks* are related to each other by their similar processes, and that they are all variants of each other.[39]

This abstract idea of oscillation and periodicity can be felt and heard in every level of the work. In this sense then, in *Harrison's Clocks*, the representation of a clock itself is not the objective for Birtwistle. He is interested in the form and local processes in sound which resemble the inner workings of a clock - not necessarily to represent its outside manifestation, just as the paintings of Cézanne express color and form through a subject. The timepieces of *Harrison's Clocks* work in relation to each other exploring the dividual concepts of circularity and oscillation within themselves and in the context of the whole work.

[39] Ibid., 26.

CHAPTER 3

EXAMINATION

"The object grows beyond appearance through our knowledge of its inner being, through the knowledge that the thing is more than its outward aspect suggests."[40] *– Paul Klee*

The purpose of this chapter is to decipher the primary processes and mechanisms of *Harrison's Clocks*. Through the analysis, the hope is that one will be able to perceive the music in a more thorough and judicious way to quickly determine the important issues of interpretation and listening. As discussed in the previous chapter, the mechanisms and musical objects of Birtwistle's music are governed by a number of criteria. These dimensions would include pitchfields (a fixed range of pitches which are not fixed to register), intervals (interval classes i.e. a major seventh will be described as an "11"), register, and duration. These criteria can relate to any aspect of Birtwistle's mechanisms. There are processes which can be governed as well, such as the continuum of expansion and contraction or repetition and differentiation. Additionally, the motives of oscillation and periodicity will be dissected. Birtwistle was particularly fascinated by the idea of "music which only existed in the abstract… like looking at an object: every view is unique, but the object exists irrespective of the way it is viewed."[41] Every new iteration is a new possibility, a new authentic example of the musical object.

CLOCK I

Clock I is the embodiment of multiple perspectives. Each of these five sections (from mm. 1, 31, 60, 89, and 118) are in essence the same. This is Cézanne's

[40] Paul Klee and Jürg Spiller, *The Thinking Eye: The Notebooks of Paul Klee*. (New York: G. Wittenborn, 1961), 66.
[41] Jonathan Cross, *Harrison Birtwistle: Man, Mind, Music* (Ithaca, N.Y: Cornell University Press, 2000), 17.

mountain where each section is a different expression of the same idea using similar means. There are many aspects of symmetry which Birtwistle explores between the hands and structurally in the pitch space. There are two primary mechanisms in *Clock I* – the eighth note "ticking" mechanism starting in m. 3 and the sixteenth note "whirring" mechanism starting in m. 7. Birtwistle experiments with the layering of these mechanisms to create a constantly renewed experience.

The ritornello or signpost which occurs inside the movement is an extension of the opening "wind-up" gesture (fig. 2.1) and occurs at the outset of each section after the opening (from mm. 31, 60, 89, and 118). It is constructed with a similar linear premise, where the linearity of the scale implied is fractured between two voices and overlapped onto each other in different tempi (6:7). The added ascension to this process adds dramatic flair, giving a significant contrast to the rest of the hyper-rhythmic material in the section. The concluding punctuating *sfffz* harmony is also present in both hands. The *Clock I* signpost is always in the same register and grounds the music so that the gradual ascent in the pitchfield over the course of the movement (a structural chromatic ascension) can be quantifiably felt over time. This particular signpost starting at m. 31 is only heard only within the context of the movement.

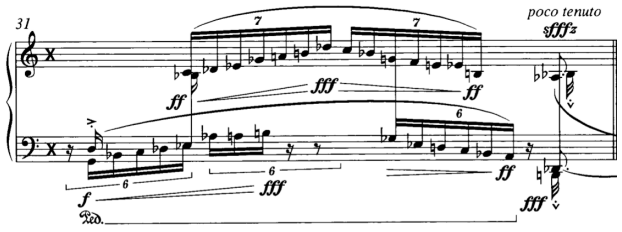

Fig. 2.1, Birtwistle, Harrison's Clocks, I, m. 31

Birtwistle's tempi are symmetrical in all aspects of *Clock I*. In the second to fifth sections, (mm. 31, 60, 89, and 118) the music accelerates from quarter = 120

bpm to 150 bpm to 180 bpm into the signpost, then immediately decelerates from quarter = 180 bpm, 150 bpm, to 120 bpm into the next section – this process being a tempo shift in degrees of 30 bpm. However, the beginning and ending of *Clock I* has its own tempo proportions as well. The tempo accelerates from quarter = 45 bpm, 60 bpm, 80 bpm, 100 pm, to 120 bpm in the opening. The last section, starting at m. 118, slows from quarter = 120-80 bpm, 100-60 bpm, 80-40 bpm, then 60-20bpm from m. 149. These are all decelerating in the same proportions as the opening accelerando (15 and 20 bpm tempo shifts), implying a larger sense of symmetry recalling those of the inner sections of *Clock I*'s ritornellos. If the process from the opening was continued, the next tempo would be 45 bpm– which would be the opening wind-up tempo. Full symmetry is achieved by the execution of the wind-up figure in the next movement. In this way, Birtwistle constructs a "circular" realization of the piece. It could go in circles forever and naturally would arrive at the wind-up figure. The process, however, moves on to *Clock II*.

Through the course of *Clock I*, there are five versions of ticking mechanisms - they each feature an increasing number of attacks for each subsequent section (fig. 2.2a-d and fig. 2.3, mm. 7-8). The ticking mechanisms begin immediately after the signpost without the sixteenth note whirring mechanism in mm. 3, 32, 61, 90, and 119. From the first section, the number of attacks of each ticking mechanism in each subsequent section either changes or grows. For example, the first section has two attacks in both hands, the second has three in both hands, the third has four in the right hand and three in the left, etc. The totality of each of these mechanisms is indicated by the eighth note beaming. The order of attacks between hands is typically maintained throughout a section. The first and the fifth are similar to each other, in

that they are structured in groups of two, giving the impression of a circular, or symmetrical, process.

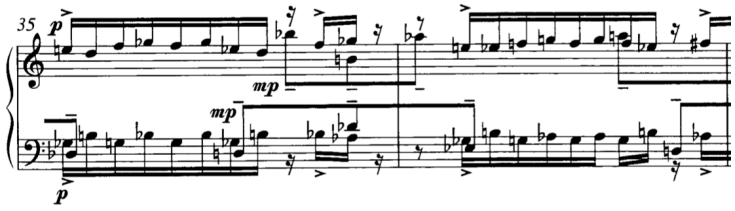

Fig. 2.2a, Birtwistle, Harrison's Clocks, I, mm. 35-36

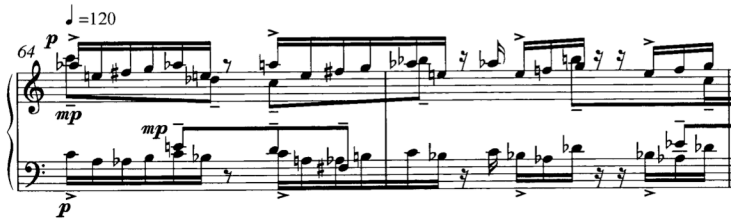

Fig. 2.2b, Birtwistle, Harrison's Clocks, I, mm. 64-65

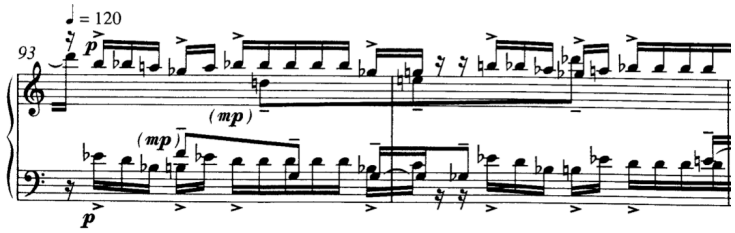

Fig. 2.2c, Birtwistle, Harrison's Clocks, I, mm. 93-94

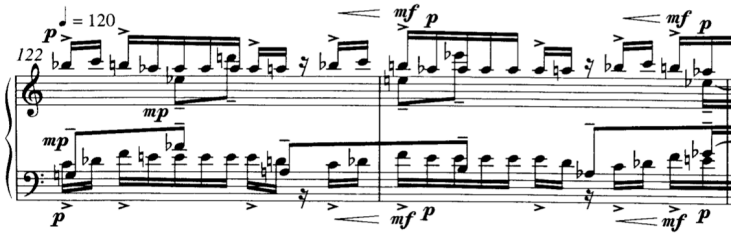

Fig. 2.2d, Birtwistle, Harrison's Clocks, I, mm. 122-123

Additionally, the ticking mechanisms undergo many different rhythmic variations. At times, there will be a clear rhythmic process happening through the repetitions of the ticking mechanism in a section. Other times, a clear process will not be obvious. For instance, in the first section, there are examples of all four different

processes which are repetition, expansion, contraction, and differentiation. There is repetition where the ticking mechanisms are rhythmically identical (m. 15-20). Expansion, where the distance between attacks is widened and blur the lines between mechanisms (m. 11-14). Contraction, where the attacks in the mechanism are tightened like a *stretto*, and they interact very quickly with each other (m. 21-26). In addition, a contraction of a mechanism's attacks will be accompanied by an expansion of space (rests) after the attacks. Finally, there are some which do not relate with each other at all – a differentiation which happens at m. 27, where the contracted ticking mechanism is suddenly contrasted with a totally different version..

The whirring mechanisms are composed of four pitches which are contained to the particular pitchfield of the section (7 or 8 measures). This pitchfield is restricted to all the notes in between a perfect fourth (for example, C to F in the right hand, and E to A in the left hand at m. 7). The pitchfield is not always strict and sometimes a note will fall outside of this boundary (the D# in m. 7-10 and the G in mm. 71-72, both in the left hand). The available intervals in the ticking mechanisms follow a similar rule. They jump over the whirring mechanisms, stretching from an interval class of 8 to 14, with most being between 10 and 13. This is due to the restricted pitchfield being only the same four notes in both octaves around the whirring mechanism. The artistic analogy for these mechanisms and their pitchfields would be a musical shape which is drawn in a particular color. The boundaries of the pitchfield inform the shape. This relationship is unique in music as opposed to visual art.

Continuing with the whirring mechanisms, the cycle of four pitches are constrained to a general shape, dictated by a range of intervals (fig. 2.3). For example, from the first note of this mechanism in the right hand in m. 7, the interval (in interval classes) moves up by 5 or 4, down by 3 or 2, up by 2 or 1, then down between 4 or 2.

In other words, for the right hand whirring mechanism, the second note must be higher than the fourth, so the third interval must be smaller than the second interval. This function immediately repeats with a new output on beat 2 in m. 7.

