Focussing the musical imagination: exploring in composition the ideas and techniques of Joseph Schillinger

by

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Tables and illustrations

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Abstract

This thesis presents the author's musical compositions in the light of the theories of Joseph Schillinger. There are two main subdivisions of the thesis:

1) The initial concept and aesthetic background to my work.

2) The role of Schillinger's theories in the technical development of the music.

In the introduction I discuss the original aim of my research and describe how it has changed and developed. In Chapter 1, I introduce the work of Joseph Schillinger and discuss in general terms its significance to the field of musical composition. In Chapter 2, I present a brief outline of his most important work. Chapter 3 is a detailed technical discussion in which I describe Schillinger's theories and illuminate those ideas which are most significant to my work. Chapter 4 is an introduction to my own compositions, describing how the aesthetic and technical ideas underlying the works will be analysed in relation to Schillinger's theory. The compositions are presented in an order which describes the evolution of my thought as a composer starting with work completed before my discovery of Schillinger's theory and ending with my most recent compositions.

The pieces and chapters are as follows: Chapter 5, *Moon Shaman* for bass clarinet and tape; Chapter 6, *Riddle,* for contralto and tape; Chapter 7, *Vision and prayer,* for violin, cello, bass clarinet and marimba; Chapter 8, *Rêve de l'Orb,* for flute, clarinet in A, harp and string quartet; Chapter 9, *Bayo's way,* for tuba with live electronics and brass ensemble; Chapter 10, *Make Night Day,* for violin, bass clarinet and tape and Chapter 11, *Trilogy,* for orchestra. Chapter 12 is a conclusion to the thesis.

Introduction

Original aims

This thesis represents the history of my efforts to solve (as every composer must do) some of the fundamental problems of musical composition. I wanted to explore the relationship between imagination and intellect in the process of composition. My immediate experience of musical imagination has always been in the form of spontaneous internal sound impressions, often stimulated by visual images, narrative and poetry. The aim of my research was to develop a rational method of crafting into coherent structures the spontaneous conceptions of my imagination. I wanted to embrace into a single working process, two different forms of musical activity which might be called the 'spontaneous imaginative', and the 'deliberate intellectual'. I believed that the assertion of intellectual control over the products of my musical imagination would allow me to effectively explore an aesthetic vision.

History of the research

During the period of writing this thesis my ideas and methods of composing have changed and evolved quite dramatically. I initially decided to devise compositional strategies by analysing MIDI sequencer recordings of my keyboard improvisations. This seemed to offer the best chance of capturing my most spontaneous musical ideas. Having focused my imagination on a musically stimulating subject, I recorded, via a MIDI sequencer, numerous 'free' keyboard improvisations. My intention was to analyse significant patterns captured in the recorded data and develop strategies to create variants of these patterns thereby building larger structures and ultimately

complete compositions. This part of my research was to some extent successful. I collected some valuable material and I believe came to understand more about my musical predilections. I also developed some techniques which are described in detail in later chapters. However, it became clear that this method of working was limited. My efforts to analyse captured material did not reveal general principles of musical construction and development and so composing larger structures remained a matter of trial and error, fitting bits of material together in an ad hoc manner and improvising my way from one point to the next.

In 1993 I discovered the work of Joseph Schillinger, in particular, *The Schillinger System Of Musical Composition* (Schillinger 1978) which is described in detail in later chapters. This system uses numbers and methods which it is claimed are derived from basic scientific and mathematical procedures to describe general principles of musical construction. Schillinger offers practical solutions to a great number of compositional problems, in particular the co-ordination of independent musical events within a score and the generation of large structures. I began to apply his methods to develop my musical material (with, to my mind, satisfactory results) and in absorbing and adapting his techniques I feel I have achieved the basic aim of my research (see section 1. of this introduction).
In studying Schillinger's extensive work I have naturally become fascinated and involved with his ideas and their significance to composers in general. While I do not intend this thesis to be primarily a justification of Schillinger's theories, it is necessary to present some explanations and clarification of his techniques in order to explain my own work. Chapter 2 is a summary of *The Schillinger System Of Musical Composition*, (Schillinger 1978) and attempts to describe, in very broad strokes, the nature of his ideas; the reader will soon understand the essence of Schillinger's theories and I shall attempt to indicate where (for my purposes) he succeeds and where he fails. Chapter 3 is a detailed exposition of specific Schillinger techniques which I have personally found to be significant and useful in my own work. Although a proportion of my compositions presented here were written before I had encountered Schillinger's work, his ideas are often relevant to the analytical discussions of the pieces and I partially revised one of them using his methods.