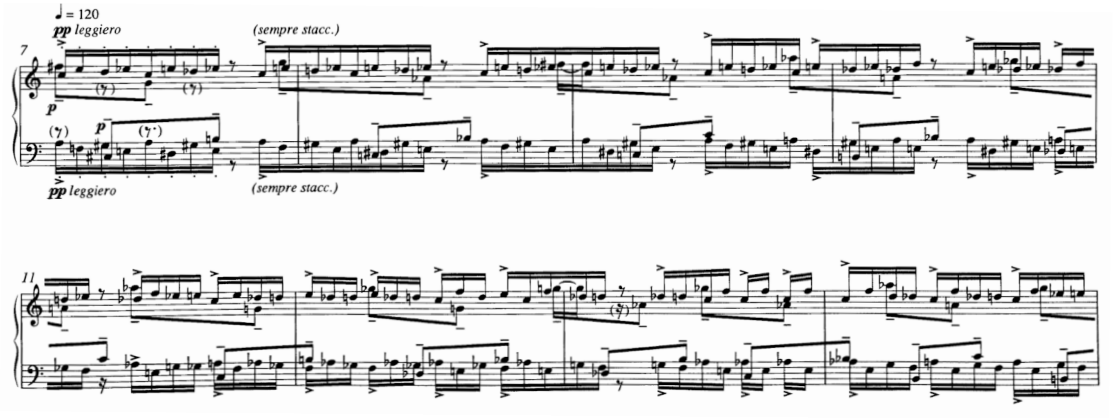

Fig. 2.3, Birtwistle, Harrison's Clocks, I, mm. 7-14

Each of these whirring mechanisms can have a different total duration. In total, a complete whirring mechanism is four sixteenth notes long at its shortest. However, Birtwistle has tactics which extend the total duration of the mechanism by repeating subsets of the four pitches. Repeating one, two, or three notes of a whirring mechanism can be used over and over, creating a "stalling" effect as in mm. 11-12 (fig. 2.3). Other times, a note of the mechanism will be "muted", or rests will be used to add "space" in an interval cycle, further obscuring any trace of predictability. Examples of this would be a mute in m. 10, where the two notes in the mechanism after Db and F are silenced, and a spacing would be in m. 7, where the mechanism has been completed and a rest separates the next entrance of the whirring mechanism.

The rhythm of the whirring mechanism is separate from the cycle of four pitches. The accents of these rhythmic patterns often do not align with the start of the interval cycles – different members are frequently emphasized – inferring that the

interval cycle and rhythmic procedures are two separate yet simultaneous processes. This can be seen in the fourth section from mm. 108-113.

Formally, each of the five sections of *Clock I* follows the same structure. Except for the fifth and final section, all of the sections are the same length of 29 measures. After each of the signal gestures, a few iterations of the eighth note ticking mechanisms are written. which provide a new context for the sixteenth note whirring mechanisms to enter. The whirring mechanisms are 22 measures and after these end, the ticking mechanism continues alone until the next signpost. In the final section, the whirring continues for an additional six measures before stopping.

The 22 measures which the sixteenth notes operate, are divided into three subsections every 8, 7, and 8 measures. Sometimes, these proportions are shuffled. The whirring mechanisms start a new interval structure with each of these changes. In contrast, the ticking doesn't change any of its internal mechanisms through the subsections. However, both change with an upward half-step shift in the pitchfield at these points. Interestingly, there are several instances where a whirring mechanism from a previous section is utilized briefly (m. 107, beats 2 and 3 in the left hand) – a disruption to the pattern. All the sections are built in this same way. The fifth section is special in that it spirals or "glitches" and gets stuck repeating the same whirring mechanism over and over until it fractures and dissipates from m. 141.

In essence, *Clock I* is an example of Birtwistle's interest in changing the perspective of an object on a large scale. Each of the five sections are different versions of an underlying process, showing new subtleties in the interactions between the ticking and whirring mechanisms in each repetition. The symmetrical nature of the rhythm and pitchfields are an integral part to its structure. While these elements are

fixed, the juxtaposition of the ticking and whirring objects are independent, yet interdependent, and are constantly renewed, creating a new context in their layering.

CLOCK II

This is the first of Birtwistle's "chiming" clocks. There are three primary mechanisms in *Clock II* – chiming, ticking, and cycling. All of the mechanisms for *Clock II* are introduced together in their most simple form in a quasi-introduction from mm. 3-16. This is a common tactic for Birtwistle, who often introduces all of his material from the outset. The form of *Clock II* can be understood in seven sections starting with the introduction (mm. 3-16), ticking (mm. 17-34), cycling (mm. 35-55), ticking (mm. 56-70), cycling (mm. 70-85), ticking (mm. 85-100), and coda (mm. 100-106).

A note should be made for the first page of *Clock II* – the measure numbers are offset by two. The first page starts counting measure numbers after the signal at the 4/8 time signature, but should start two measures before. Measures 1-24 in the score will be referred to as their actual measure numbers (mm. 3-26).

In *Clock II*, Birtwistle controls what the listener perceives as foreground, middleground, and background. By focusing or emphasizing a certain layer, he manipulates your perception of the hierarchy of the three mechanisms at any given time. This is achieved in *Clock II* by the use of the hocketing technique amongst the mechanisms as a way to clarify which mechanism is sounding for clarity. The hocket is a renaissance technique where a secondary voice is heard while the other is resting. It is a device which alternates between multiple parts, resulting in a continuous flow with a voice resting while the other sounds.[42] Birtwistle creates a continuous rhythmic pulse amongst the many voices – it is a technique for interweaving material.

[42] Ernest H. Sanders, "Hocket." *Grove Music Online,* October 2, 2024.

Overall, the hocket is explored on multiple structural levels in *Clock II* amongst the chiming, ticking, and cycling mechanisms. Chiming is used in the midst of mechanisms on the local level (the chiming and cycling mechanism in mm. 35-42) or alternating between two complete iterations of a mechanism on the phrase level (the chiming and cycling mechanisms between mm. 43-55). In relation to the structure of the piece, both the ticking and cycling mechanisms alternate from ticking (mm. 16-34, 55-70, and 85-100) and cycling (mm. 35-55 and 70-85). This form (TCTCT) alludes to the hocket. All of *Harrison's Clocks* is also an abstract of the hocket, where the three toccata movements (*I*, *III*, and *V*) are interwoven with the two chiming movements (*II* and *IV*) creating an alternating form (TCTCT). The hocket, then, is a "zoom-in" of *Harrison's Clocks* motive of oscillation.

In regards to the chiming mechanism, *Clock II* centers around the chime of the note E. This is a proliferation of the second part of the signpost at the opening (see fig. 1.1) - the punctuating *sfffz* notes. This detail becomes the chiming mechanism throughout *Clock II*. These two simultaneous attacks in the mechanism are accompanied with functions regulating the combination of long and short durations, the total number of notes in the two attacks, and the periodic duration of the chiming. The balance of these three aspects of the "chiming" object changes throughout, but always maintains these essential qualities.

As mentioned, the chime is the note E. It is often accompanied by a cluster of pitches around it. The number of pitches in these clusters can vary from 1 to 8 notes, but most often with E's neighbor D and occasionally Db. The attack of these clusters can be a brief grace-note punctuation, a sustained cluster, or a combination of the two (mm. 15, 43, and 56 respectively). The scales of density and attack can be seen from

mm 9-16 as well (fig. 2.4). The chiming E can be long or short independent of the duration of the clusters as well.

Birtwistle's use of the word "chiming" indicates a certain periodicity, not unlike a church bell, which measures time on the hour. Changes in the measurement of periodicity changes the perception of time. It tends to be regularly periodic, but expands through the clock, averaging at 7, 9, then 11 eighth notes per repetition. The chiming undergoes a process of expansion until m. 86, where it begins to contract to single sixteenth notes arriving in ms. 100. The chime's structural relationship with the two other mechanisms transforms throughout, its context changing from a local, phrase, or structural level. Birtwistle staggers these modifications in the chiming mechanism with the sectional changes in the other mechanisms, softening the number of alterations at once. They will usually change significantly halfway through another mechanism's section.

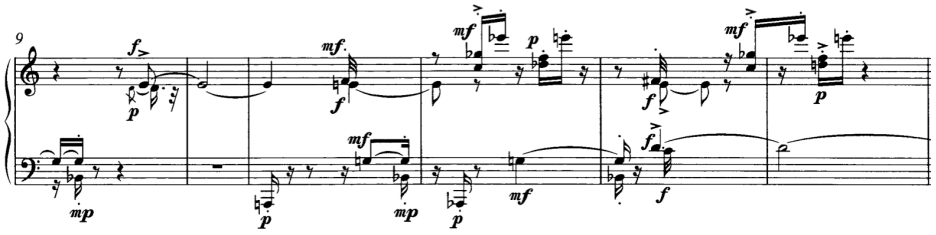

Fig. 2.4, Birtwistle, Harrison's Clocks, II, mm. 9-14

Next, the ticking mechanism comes in three sections after the introduction (mm. 16-34, 55-70, and 85-100). On the surface, all the ticking mechanisms share similarities. They are composed of small rhythmic groupings of 2-3 attacks with an angular shape, generally leaping up or down an interval of a minor sixth or more.

The first exploration of the ticking mechanism from mm. 17-34 is in two parts. Until m. 27, the left hand plays rather slow, very angular 2-3 note shapes across the keyboard. It is also relegated to a specific pitch collection (Db, D, Eb, G, Ab, A)

spanning four octaves (fig. 2.5). At m. 26, Birtwistle takes this single mechanism and duplicates it in both hands, thus entering into a new geometrical and symmetrical pitch collections of six notes per hand (D, Eb, E, Ab, A, Bb in the right and E, F, Gb, B, Bb, C in the left). In total, all twelve pitches are in the pitch collection between the hands.

Measures 26-28 serve not as a transition of mechanisms, but as a moment of acceleration and as a proliferation of one ticking mechanism into two. The right hand has a different acceleration rate than the left hand leading to and from this section. The length of each repetition of the mechanism in the right hand shrinks from 11 thirty-second notes to 7, 4, 2, and 2. This is shown through the contraction of C#, D, and Bb. The left hand primarily shows its acceleration in m. 26 between the D and C. The length of these are 3 thirty-second notes and are halfway between the prior pulsation of eighth notes and sixteenth notes (four vs. two thirty-second notes). The result is that the bass is twice the speed as before in sixteenth notes, spatially contained in two octaves. The treble becomes four times the speed as before in thirty-seconds, but in one octave (fig. 2.6).

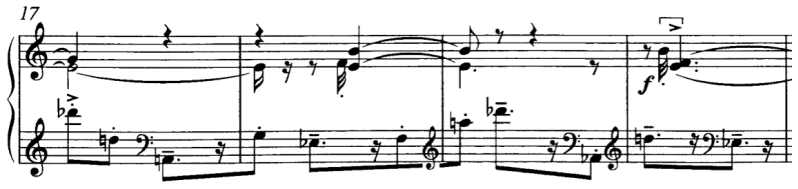

Fig. 2.5, Birtwistle, Harrison's Clocks, II, mm. 17-20

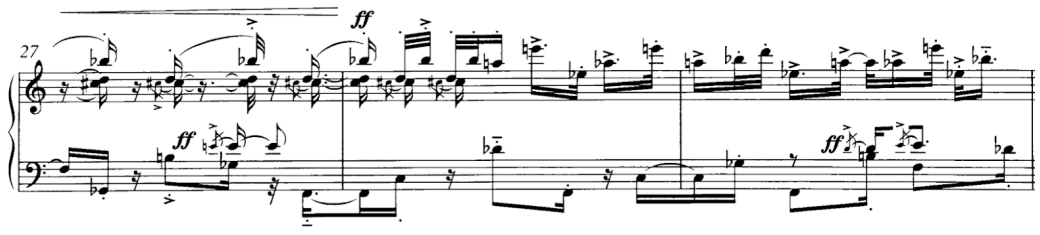

Fig. 2.6, Birtwistle, Harrison's Clocks, II, mm. 27-29

The second and third sections of the ticking mechanism (mm. 55-70 and 85-100) feature opposite processes of expansion and contraction. In the second ticking section from m. 55, the phrase length of the second gradually expands from six to eight 8ths and the ticking mechanisms between hands are coordinated in their accents (fig. 2.7). Phrases are then interspersed by the chime mechanism. The third section, from m. 85, has a contracting process where the phrases shrink from thirteen 8ths to three 16ths The accents between the hands are asymmetrically aligned. This third section is also the winding-down portion of *Clock II*, with a long rallentando (fig. 2.8).

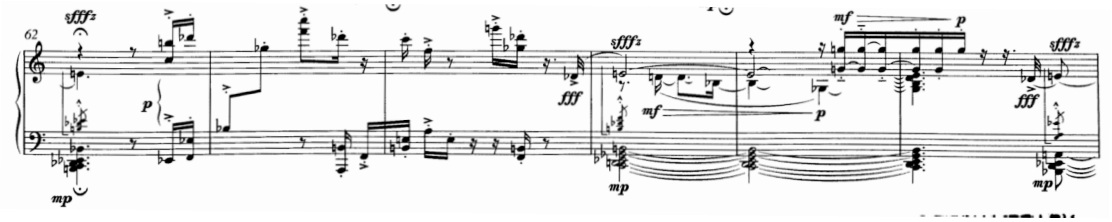

Fig. 2.7, Birtwistle, Harrison's Clocks, II, mm. 62-67

Fig. 2.8, Birtwistle, Harrison's Clocks, II, mm. 90-94

Finally, the cycle mechanism in *Clock II* has two sections in mm. 35-55 and 70-85. The cycle mechanism is in multiple layers – several can be stacked together at

once. The functions in both of these mechanisms are the cycle of pitches irrespective of rhythm, the hocketed rhythm itself, and the total duration of the mechanism. In each section of *Clock II*, there is a limited number of pitches which complete a cycle in a mechanism. The pitches are localized and have the character of a melody, or as Birtwistle will often refer to them, as a "cantus".[43]

The first example of this is in m. 35. The right hand has pitches B, Eb/Db, Bb, D, C/D, B, Bb, while the left hand has F, G, Gb/Ab, F, G, A/E. The order of the pitches remain the same in each new output of the cycling mechanisms in both hands, but the rhythm that the pitches are expressed with changes on each new iteration. They are hocketed with each other, creating a continuous pulse (fig. 2.9). The total duration of the complete mechanism for both parts is constantly changing, meaning that the beginning and ending of each respective cycling mechanism does not align together often, creating a distinct and renewing perspective between both cycling mechanisms. Birtwistle often uses his grace notes to delineate the beginning of his mechanisms in general, and is true in this case with B and F. From m. 44, where the chiming mechanism changes to a more sectional structure, the cycle mechanism has a duration of five eighth notes. Because of this, the cycling mechanisms in both hands have more alignment, but are still rhythmically hocketed with each other.

In the second section in mm. 70-84, two cycle mechanisms are superimposed on each other in addition to a ticking (from m. 69) and chiming (mm. 70, 73, and 78) mechanisms (fig. 2.10). The right hand has a five-note cycle (F/G, C, D, Db) which receives an additional elaboration in m. 76. The left hand has two ostinatos at the same time with different durational cycles. The cycle mechanism of sixteenth notes in the middle register maintains the same rhythm throughout, and is in two groups – an

[43] Michael Hall, *Harrison Birtwistle in Recent Years* (London: Robson, 1998). 26-27.

ascending and descending group. Each duration of this cycle mechanism is six eighth notes long. The lowest mechanism is in two notes and is actually the ticking mechanism, but each attack is spaced far apart. Each of these iterations of the lowest ticking mechanism is five eighth notes long. These lowest mechanisms (ticking and cycling) are offset from each other by a sixteenth note, ensuring that they will never align. Additionally, the mechanism lengths of six and five eighth notes respectively help emphasize the constantly changing relationship. The cycling mechanism in the top (cantus) experiences changing durations, while the chiming mechanism occurs every eleven eighth notes. All four layers are independent from each other, constantly renewing the experience of this section.

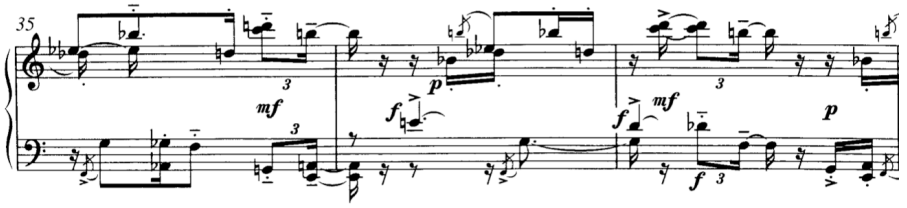

Fig. 2.9, Birtwistle, Harrison's Clocks, II, mm. 35-37

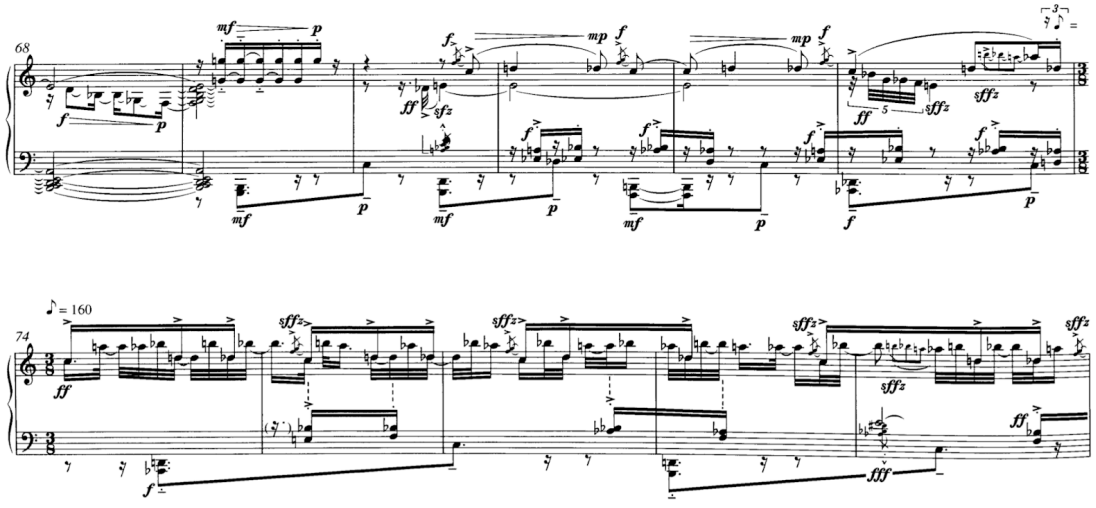

Fig. 2.10, Birtwistle, Harrison's Clocks, II, mm. 68-78

Clock II's charm comes from its formal interplay and the ambiguity of foreground and background. The oscillation on the macro level of larger sections

between the ticking and cycling mechanisms, and the smaller form of alternating the ticking and cycling mechanisms with the chiming mechanism, explore formality in different levels of juxtaposition. Birtwistle is known to say that he likes to "confuse which is the bread, and which is the filling" in his compositions.[44] The constant hocketing of multiple layers and sections eventually creates a perceptual mystery as to what the true "line" of the journey in *Clock II* is. Although the chime mechanism seems to be the primary line, the emphasis of the other two mechanisms constantly calls this into question, leaving multiple possible perceptions of the journey though *Clock II*.

CLOCK III

Clock III juxtaposes six unique mechanism types against each other. Birtwistle explores ways of finding new interactions and ways of experiencing these constantly varying processes. Through the course of the movement, each of the six mechanisms undergo a series of changes. The essence of each mechanism is maintained, and Birtwistle explores the possibilities of the constraints of each operation on the dividual level. *Clock III* has a small exposition from mm. 1-32 where all six mechanisms are introduced in their most straightforward form. The larger variations of these mechanisms begin after m. 32. This exposition is a microcosm of the movement.

This clock most closely resembles one of Birtwistle's most famous ensemble works, *Carmen Arcadiae Mechanicae Perpetuum*; the idea of which came from Paul Klee's *Twittering Machine*. Instead of four mechanical birds, as in *Twittering Machine*, *Carmen Arcadiae Mechanicae Perpetuum* has "six mechanisms juxtaposed

[44] Cross, *Man, Mind, Music*, 156.

many times without any form or transition."[45] *Clock III* undergoes a very similar process as *Carmen Arcadiae Mechanicae Perpetuum* with its own six mechanisms.

Within each of the six mechanisms, dividal elements control the dimensions of rhythm, register, pitch, interval, and duration. The variables which control each are different. For example, some have an identical length throughout their repetition, while others will have an irregular, asymmetrical duration upon repetition. There is a range of possible outputs for any given mechanism. Every possibility of these mechanisms are composed in such a way to create a valid, musical result – or object. The six base mechanisms, or mechanism families, are each created with a unique set of parameters which are held in later variations of the mechanism. The essence of each mechanism's family (from A to F) is listed below.

Mechanism A is composed of two similar figures – a quick angular gesture followed by a more spaced out echo (fig. 2.11, mm. 13-20). These mechanisms have strict pitchfields and the range of intervals integral to the gesture's identity is informed by the pitchfield's size – usually from a minor seventh to a major ninth, avoiding octave leaps. The duration of the total mechanism is asymmetrical, meaning that it changes in each repetition. Mechanism A has seven appearances from mm. 1-20, 32-42, 68-81, 87-93, 155-166, 184-199, and 203-214.

Mechanism B is the most varied of all the mechanisms (fig. 2.11, mm. 13-16 and 27-29). The total duration of each mechanism is highly irregular. It is built with two angular or grace note gestures – generally descending. Mechanism B works with strict intervals and pitch fields. Its eight different versions appear in mm. 6-16/27-29, 44-51, 82-86, 100-103, 127-138, 170-184, 187-193, and 207-215.

[45] Jonathan Cross, *The Stravinsky Legacy* (Cambridge, UK: Cambridge University Press, 1998), 73.

There are three aspects to mechanism C – an introductory punctuating group, leading into a sustained two-voice texture, which is followed by a short concluding gesture (fig. 2.11, mm. 16-22). This concluding gesture will have various reincarnations, but they vary from a cluster, to a grace note figure, to a low ostinato. The pitchfield is restricted to a small pitchfield in each voice, giving the sustained two-voice texture a very linear quality. The mechanism has an unvarying total duration. It has five appearances in mm. 16-22/31-37, 63-74, 102-107, 123-131, and 144-157.

The essence of mechanism D contains two primary components. The first is a descending scale and the second is an axial ostinato. Like a hocket, every other note of this mechanism switches between these two functions (fig. 2.11, mm. 21-26 and 28-31). After the first version of the mechanism, each mechanism's output is the same length. Birtwistle dispenses with the axial ostinato in D5 (mm. 113-126) and focuses on the rhythmic and scale qualities instead. Every iteration after D5 focuses on this scalar aspect. This mechanism undergoes the greatest transformation over its eight appearances. This mechanism appears in mm. 21-26/28-31, 38-42, 52-67, 75-82, 108-122, 113-126, 132-143, and 194-202.

Mechanism E consists of two angular lunges (fig. 2.11, mm. 23-28). In later versions, these figures are followed by a punctuating response. The density and direction of each lunge can vary; an additional pitch can be on the first or second note of a lunge, but never on both. This mechanism undergoes a process which starts in the low-middle register with its first appearance and arrives at the bottom of the piano in its last appearance. The length of each mechanism has a high degree of variability, making its entrances rather unpredictable. The three versions of this mechanism are found in mm. 23-28, 83-101/105-112, 167-187/206-8.

Mechanism F is divided into two parts – upper and lower. One part, usually in slower note values, usually descends in steps. The other serves as a pedal point, sounding as a rush of pitches. This is a typical pedal point only in the first two iterations. In the last three, it acts more like a "pedal cloud" where the pedal is a seemingly indeterminate group of pitches. Both of these parts draw their pitches from one or two pitchfields (a fixed region of pitches). These are usually the fastest figures in the movement, quickening the pulse. Each iteration of this mechanism generally has the same total duration (fig. 2.11, mm. 30-31). This process has six appearances in mm. 30-32, 43-63, 94-99, 139-154, 157-169, and 199-205.