Chapter 1 Joseph Schillinger

1.1 Introduction

Joseph Schillinger was a Russian-born composer and teacher, active in New York in the 1930s. Today his name is largely forgotten and his books are not widely read. The unprecedented migration of European knowledge and culture that swept from East to West during the first decades of the 20thCentury included Figures such as Prokofiev and Rachmaninov, great composers who were the product of the renowned Russian system of music education which was geared towards creating truly professional musicians, Schillinger came from this background, having been a student of the St Petersburg Imperial Conservatory of Music, where he won the gold medal for composition in 1918 (Schillinger 1976 page 155). On his defection from the Soviet Union in 1928 he visited Berlin, and since he was a member of the *Genossenschaft Deutscher Tonsetzer,* in honour of his visit, the State Radio of Berlin broadcast a programme of his music (Schillinger 1976 page 170).

However, unlike his more famous contemporaries[1] Schillinger was a natural teacher and communicated his musical knowledge in the form of a precise written theory. He attempted to use mathematical expressions to describe art, architecture, design (Schillinger 1948) and most insistently, and with most detail and success, music. Furthermore he tried to apply the same general ideas to all the arts, so the mathematics for one would apply to all. His work not only described the theory of music in a new way, it also predicted certain developments, for example, in the field of electronic music and encompassed all styles of music most notably American Jazz[2]. In New

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[1]For an account of Prokofiev's inability to pass on his musical knowledge see, Duke, V. (1947). Gershwin, Schillinger and Dukelsky. *Musical Quarterly* 75: 119-24 .

[2]In the field of electronic music, Schillinger collaborated with Leon Theremin, the inventor of an early electronic musical instrument, the Theremin.

York, Schillinger flourished, becoming famous as the advisor to many of America's leading jazz musicians and concert music composers. These number, *inter alia*, Gershwin, Benny Goodman, Glen Miller, Nathan Laval, Oscar Levant, Tommy Dorsey, Henry Cowell, John Cage and Earl Brown (Schillinger 1978. page XII). Jazz was of particular interest to Schillinger because of its unusually active rhythmic structure and while still in Russia, he had founded the first Russian Jazz orchestra and had applied his theories to explaining the basis of swing music. Indeed it was his public pronouncements in a lecture given in the State Academic Choir Hall in Moscow in 1929 entitled 'The Jazz band and music of the future' (Schillinger 1976 page. 167) that was the cause of his having to flee the Soviet Union.

It is reported (Duke 1947) that those students who knew Schillinger found him an inspiring teacher. Gershwin spent four years studying with Schillinger (Duke1947). During this period he composed Porgy and Bess and consulted Schillinger on matters concerning the opera, particularly its orchestration. At the same time another Schillinger student, Glenn Miller, famously composed the hit 'Moonlight Serenade' as an exercise for his teacher (Schillinger 1976). John Cage visited Schillinger in 1943 and was apparently greatly impressed by his ideas on rhythm (Schillinger 1976 page 198).

A small group of students were accredited by Schillinger as qualified teachers of the system and after his death, one of these, Lawrence Berk, founded a music school in Boston to continue the dissemination of the system. Schillinger House, was opened in 1945 and later became the Berklee College of Music where the system was taught until the 1960's (Hazell 1995). The system as it is published today was in fact born out of a series of correspondence courses. These were only fully developed towards the end of Schillinger's life and so the one-to-one tuition he offered must have been important to the communication of his ideas. Those students who never met him wrote to him with their questions and he apparently spent much time on lengthy replies (Schillinger 1976). Schillinger's skill as a teacher rather than a writer might partly explain why his work faded into obscurity after his death. In 1966 an attempt was made to revive his work. Charles Colin, and Arnold Shaw (one of the original editors of *The Schillinger System of Musical Composition*) produced '*The Encyclopaedia Of Rhythm*' (Colin 1976) in which was realised in musical notation a complete table of the most important rhythmic structures developed from Schillinger's theory. There are some hundreds of examples worked out for

piano, which the student composer was supposed to transfer directly to his own work. This, in my view, did Schillinger a great disservice since it suggested a mechanical approach to composition and (more importantly) was of no practical use since the master patterns alone cannot be used effectively without an understanding of the complete system. The production of an 'Encyclopaedia' of this sort suggests that Schillinger's writings had already proven indigestible to the would-be student.
It has been suggested that envy played a part in Schillinger's neglect by the establishment (Schillinger 1976 page 201). As a result of his postal tuition courses he became very rich and at one time rented a twelve room apartment on Fifth Avenue. It would seem plausible that his celebrity status made him unpopular with the traditional music establishment and that his ideas would be treated with greater scepticism than they deserved (Schillinger 1976. page 126).