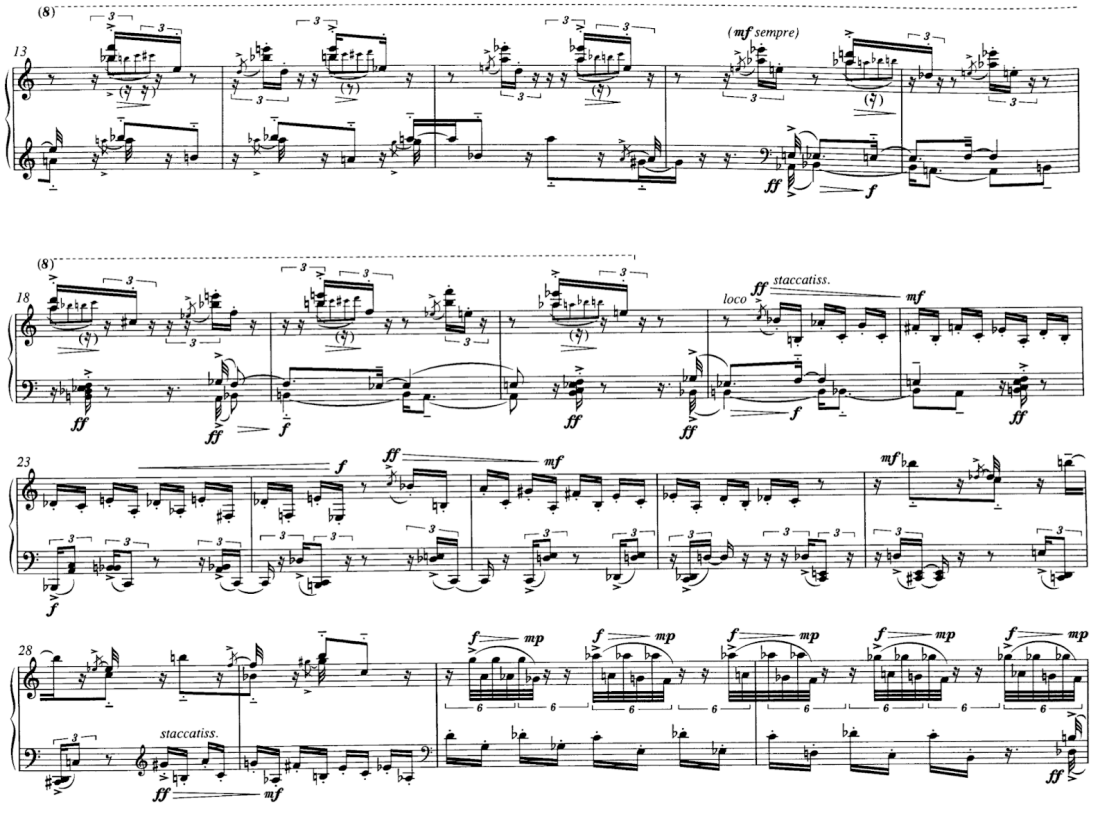

Fig. 2.11, Birtwistle, Harrison's Clocks, III, mm. 13-31

Through the course of *Clock III*, every unique possible combination of these mechanism families are employed. There are a total of 15 different interactions between the six mechanisms. The only exception is in the middle symmetrical

"turning point" where two opposing versions of mechanism D (D4 in the bass and D5 in the treble) are played against itself starting in m. 113 which is a unique moment in the movement (fig. 2.12). This creates a total of sixteen unique juxtapositions from the six base families of mechanisms.

This symmetrical implication from D4 and D5 is further implied by the beginning and closing processes of *Clock III.* The opening and closing mechanisms are the same: A and B. A1 and B1 differ significantly from where they arrive as A7 and B8, but their function and their essence remains the same. This way of beginning and ending a piece the same way comes in many of Birtwistle's works. This is similar to a labyrinth where the entrance and the exit are at the same point, and the goal is in the middle of the maze.

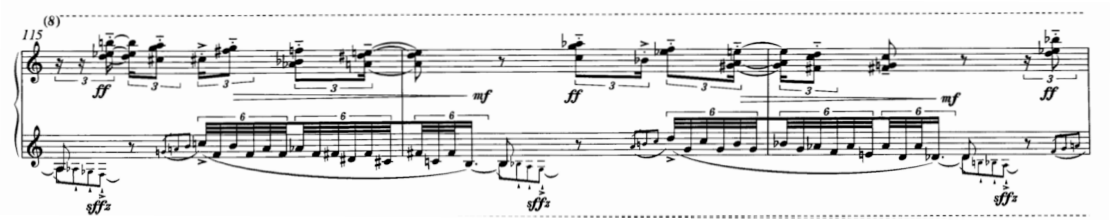

Fig. 2.12, Birtwistle, Harrison's Clocks, III, mm. 115-117

Additionally, the register is an important aspect to most of these processes' identities. The functions of space are constant with most mechanisms. Many of the mechanisms, such as A, B, and C are completely fixed in their register (high, middle-high, middle-low respectively) and do not change through the course of the movement. Mechanisms D and F have general territories, but can vary due to where the other mechanism is located. They may appear in some registers more than others but tend to appear in the same middle register. Mechanism E undergoes a registral process from the beginning of the movement to its last appearance. It heads on a downward trajectory from the middle-low register all the way to the bottom of the

piano. E2 (mm. 83-101/105-112) is the mechanism which emphasizes this downward trajectory the most.

The rich variety of these six mechanisms provide a fertile ground to explore and create interesting interactions among processes. Because the mechanisms are not dependent on each other, the way they can be juxtaposed with each other can be constantly recontextualized. In the opening interaction between A1 and B1 (starting from m. 6), A1 has an irregular series of durations, shifting from fourteen to sixteen sixteenth note triplets in total, while B1 is a mosaic of durations between four and six sixteenth notes – gradually getting longer. Another example would be in m. 44, where mechanism E2 has a regular series of durations in relation to B2's irregular length. Every starting interaction between the two processes will be in new locations, renewing the way the two mechanisms interact with each other. The context for their start is always different. Finally, D4 and D5 each have a fixed duration, but the two mechanisms have a slightly different total duration (see fig. 2.12). This is a polyrhythmic relationship between the mechanisms on a global level of 19:20. The top mechanism (D5) falls behind D4 because of its slightly longer length. Given enough time, the relationship would repeat, similar to how two cogs of nineteen and twenty teeth would need twenty and nineteen rotations respectively for them to align exactly as before. In fact, Birtwistle starts these two mechanisms near the end of this polyrhythm, and by the fifth iteration, the alignment of D4 and D5 coincide together before drifting off again.

One of the unique characteristics of *Clock III*, compared to the other movements in *Harrison's Clocks*, is the impression of many simultaneous pulses. These are in two broad divisions: triple and duple, each divided into eighth, sixteenth, and thirty-second variants. Because each processes stays strictly in their pulse world,

the feeling is that of multiple simultaneous tempi, creating a strong sense of rhythmic stratification. This is amplified in part to the differing alignment and register of the active mechanisms, which are constantly offset from each other. The only two mechanisms that feature both types of pulsation are at the end during E4 (mm. 167-187) and A7 (mm. 203-215). As *Clock III* progresses, it gets increasingly "wound-up" using smaller and smaller pulse values until m. 200 when mechanisms E3 and F6 spiral out of control and the clock "breaks". After this, mechanisms A7 and B8 gradually grind to an irregular halt, now dissipating all of its energy from the opening "wind-up".

The six mechanisms of *Clock III* and their subsequent evolutions are textbook Birtwistle. On any mechanism's reappearance and subsequent transformation, he gives the impression that they were processing silently in the background. In a sense, all six mechanisms are functioning at the same time, but Birtwistle chooses only two to be present in the foreground and background. He leads our focus to particular moments of an otherwise automatic process.

CLOCK IV

Clock IV poetically is most similar to a clock being wound up, and constantly losing its tempo or losing its time. This would be analogous to a clock with a fault in the mainspring where the device is unable to store its energy properly. *Clock IV* is the second of two chiming timepieces in *Harrison's Clocks* (the other being *Clock II*). The context of the opening signpost changes significantly in this timepiece, and is in fact composed completely out of the materials of this opening gesture.

As established, *Harrison's Clocks* uses the wind-up gesture to signify the beginning of a movement and of an action. Upon the arrival of *Clock IV*, the "wind-up" will have been heard a total of four times, and we, as the audience, will

recognize its function as the starting action of a movement. However, *Clock IV* subverts those expectations. *Clock IV* uses this action to begin each of its four sections at mm. 1, 8, 33, and 39. Before each new section, *Clock IV* loses its tempo, giving the impression that it is ending. The signpost within the movement is a signal of a new beginning. This can be heard as multiple attempts to start *Clock IV* and functions to amplify its significance as the instigator of action. This is a distinct difference from the use of the signpost in *Clock I*, where a special signpost unique to the movement (see m. 31) is used to distinguish sections, and a *stretto* is used to arrive at these points, as opposed to fading away as in *Clock IV*.

Furthermore, the wind-up is materially broken apart, zoomed-in, and explored in this chiming movement. Two mechanisms are derived from this figure – chord and ticking mechanisms. These mechanisms are explored in each section with different orders, lengths, and juxtapositions. Each new beginning is an attempt to give *Clock IV* the energy it needs to progress. Each of these new journeys with the timepiece offer a new perspective, and each adventure treats the same mechanisms differently after each new attempt.

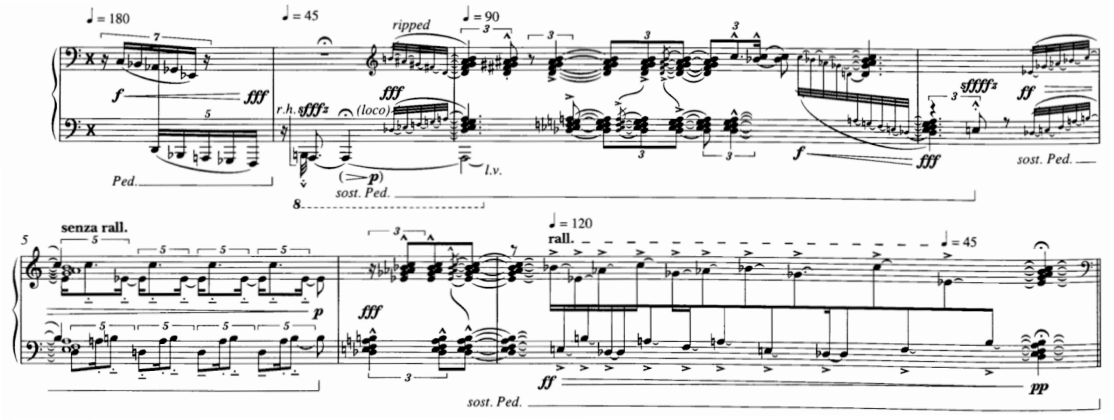

Fig. 2.13, Birtwistle, Harrison's Clocks, IV, mm. 1-7

In regard to the chord mechanism of *Clock IV*, this process is composed of two five-note chords superimposed on each other in m. 3 (fig. 2.13). In *Clock IV*, the harmonic aspect from the initial gesture is explored – the changing ten-note conglomerates which are constantly out of sync, just as the two five-note figures start at different times. The essence of the chord mechanism is that the two groups of five-note chords are non-synchronous with each other, constantly out of phase. Their harmonic structure is generally made of slow, small changes. These ten-note harmonic structures always use ten individual pitches out of twelve.

Furthermore, the notation of this mechanism changes throughout the sections. The chord mechanism of the first two sections are notated the same until m. 11 in the second section. From m. 11, the chord mechanism undergoes a metric modulation where each eighth note is equal to the previous measure's triplet (each bar from m. 11 is a quarter note from the last tempo). This is used to more clearly notate the ticking mechanism which is stated in triplets and quintuplets. The third section at m. 35 has rallentando beaming diminished from thirty-seconds to eighths for the chords and the fourth section from m. 45 changes the chord voicings and maintains the non-synchronous element with 2-3 grace notes before the primary chord.

This non-coordinated element of the chord mechanism functions as a way to emphasize the angularity of the rhythm, which pushes itself forward. However, over time the signpost action loses energy and the chords lose momentum at the end of each of the four sections. Because of this, in section three and four (mm. 40 and 67) a new element of the chord mechanism is introduced – alignment. This occurs as a result of the loss of momentum. The ending chords are a frozen chord mechanism, giving the only moments of synchronicity in *Clock IV*. These are always coupled with the widely spaced dyad Eb/Db, which is again a variation of the signpost's own *sfffz*

major second (A/B). The three E/Db dyads always occur in regular intervals and function like a chime.

The chord mechanism also has an action figure, in contrast with these synchronous moments, which appear as mini wind-ups. These quick flurries suggest a realignment of tempo or a resetting of tempo. This is especially notable in the fourth section (from mm. 44) where each brusque flurry begins after a rallentando, resetting to the previous tempo. This also appears in mm. 10 and 35. Different from the signpost, which is of larger structural significance, these flurried grace notes usually occur at the beginning of a phrase. They increase in momentum at the local level, suggesting a tempermental clock which is not entirely regulated, seizing back into time.

Regarding the ticking mechanism, it is first introduced in m. 5 (fig. 2.13), is found in all four sections. It appears in three different rapid pulses: quintuplets, triplets, and duplets. Within this puslation, the "ticking" occurs in regular two or three oscillating note patterns. When there are two groups of ticking mechanisms together, they alternate from each other like a hocket without sounding simultaneously. These ticking mechanisms follow chord mechanisms generally or simultaneously and outline the chord's ten-note harmonic structure. The ticking mechanism in *Clock IV* has similar characteristics of ticking as heard in the other timepieces, especially of the eighth note ticking mechanism in *Clock I*.

Clock IV also has several occasions where both the ticking and chord mechanisms are superimposed. In the second and fourth sections, the ticking and chord mechanisms are heard together (from mm. 16-32 and mm. 54-65). In the second section, this is observed in mm. 18-19, 19-21, and 21-23 where only one ticking mechanism is heard with the chord mechanism. On the other hand, Birtwistle

juxtaposes two sets of ticking with a chord mechanism in different layers in mm. 23-32 (fig. 2.14). The ticking and chords are seen again from mm. 55-65 (fig. 2.15), where the ticking mechanism is suggested to be an outgrowth of the chord mechanism as *Clock IV* grinds to its final halt.

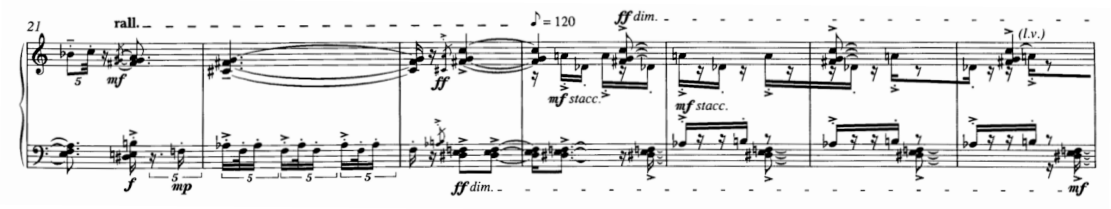

Fig. 2.14, Birtwistle, Harrison's Clocks, IV, mm. 21-27

Additionally, this outgrowth of mechanisms from m. 55 in the fourth section is often associated with Birtwistle's frozen moments, or friezes. This is a double entendre – where the music seems to "freeze" in time, but is also related to the frieze in visual art, where patterns in wallpaper repeat. Further, this is similar to the "freeze frame" in cinema, where there might be a narrator above commenting on a particular moment in the action or when slow-motion[46] is used. This is achieved by frozen harmony and repetition and is normally accompanied by an increase in compositional detail. This is a commentary on the frozen moment – a detail frozen in time.

A painting is frozen in time and there is unlimited opportunity to look at every detail.. Music, however, is constantly progressing through time, allowing limited moments to perceive all the information. By slowing down the music, Birtwistle gives the listener the opportunity to listen and perceive more in the music, and allows Birtwistle to elaborate even more on a given moment. This process of freezing music and accumulating detail can be most clearly seen from mm. 44-66.

[46] Adlington, *The Music of Harrison Birtwistle*, 153.

In this fourth section, Birtwistle sets a context at m. 44 with a phrase of five non-synchronous chords, each led with two or three grace notes of the chord, which gradually slows down and is followed by an E chime, reminiscent of *Clock II*. From mm. 44-66, this phrase is repeated five times with all of these aspects. The pacing of the five chords controlled by a rallentando is extended to a structural level with the five phrases. Each of these phrases gets gradually longer and longer as seen by their increasing durational values where the
E chime is placed further away from the chords.

The repeated use of the E chime throughout is used to mark the passing of time. As discussed in *Clock II*, chimes are periodic structures meant to measure time. When the time between these chimes grows, as it does in this fourth section, it gives the feeling that our perception of time has slowed down, and that the chimes are still measuring time "accurately". In this way, Birtwistle gives the impression of slowing down our perception of time.

As time slows, Birtwistle is able to add more details to the repetitions. The fifth repetition from mm. 53-66 is a true freeze and has much more detail – there is more time to aurally observe it. The detail comes from the elaboration of the grace note figures before the chords. Birtwistle takes these grace notes and extends them into very rapid ticking mechanisms. The first four of these chords in the fifth phrase take a measure each, until the fifth chord, which is given nine measures (mm. 57-66). The suspended nature of this last chord is now elaborated by the ostinato figure outlining the harmony in the left hand and the continual ticking in the right hand. Over time as the music undergoes a final rallentando, these figures slowly deteriorate and skip beats. The music is frozen and slowly falls apart.

These slowed down moments are a zoom-in, a microscopic look at the materials. One is reminded of a fractal in this regard, where the material keeps emphasizing itself the deeper one looks. The cutting of repetitions or notes from the ticking mechanism and ostinato (chord mechanism) over time gives a sense of time dissipating or of *Clock IV* falling apart.

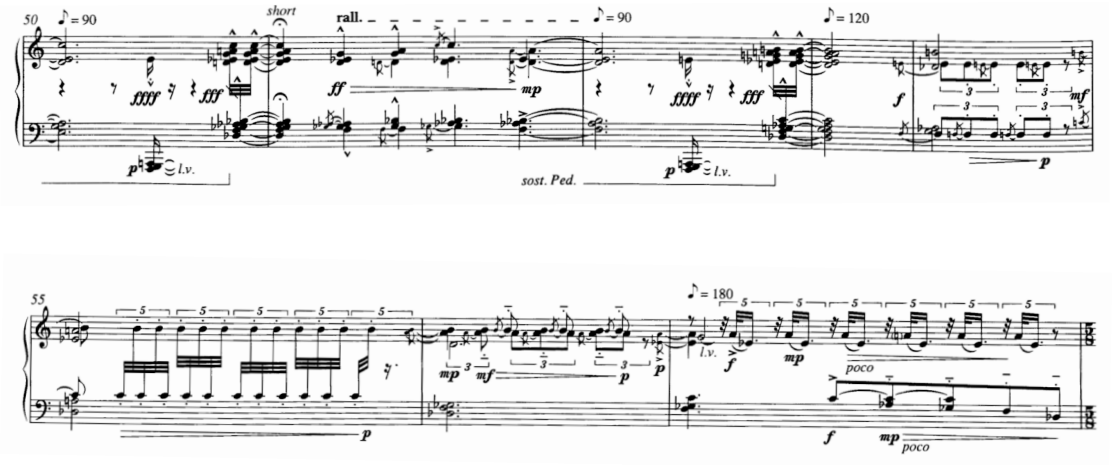

Fig. 2.15, Birtwistle, Harrison's Clocks, IV, mm. 50-57

Formally, *Clock IV* recontextualizes the "wind-up" figure of *Harrison's Clocks*. It was a signal to start a movement, but it changes to here create the impression that each of the four sections are separate beginnings of *Clock IV*, as opposed to a continually flowing form – changing the perspective and dimensions of each of these sections. Additionally, the creative variety of the ticking and chord mechanism with the illusion of freezing time, show the poetic variety Birtwistle finds with his mechanisms, demonstrating the flexibility of possibilities.

CLOCK V

Clock V is concerned with symmetry on multiple levels: harmonic, physical, and structural. The mechanism which Birtwistle uses to display these aspects is through oscillating repeated notes. Additionally, Birtwistle utilizes gradual layering of

these repeating notes like a slowly unfolding gradient to give the impression of density in motion.

The first mechanism is the repetition of sixteenth notes on a single pitch starting in m. 3 . *Clock V* explores the continuum of density through its mechanisms of repeated notes. The repeated note can be a single held note, but it often is heard as many repeated notes leading to a held note. Places which emphasize this are specifically from m. 75 where four of these repeating mechanisms are constantly in play (fig. 2.17). This section features four repeating note mechanisms, two in the right hand, two in the left, and the intricate texture is achieved by vertically layering this mechanism. In m. 172, *Clock V* utilizes the repeating mechanisms in a more vertically dense way, overlaying many repeated notes, creating a thicker chordal texture. (fig. 2.18). Through adding and subtracting multiple layers of the repeating note mechanism, Birtwistle creates various levels of intensity and density.