In 1993 I came across his work in the Westminster Music Library, two large volumes entitled '*The Schillinger System Of Musical Composition'* (Schillinger 1978). I began to read the first volume and was immediately struck by an abundance of mathematical formulae: being largely ignorant of mathematics I almost decided to not to continue but in the end curiosity got the better of me and I took them home and began to read. Schillinger, I found, believed that science was the answer to all things and that, just as in the realm of physics and engineering, all human endeavours could be better understood and improved through the application of rational scientific thought. Music was no exception and if its various components and their behaviour could be described, then methods could be devised for its synthesis. Although Schillinger's work is forward looking, being couched in an apparently modern 'scientific' form, it is also intended to clarify traditional music theory by debunking misconceptions from the past. Schillinger, it would seem, was never really celebrated for his own music or for a particular stylistic innovation made possible by his system. On the contrary he was clear that his work was meant to allow any style of composition to be undertaken more effectively (Schillinger 1976 page 126).

> My system does not circumscribe the composer's freedom, but merely points out the methodological way to arrive at a decision. Any decision which results in a harmonic relation is fully acceptable. We are opposed only to vagueness and haphazard speculation. (Schillinger 1978 Page 1356)

Schillinger believed that music theory had become mired in tradition and, in particular, in the 19th Century attraction towards the cult of the inspired genius. Music education, he believed, was largely based on individual stylistic observations (such as the tendency of the leading note to ascend or the 'dominant seventh', to resolve) which were only true in certain cases and not in others. By revealing the underlying principles of the organisation of sound through scientific analyses he hoped to free the composer from the shackles of tradition.

The Schillinger system begins with the *Theory Of Rhythm* based on the premise that time is the fundamental dimension in music. To me this was terribly exciting as it confirmed various half-thought-out ideas of my own. I soon found that by using the techniques described by Schillinger, I could create rhythmic structures and phrases of sophistication and balance and that the most simple material could be made to yield all manner of variations. In the area of pitch scales, techniques for modal modulation and redistributing the pitches and intervals of scales, triggered personal insights into the workings of music such as Jazz improvisation which had always fascinated me. The most significant advantage in adopting Schillinger's ideas was the ability to think and work in large segments of time and to view an entire piece as being the organic development of the smallest part.

However, I began to question Schillinger's judgement when in *The Theory Of Rhythm,* (Schillinger 1978, page 21) he introduced a technique for constructing pairs of phrases with the comment that 'These procedures were performed crudely by even well-reputed composers. For example L. van Beethoven.....' Later, in *The Theory Of Melody* (Schillinger 1978 page 250) Beethoven is again taken to task over the 'flawed' construction of the opening melody of his Pathétique Sonata. In '*The variation of music by means of geometrical projection'* (Schillinger 1978 page 193) Schillinger gives us his own version of J.S. Bach's Two Part Invention No. 8, in the belief that Bach had not fully explored his own material. Elsewhere, Schillinger refers to Mussorgsky, Borodin and Wagner as if they were to be pitied for their inadequate knowledge of harmony and it is implied that they would have faired better had they had the advantage of the Schillinger *System*. These extraordinary claims inevitably make the reader wonder if any part of the *System* has validity, and one suspects that many of Schillinger's readers simply abandoned the study of his work at this point. There is no getting

away from his excesses: they were not simply of vanity and an uncritical conviction in his Theory.

Schillinger's belief in the power of science and mathematics makes much of his work complex for the mathematically illiterate but it would seem that Schillinger was no mathematician himself.[3] He consistently misuses mathematical terms and notation often with highly misleading results (see Chapter 2 section 2.2) and it seems probable that many readers attracted to his work because of their own understanding of mathematics were quickly put off by his dreadful confusions. Schillinger was obviously very keen to be thought of as a scientist and it would seem that for a musician he had a fairly active knowledge of scientific development at the time. He was clearly fascinated by the work of Albert Einstein and it may have been misplaced admiration or a desire to make his own ideas seem more impressive that lead him to call the parts of his system which deal with harmony '*The Special Theory Of Harmony*' and the '*General Theory Of Harmony*'.