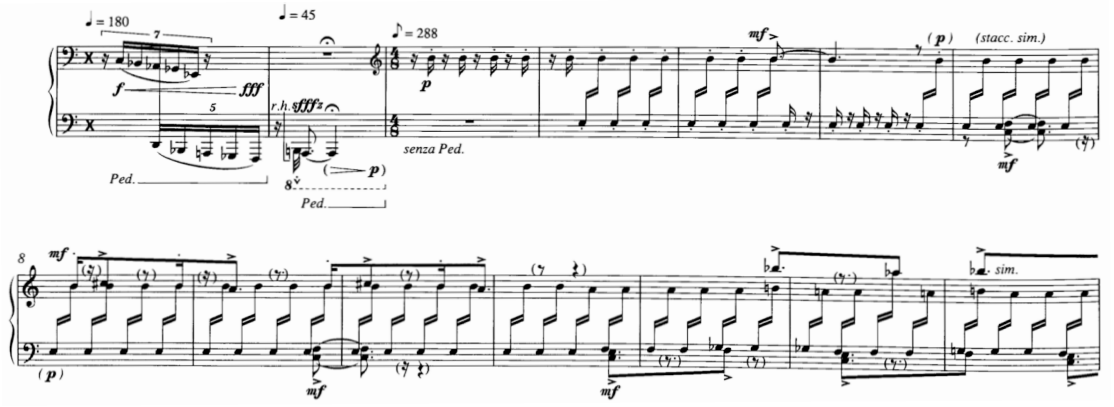

Fig. 2.16, Birtwistle, Harrison's Clocks, V, mm. 1-14

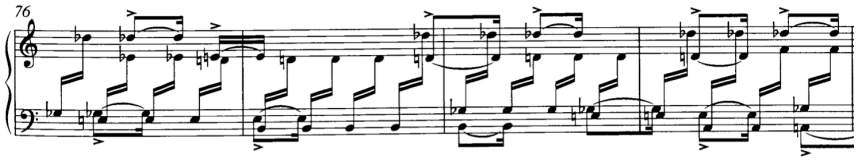

Fig. 2.17, Birtwistle, Harrison's Clocks, V, mm. 76-79

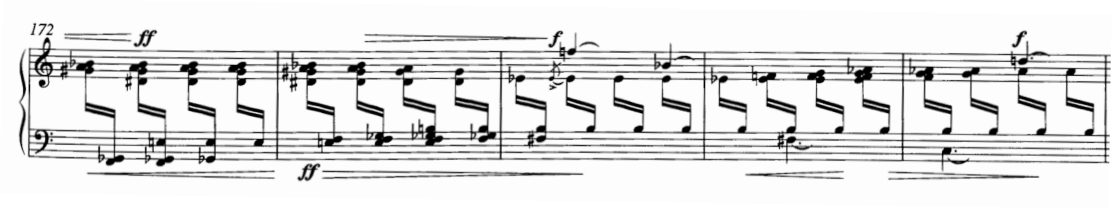

Fig. 2.18, Birtwistle, Harrison's Clocks, V, mm. 172-176

The second is a ticking mechanism. This is similar to the ticking mechanisms in the rest of *Harrison's Clocks*, where they are short strands of alternating notes (usually two or three) and are usually eighth notes. This mechanism can be spotted similarly to the eighth note ticking mechanism of *Clock I*, where the beaming indicates all of the notes involved in the mechanism. In many instances, just one note of a ticking mechanism will be shown without its pair, and the second note of the group will be introduced later as seen in mm. 7-14 in the left hand (fig. 2.16)

The alteration of sounds is important to this mechanism, and mm. 95-97 (see fig. 2.19) and 174-176 (fig. 2.18) are larger, more spaced out versions of ticking. Structural oscillation is not used in relation to this mechanism as in *Clock II*. The ticking mechanisms in Clock V are repeated continuously until an underlying variation to the mechanism is applied, altering its sound and appearance. For example, mm. 133-152 (see fig. 2.20) have two completely different manifestations of the ticking mechanism (starting at mm. 133, 140, and 146) while the left hand has three of its own ticking mechanisms in this same window starting at mm. 133, 137, and 146.

The hands are divided into symmetrical pitchfields. The first pitchfield from mm. 3-28 is Ab, A, Bb, B, Db, and Eb [0,1,2,3,5,7] in the right hand and the other is C, D, E, F, F#, and G [0,2,4,5,6,7] in the left. The group of whole steps in each hand overlap with the other hand, creating a kind of pitch interlocking and in total, these two groups of six complete the 12-note pitch aggregate of the chromatic scale.

Additionally, these pitchfields are associated with the beat it lands on, not with the left or right hand – these two sets of harmony oscillate in relation to the downbeat and upbeat. The sections where there is a constant stream of notes in one hand also holds true to this rule such as from mm 90-101 (fig. 2.19). The alternating hands give the opportunity for each pitchfield and its associated objects to sound individually and for them to be clearly heard – similar to the hocket.

As *Clock V* chromatically moves its pitchfield upwards, Birtwistle uses two modulation techniques to shift the pitchfields in both hands. This is accomplished by softening the transition between sections by highlighting the common pitches, or by emphasizing the difference, which is often accompanied by a more abrupt gesture. The smoother transitions which emphasize common notes are accomplished by slowly phasing out pitches exclusive to the old group and focusing on the pitches shared between groups, prior to introducing pitches of the new group. In *Clock V*, examples of this occur in mm. 75, 89, and 218. In the first two examples, the music is restricted to only two alternating sixteenth notes, and in the third example, the shift is only signaled by the bass' movement from D# to D-natural. In this way, the transition of pitchfields is similar to that of a gradient transition. This is a similar technique to *Clock I* in which the whirring mechanisms leads to a chromatic upward change in pitchfield, where Birtwistle would also phase pitches from the previous pitchfield out and gradually introduce the pitches of the new pitchfield in.

The more abrupt transitions in *Clock V* are usually accompanied by a rougher gesture as well, whether in an extreme change of register (mm. 58, 209, and 123) or a disruption to the pulse (mm. 28, 131), or an introduction of a contrasting idea (mm 102 and 197). Sometimes, several of these are utilized at once, such as a disruption in pulse and contrast of material from mm. 231-233.

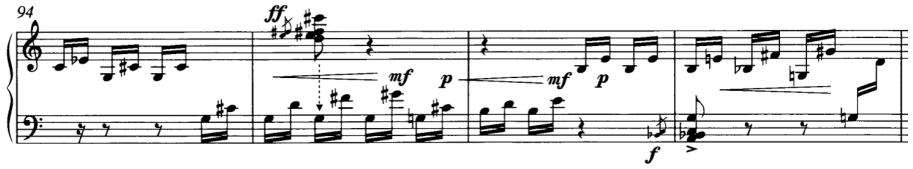

Fig. 2.19, Birtwistle, Harrison's Clocks, V, mm. 94-97

Circularity is inherently symmetrical, and Birtwistle shows this with his use of the ticking eighth note mechanism and the pitchfields by presenting a circular form which overlaps with the beginning and ending of *Clock V*.

Birtwistle makes allusions to the opening music by referring to the C/F object which makes its appearance m. 7 (fig. 2.16) and m. 244 (fig. 2.21). Both are in the same register. In the opening, this C/F object grows in size, while in the final bars, it is reduced from an originally larger object. The pitchfields between these sections are also strikingly similar, sharing four of six pitches in the left hand, where the mechanism resides. These objects all share the same pitch field of C, F, Gb, and G, further alluding to the circular structure of the music. In mm. 11-12, the sixteenth-notes in the left hand alternate from G and Gb to F, while progression in the left hand of m. 244 is reminiscent of a modal cadence, achieving a "resolution" by lowering the upper voice from Gb to F and an upward V-I motion in the bass from G to C.

Additionally, the gradual introduction of the alternating notes is reflected in the end as well, where they are taken away as its energy dissipates. If Birtwistle were to continue the music at the end without this dissipation of energy, it would appear that the music would continue by going back to the beginning without the signpost.

This is a clear resemblance of circularity, however *Clock V* also has a strong sense of symmetry that occurs beginning halfway through the movement (m. 140 out

of 280). The symmetrical structures here are at different points throughout this section from mm. 140-154. The three separate symmetrical moments in this section are the pitchfield inversion at m. 140, the inversion of the hands at m. 146, and the first "wind-down" alluding to the beginning and ending is m. 155 (fig. 2.20). Birtwistle is interested in staggering the symmetry so that there is not an overwhelming amount of change all at once.

The harmonic structure of the pitchfields in both hands invert at m. 140. The right hand F, F#, G, Ab, Bb, and C [0,1,2,3,5,7] becomes Bb, C, D, D#, E, and F [0,2,4,5,6,7]. The similar pitches between the two fields are Bb and C. In the left hand (A, B, Db, D, D#, E) [0,2,4,5,6,7] becomes (F#, G ,G#, A, B, Db) [0,1,2,3,5,7]. The shared pitches are A, B, and C#. In other words, the pitchfield structure of the right and left hand switch. This is similar to the modulation technique discussed earlier. These common pitches serve as an axis which the new pitches flip. These common pitches in the left hand are used exclusively until m. 144, where the new pitches are introduced. Furthermore, these three pitches are also from the opening right hand mechanism from mm. 8-10. The left hand of the opening alludes to the beginning and ending, while the right hand of the opening refers to the left hand at the point of symmetry at m. 140. These are not only interesting because of the direct harmonic relationship between the objects, but because of how they relate structurally, outlining and maintaining a place of structural significance in *Clock V*.

At m. 146, the hands switch order, the right hand now taking the downbeats. Significantly, the mechanisms before and after this point are quite different in terms of the way they treat density and simultaneity. In the second half after m. 146, the mechanisms in the foreground are notably less independent from each other; each hand, although still separate, generally functions in conjunction with the other part, as

opposed to the first half, which exhibits much more independence amongst musical objects. The second half is also much denser, using alternating four note-chords between the hands often (from m. 179).

The third symmetrical point from mm. 155-160 where *Clock V* has its first loss of momentum – stopping in the same manner as the end of the movement. The sudden loss of pulse is brief before the regular oscillations start again in m. 160. These moments of dissipation or "winding down" are shown by the empty sixteenth note stems and are achieved by "cutting out" notes of the repeated note mechanisms. This temporary point of stillness is wound again by the two chordal gestures in m. 156 and 158 before returning to the continuous pulse at m. 160. This point of dissipation is also the division between the more independently layered first section, and the more chordal and harmonically dense second section.

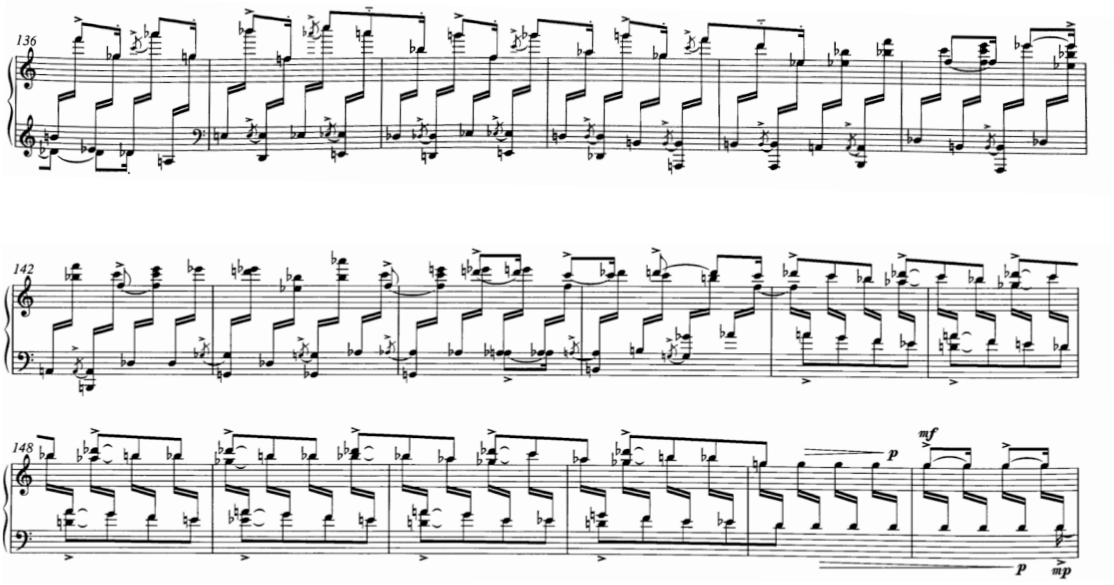

Fig. 2.20, Birtwistle, Harrison's Clocks, V, mm. 136-155

The process of time-dilation is where one clock loses time in relation to another clock. This process ends *Clock V*, beginning in m. 241 (fig. 2.21). Starting in m. 241, Birtwistle states both closing mechanisms with the same synchronicity,

completing a unified cycle in m. 246. From m. 246, a process of de-synchronization occurs in the last three repetitions of these two pitch cycles. The right hand mechanism, starting in the high D#/E occurs in mm. 246, 253, and 264, while the beginning of the left hand mechanism starts in mm. 246, 251, and 257 with the high Bb. The de-sync is accompanied by sixteenth notes being gradually left out, giving a sense of slowing down, although the pulse remains constant. The de-synchronization and dissipation of *Clock V* is unique to the whole of *Harrison's Clocks*.

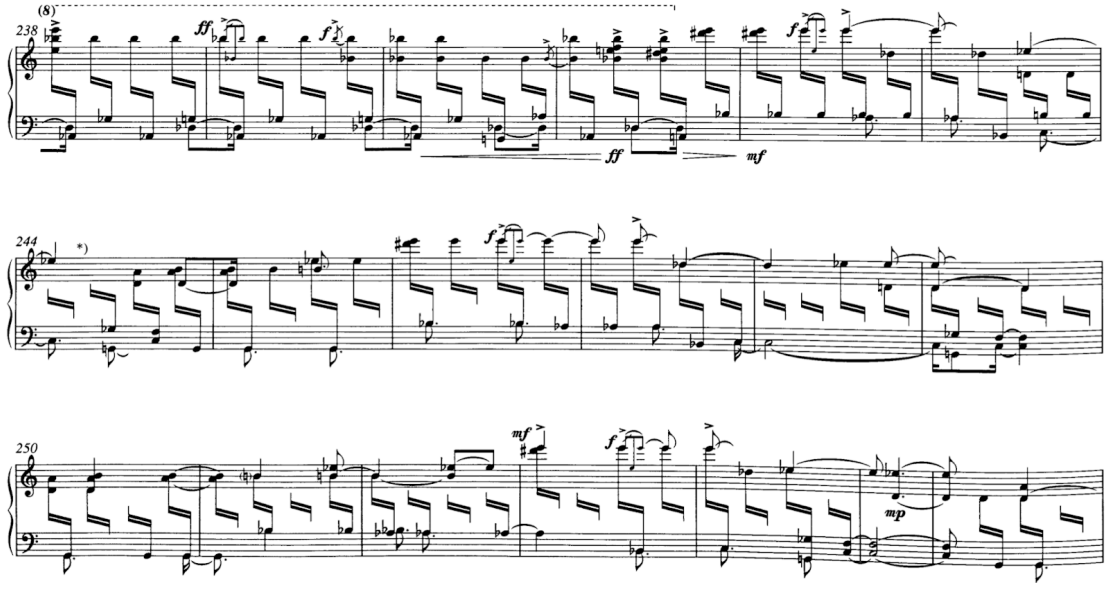

Fig. 2.21, Birtwistle, Harrison's Clocks, V, mm. 238-255

This final timepiece of Birtwistle explores symmetry and density dynamically in its layers. Through a continuum of repeated notes in the sixteenth note mechanism and continually varied ticking mechanism, Birtwistle achieves sonic variety and sonority to create a uniquely constructed *perpetuum-mobile* styled toccata. The imaginative sequence of symmetrical points in the middle and the feeling of a circular labyrinth-like structure, emphasize Birtwistle's preoccupation with creating mechanisms which, through repetition and variation, create a sense of continuous exposition.

As one can see, each of *Harrison's Clocks* work through the motives of oscillation and periodicity and explore these aspects in completely renewed ways from timepiece to timepiece. Additionally, Birtwistle's preoccupation with pitch space and evolving cyclical time is central to the themes of varied repetition in the mechanisms. Each timepieces' theme, in order, could be best understood as layering, periodicity, juxtaposition, dilation, and alternation. Tracing his details to their smallest component allows for a concise and precise understanding for each mechanism and their many possibilities. The closer that one looks into the details, the more they seem to self-replicate – not unlike fractal sets in mathematics. What are these musical timepieces made of? If they are not literally made of cogs, they are made of the essence and spirit of cogs and gears. They have multifaceted relationships with each other, constantly renewing, embodying an unfolding mechanical landscape.

CHAPTER 4

OPERATION

"Why not love it [music] for itself? Why not love it as one loves a picture, for its fine color, its fine drawing, its fine composition?... it is sufficient in itself."[47]

– Igor Stravinsky

The performer's role, in a fitting analogy, could be compared to the story of Lieutenant Commander Rupert T. Gould and his journey in rebuilding John Harrison's clocks, as told in Sobel's *Longitude*.[48] Gould volunteered to take apart and fix each of John Harrison's clocks in 1920, since they had not been running since 1766. This became a 12-year endeavor. He had no horological experience, and learned how the clocks functioned as he rebuilt them. Of the clocks, he found that H-3 was especially difficult. The removal of the escapements in H-3 routinely took eight hours, which he did at least forty times.[49] After the endeavor, Gould remarked on H-3, "it is abstruse. It embodies several devices which are entirely unique-devices which no clockmaker has ever thought of using, and which Harrison invented as the result of tackling his mechanical problems as an engineer might, and not as a clockmaker would."[50] The performer likewise should prepare to "rebuild" *Harrison's Clocks* in the same manner.

INTERPRETATION

"Expression", in the context of Birtwistle's music, is achieved by the performer through scrupulous sonic detail and rhythmic integrity. The pianist's gestures should articulate the form, shape, and color of the musical objects. This approach to expression is most similar to that of Stravinsky. Stravinsky's music after

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[47] Jonathan Cross, *Harrison Birtwistle: Man, Mind, Music* (Ithaca, N.Y: Cornell University Press, 2000), 16, note 30.
[48] Dava Sobel, *Longitude : The True Story of a Lone Genius Who Solved the Greatest Scientific Problem of His Time* (New York, New York: Bloomsbury, 2010), 170-71.
[49] Ibid.
[50] Ibid. 171-172

the 1920s very rarely has any overtly expressive markings, and like Birtwistle, will generally use a metronome marking as opposed to a description of the tempo. Birtwistle only uses *delicato*, *leggiero, pesante,* and *ripped* as expressive markings throughout the score. These suggest particular types of touch, especially in relation to their corresponding dynamic markings. In *Harrisons' Clocks*, the dynamics generally range from *ppp* to *fff*, with exceptions which use *pppp* and *ffff* at the end of *Clock I,* and throughout *Clock IV*. These should be carefully delineated. Birtwistle is very detailed in regard to articulation, it is similar to composers such as Webern or Boulez. Generally a repeated object will share the same articulation in every subsequent repetition. The pianist must create a sound which amplifies the inherent characteristics of the mechanisms. There is a certain objectivity to playing this music. The performer's role is not to get emotionally involved, but to be a conduit and to convey the processes as they unfold in the music.

This brings up another interesting recurring aspect in Birtwistle's music, which is that of instrumental theater. The performer has several roles in relation to the work. Much like the premise of his music, the role of the performer can be observed in multiple perspectives. Referring back to Klee's water mill diagram in chapter 1 (see fig. 1.3), the nature of a performer's relationship to the score is more apparent. The movement of the wheel (score) moves the belt (performer), which in turn operates the hammer (piano). To operate these clocks as a performer, the objective is to present a well organized, well-oiled machine, and to let the machine create the music. Alternatively, the movement of the wheel (Birtwistle) moves the belt (score), which in turn operates the hammer (pianist). The sound is the product of this "theater" on stage, just as the cogs in a clock are mesmerizing to watch and result in the hands on the face moving.

There are not many works which liken a direct comparison in the Common Practice Period repertory of the piano which are similar in their construction as *Harrison's Clocks*. Indeed, the problems faced are unusual and often unique to Birtwistle. Bartók's "The Night's Music", from the *Out of Doors* suite, would be one of the closest parallels from a perspective of how the material is treated as an object. "Night Music" is interested in a sort of geometric space with multiple "objects", similar to Birtwistle's own concerns. There is the "setting" of the opening, where five-note clusters containing the same five pitches are indeterminately rolled, along with the repeating insect and nature sounds found in specific registers of the piano. Bartók is more interested in portraying wildlife and nature than Birtwistle. However, they function similarly to Birtwistle's mechanical objects.

In Birtwistle, the performer should strive to show the interesting interactions between mechanisms, and to emphasize the contrast of all of their unique colors. Every cog and gear of these timepieces interacts with and impacts others, which shows a constantly evolving yet repetitive recontextualization. If the interpreter preserves the delicate and intricate interaction between the layers, the beauty of the precision and the detail evolving into a sprawling structure is revealed.

EXECUTION

In preparing the work, there are a few aspects to consider. One must reckon with the difficulty of reading the work, finding effective rehearsal strategies, and discovering the correct gestures for performance. The toccata timepieces (*Clocks I*, *III*, and *V*) are the exceptional timepieces which will require the most time and effort.

Because of the compositional detail of *Harrison's Clocks* and the emphasis on simultaneity of mechanisms, the earliest stages of the learning process should be approached with patience. *Harrison's Clocks* demands the utmost concentration. One

should not depend on reading or thinking their way through its many processes. Often, even a slight loss of focus will lead to error. The ideal is reminiscent of Zen-like mindfulness.

Generally, because of the amount of information the performer must absorb, it is useful to to completely focus on one hand at a time at the beginning due to the complex interactions of musical objects. Going beyond slow reading is difficult, especially because the objects and the physical coordination for these mechanisms is rarely aligned. As one reads the music, one must be able to focus the attention to either hand, while not depending on reading the score for that hand's part. The ability to play each hand individually, at full tempo, on autopilot is a good marker for progress – the goal being able to freely adjust one's aural attention at will between hands and parts. Intellectually, one might understand the processes and juxtapositions, but the experience of the work in the hands is quite another. Every mechanism when in relation to something new will not just aurally, but physically, feel different. For someone learning Birtwistle for the first time, this is perhaps the most astonishing realization in the learning process.

Birtwistle's use of beaming in *Harrison's Clocks* is idiomatic for him in the 1990s and 2000s – long beams spanning several measures indicating an object's compositional organization and phrasing. Traditional beaming practice, which clarifies the middle or strongest beats, is not observed. Each note connected to the beam will be of the beam's duration, regardless of its location in a measure. This decision, while useful analytically, is not necessarily practical for the performer, and many rhythmic ambiguities arise due to this kind of notation. A useful method of clarifying the beats is to draw lines clarifying the big beat in particularly confusing measures throughout *Harrison's Clocks*.

The two classifications of movement types in *Harrison's Clocks*, "ticking" and "chiming", share similar rehearsal problems with each other. The ticking movements (*Clock I*, *III*, and *V*) require a complete independence in feeling between the hands which must be coordinated together, and felt in context of each other. The chiming movements (*Clock II* and *IV*) tend to have more "expressive" concerns, such as the creative use of the *sostenuto* pedal or relating the tempi of long *rallentandos* from the beginning to the end.

In *Clock I*, the primary challenge is remembering and programming the body to play automatically, with minimal thinking. If one starts from the outset knowing that this piece will require memory, whether the score is used or not, will help accurately depict the most effective approach to mastering this timepiece. Although, Birtwistle indicates staccato for the sixteenth notes, the reality is more similar to non-legato.

Hearing each note individually against the others is useful, but the key to achieving effortlessness is to hear the larger groupings. These grouped motions in *Clock I* should be internalized, getting a clear understanding of how the two cycles feel against each other. The 8th-notes mechanisms should be practiced with the 16th-notes at first, but placing no emphasis on the eighth notes, using the sixteenth notes as the mental line to follow. After this becomes comfortable, switch to prioritizing the eighth note relationships, especially in respect to feeling the rhythm between the hands. When playing the eighth and sixteenth notes together, very briefly lift the hand and drop into the two notes for a better sound, and for a more relaxed physical motion. This will program a more efficient hand and arm in tempo. At a faster tempo, the eighth note rhythms will prove to feel the most dominant, especially if the sixteenth notes have been prepared in larger groupings.

The challenging part of *Clock III* is finding the feeling of the groove. This is the only movement where Birtwistle gives a range of tempo (eighth = 120-132 bpm), however he stated in an interview with Micahel Hall that it should be played "as fast as possible".[51]There are pointalstic triplet and duplet mechanisms throughout this timepiece. They are often contrasted with each other between the hands. At the extreme tempo required, internalizing all aspects of 2:3 and 3:4 polyrhythms is necessary for confidence. Writing a compound rhythm between the two hands is very useful in sections with irregular duplet and triplet relationships. As one practices the objects, it is important to be able to direct one's attention from mechanism to mechanism at will. Some contexts are easier to feel than others, but the most important ones are those which have complex pulse relationships. Feeling these multiple perspectives of pulse is important to feeling a sense of control.

In a rhythmically dense work such as *Clock III*, a practice method, outlined in Brian Ferneyhough's works, is especially helpful in this context. The first step is to find and to practice the general gestures of work. After this is comfortable, break the work down again, focusing this time on obtaining precise rhythm. Finally, combine the gestural feeling with the rhythmic precision.[52]

Because so much of Birtwistle's music is made of short notes, connecting pitches is helpful to hear and perceive the whole shape of the mechanism in a focused way. Legato playing is especially helpful in these angular places. Once the performer is comfortable with and can clearly hear these connections, the staccatos and rests should be implemented.

When practicing sections with grace notes, it is best to practice the grace note figures hands alone. If a grace-note run is after the primary note, such as in *Clock III*,

[51] Hall, *Harrison Birtwistle in Recent Years*, 148.
[52] Ferneyhough, Brain. *Lemma-Icon-Epigram* (London: Boosey & Hawkes, 1981), ii.

m. 131, practice the primary note in relation to the other part without the grace notes. When the start of these attacks between the hands are comfortably felt, add the grace notes. If the grace notes are part of leap, similar to *Clock V*, m. 140, play the grace-note simultaneously with the primary note as dyad for a clear understanding of the rhythmic structure.

Clock V feels like a *perpetuum-mobile* toccata of the early twentieth century, recalling Ravel's *Toccata* from *Tombeau d'Couperin* or Prokofiev's *Toccata in D minor*, Op. 11. The constant alternation of hands leads to interesting difficulties. Having only a mechanical, physical understanding of this timepiece tends to lead to confusion in terms of hand order, especially in the second half, where the strong beats switch to the right hand, but the weight of the left hand can make the sensation feel reversed. Because of this, it is important to balance the left hand according to the register of the right hand to avoid confusing the beat.

Both hands in *Clock V* have a contrasting, symmetrical set of six notes – totaling the complete chromatic aggregate. Each hand has a distinct flavor of pitchfield and musical object at any given time. The sensation is similar to polytonal music, each hand by itself even seems to infer a kind of modality. One must be able to hear each hand individually when playing them together.

These ticking timepieces, although very strikingly different on the surface, all have a similar approach to their preparation. Their precarious tempi require that the performer learns to hear the music clearly in their mind before attempting a performance. This will ensure security and enable confidence in these particular movements.

Moving on, both "chiming" timepieces (*II* and *IV*) have more particularly detailed problems around rehearsing tempo relationships and the use of pedaling.

There are many sections which have non-intuitive solutions, or where particular tempo or pedal markings are misleading in achieving Birtwistle's desired effect.

Practicing the long *rallentandos* should be done in two stages (found in *Clock II* and *IV*). It is helpful in the first stage to practice the section in question at the beginning and ending tempi independently. This assures a proportional understanding of the underlying pulsation in both tempi. Once the feeling for these independent tempi is felt, one should connect them together, even setting particular moments of specific tempo in between the two points. Imagining a continuously slowing pulse is an effective method to obtain consistent pacing.

Metric modulation, a term coined by Elliott Carter, is useful in establishing precise tempo changes. Birtwistle alludes to many of these relationships in the score, but often does not indicate them with a metric modulation, instead favoring an altogether new metronome mark. For example, the shifting of tempo from quarter = 90 bpm to quarter = 120 bpm in *Clock IV* is indicative of a metric modulation. The ratio of 3:4 indicates that the sixteenth notes in quarter = 90 bpm are equal to the triplets of quarter = 120 bpm. Practicing this relationship will consistently arrive at the original tempo. Applying this method will enable precise tempo relationships, even if Birtwistle did not explicitly write them in himself.

Of the two metric modulations, however, written in *Harrison's Clocks,* the first in *Clock II* is incorrectly written (see fig. 2.10). The written tempo contradicts the metric modulation. The metric modulation is correct, but the metronome marking is incorrect. The tempo should be dotted eighth = 180 bpm, not 160 bpm. The sixteenth notes of the prior measure are equal to three thirty-seconds notes of the next measure. Thinking in thirty-second triplet notes during the sixteenth notes in the prior measure will help modulate the tempo properly. Further evidence of this would be that the

mechanisms in the left hand should remain at the same tempo as before the metric modulation. The metric modulation is the only way to achieve this.

For an accurate rhythmic representation of the ritornello (see fig. 1.3), think of the quintuplet happening in the space of a quarter note. The first two notes of the septuplet can function psychologically as upbeats, coordinating on the "beat" where Ab and D align. The last note of the septuplet must end before the third note of the quintuplet. These are two gears turning against each other – two mechanisms in motion. The sixteenth rest in the second measure is the same duration as a quarter at quarter = 180 bpm with the metric modulation. A sixteenth note at quarter = 45 bpm is equal to a quarter at quarter = 180 bpm. To determine a precise timing, think in four beats: the first as enveloping the upbeat, the second as the quintuplet, the third as a rest, and the fourth as the low punctuation. The switch from quarter = 180 bpm to 45 bpm is more psychological than practical in this regard.

The sostenuto pedal is regularly notated in *Harrison's Clocks*. He only rarely recommends the damper pedal – there are only two occasions. He notates it in the opening sweeping gesture with its similar variants and with the punctuated low note to broaden the sound. The second occasion he writes *col Ped.* in m. 217 of *Clock V* which lasts until the *senza Ped.* in m. 233.

Aside from these events, the *sostenuto* pedal would be his pedal of choice. His hocket-like conceptions need to be clearly articulated to bring out the rhythmic relationships amongst layers of sound. Because of this, the indiscriminate use of the damper pedal leads to an indistinct texture. Using the damper pedal for punctuations or very lightly is largely the most effective way to use it. There are many opportunities for the sostenuto pedal which should be considered instead.

Birtwistle uses the *laissez vibrer* (*l.v.*) indication often with an open-ended slur. He does not indicate pedaling for these. Using a half or quarter pedal to keep the sound ringing, but keeping a semblance of clarity or interpreting it as indication of *sostenuto* to keep the vibrations of the particular note(s) is also an effective strategy.

Sostenuto pedaling requires forethought about how the pianist will catch the required pitches. Many places will only have a brief moment to catch the notes (such as the end of *Clock IV*). Of equal importance, is determining the best moment to release the sostenuto pedal. If left for too long, especially in multiple instances of *Clock I* or *III*, the attacks after the *sostenuto* will start to be picked up by the sympathetic resonance. The resulting resonance will eventually be louder than the current amplitude of the held sostenuto pedal note and should be lifted before this point.

In *Clock II*, there are several opportunities to use the sostenuto pedal where it is not directly indicated which creates clarity in Birtwistle's textures. From mm. 27-34, it is possible to keep the D's and E's ringing for their precise duration. Finger pedal is required initially before the sostenuto pedal can take over. A more intricate species of sostenuto pedaling can be utilized in m. 36. Because the D's and E's have the open slur indicating *l.v.*, one might assume that the total duration of their ringing is undefined. Instead of having a thicker pedaling which would obscure the texture or letting them fade prematurely, it is possible to use sostenuto pedal for textural clarity. There are two approaches. The first, would be to use the sostenuto after each of these notes are struck. Since these notes are treated like hockets, they are always struck alone, allowing enough time to grab them with the *sostenuto*. The more interesting option, although more difficult, is to silently depress the D before (or after) striking the E in m. 36 allowing both notes to ring throughout (see fig. 2.9).

The execution and the secure performance of *Harrison's Clocks* will test the performer to their utmost ability. A deep examination of the pianistic fundamentals, the learning process, and the uniqueness of the experience make this a work which has few analogies. The constant renewal of the mechanisms along with the simultaneous juxtaposition of other objects creates a state which is both focused on repetition and development. Physiologically and psychologically, *Harrison's Clocks* insists on a re-evaluation of the self, that the performer forgoes a sense of the "hero's journey", instead favoring the journey of the moment. John Harrison's chronometers revolutionized the way time was measured relative to space. His precise mechanisms gave light on how we experience and understand the world. In the same way, Birtwistle's *Harrison's Clocks* focuses on precise relationships underlying the perception of time, space, and the present moment. This is music which experiences itself.

CHAPTER 5

CONCLUSION

Harrison's Clocks is one of the most effective works of Sir Harrison Birtwistle's many achievements, showing his imaginative and dramatic approach to building pieces out of the simplest materials. Context and repetition are at the core of Birtwistle's ideas and manifest as changes in both perspective and perception. Birtwistle creates his forms by altering the context of his musical ideas through combining two aspects of repetition together – that of cycling oscillation and of periodic chiming.

Going into this project, I was under the impression that most of the material in this work acted as separate ideas. As I began to distill the essence of this complex work, it became apparent that the underlying ideas were in fact very simple. Only deep into the project did I begin to understand how compact, interconnected, and unified these timepieces were across the whole of *Harrison's Clocks*. This approach to interconnectedness, I realized, had its origin with Klee's abstraction of the processes found in nature derived from his pursuit of discovering the essence of the material with which he was working. Birtwistle continued this by emulating this abstraction of nature through mechanical means by creating musical processes which created organic and varied musical objects.

It became apparent to me that in each musical object, the specifics of pitch seemed less important than the range of pitches that were possible. With this in mind, as well as the knowledge of Birtwistle's preoccupation with random numbers, I realized that more often than not, the decisions of the smallest components in each object were determined seemingly at random, but within a range. Realizing that these components could be abstracted, I found that what I once thought were an extensive

range of unrelated musical ideas, were in fact a wide range of manifestations of only a few processes. This led me to recognize that each timepiece in *Harrison's Clocks* had only two or three underlying core mechanisms, with the exception being *Clock III* with six. These mechanisms produce widely different varieties of music, but at the core the music is fixed to an underlying principle.

Furthermore, the realization that this piece not only locally, but formally is about repetition, and how through this repetition one can see a new perspective of a single musical object was striking. Repetition through context changes our perception of the ideas in *Harrison's Clocks*. Birtwistle treats musical time as a canvas and seeks to control time and how we perceive it formally through the juxtaposition and superimposition of the processes and musical objects found in *Harrison's Clocks*. The music is constantly changing through its repetition, formulating new details and presenting itself in a continuously changing perspective. By avoiding preconceived forms and allowing the material to develop in a state of constant exposition, Birtwistle investigates formality and how we experience events in time through layers of repetition. This journey through the music can be perceived on multiple levels and rewards repeated listenings.

Harrison's Clocks is a unique entry in the piano repertoire. It is a significant work that deserves further investigation from performers who are up for the challenge. Although the preparation of this work should not be underestimated, the reward of embarking on this journey is a worthy pursuit. Engaging with the ideas of such an exceptional individual composer and performing a work of this magnitude, one cannot help but be transformed and to develop a thoroughly altered perception of both music and the cultural world.

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APPENDIX A

PERMISSION TO REPRODUCE EXTRACTS FROM HARRISON'S CLOCKS