In relating these eccentricities it is easy to make Schillinger sound like a fraudulent charlatan and obscure the true value of his work. To redress the balance it is worth mentioning the following anecdote, recounted in Schillinger's biography (Schillinger 1976). Schillinger was a personal friend of Shostakovitch, who, clearly fond of his old school fellow, prepared a doctored photograph which he sent to Schillinger in New York. It showed Schillinger sitting on a mossy bank arm in arm with Ludwig van Beethoven, (Schillinger 1976. page 117), the implication of this delightful joke being that Schillinger was there at the moment of inspiration for the Pastoral symphony and had also been of some influence on its composition. Clearly Schillinger was liked and admired by eminent musicians such as Shostakovich who tolerated his lack of moderation with humour. In my opinion it would be a mistake to consider Schillinger merely as a numerological crank, who temporarily succeeded by hoodwinking the ignorant and credulous. His pupils in America included some of the most distinguished Jazz musicians of the century and one wonders how eminent musicians such as George Gershwin and Benny Goodman maintained any interest in his highly

[3] For a highly critical account of Schillinger's theories see Backus. (1961). Re: pseudo science in music. JMT.

technical numerical theories, unless they were of immediate practical use. It is my belief that Schillinger's work has much to offer the contemporary composer and deserves to be revived. Many of the concepts contained in the system have already penetrated modern compositional practise[4] and it has been of incalculable benefit to many of the works presented in this thesis. The numerous techniques described by Schillinger in the field of rhythm offer a unique and attractive approach to the student of composition and to some extent compensate for what I perceive to be an imbalance in composition literature which is still largely dominated by considerations of pitch. As a by-product of discussing my work I hope to show that Schillinger's techniques are like tools which must be used imaginatively. They do not by themselves compose music - a charge later levelled against Schillinger - but they merely assist the composer to realise his or her vision through facilitating the planning and execution of large musical structures.

[4] For example Elliot Carter's numerical chord charts (Schiff 1985 pg 324) or Allen Forte's work on 'pitch class sets' (Forte, 1973)

Chapter 2 Summary of the *Schillinger system*

2.1 Overview

The Schillinger System Of Musical Composition (Schillinger 1978) is an ambitious attempt to provide a complete theory of musical composition. The entire work is contained in two volumes and totals 1640 pages of text. It is divided into twelve sections (which Schillinger refers to as 'branches') each of which occupies a separate 'Book'. In order to communicate the essence of Schillinger's work I will briefly summarise the contents of each Book. However, I can do no more than describe some of the most significant themes which refer to the present submission and must omit many interesting details. The twelve books grouped as two volumes are as follows:

Book I: Theory Of Rhythm.
Book II: Theory Of Pitch Scales.
Book III: Variations Of Music By Means Of Geometrical Projection.
Book IV: Theory Of Melody.
Book V: Special Theory Of Harmony.
Book VI: The correlation Of Harmony and Melody.
Book VII: Theory Of Counterpoint.

Book VIII: Instrumental Forms.
Book IX: General Theory Of Harmony.
Book X: Evolution Of Pitch Families (Style).
Book XI: Theory Of Composition.
Book XII: Theory Of Orchestration.

2.2 Book I: *The Theory Of Rhythm*

2.2.1 Pulse *interference*

The Theory Of Rhythm is the foundation of Schillinger's work. Its techniques are consistently applied in all areas of his writings on music. Schillinger believes that time (and therefore rhythm) is the fundamental dimension of music. *The Theory Of Rhythm* is based on the very simple idea that rhythm occurs when two or more separate sources of pulse are combined. It is assumed that the two sources of pulse begin at exactly the same moment but that their frequencies are different. Schillinger refers to this process as

'interference'[5]. He uses numbers and graphs to represent and calculate rhythmic patterns generated by pulse 'interference'. The numbers represent durations between pulses and do not tell us anything about their final musical presentation. For example, the number 2, might represent a note held for two beats but could equally represent a staccato attack for one beat followed by a beat of silence. In the following diagram two different pulses are superimposed. Each column represents a unit of time. Pulse A recurs every 3 units of time and pulse B recurs every 1 unit of time, (A=3, B=1). The pulses are represented by down arrows. The double arrows show the effect of two pulses combining to create a specially strong pulse.

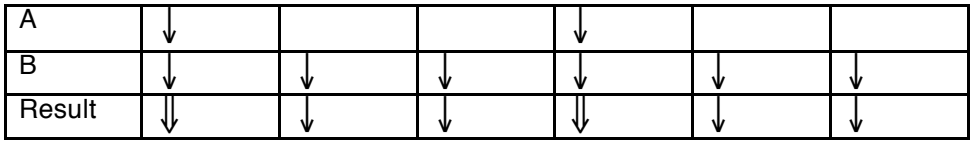


Figure 2.1 The 'interference' of two pulses.

The strong pulse can be interpreted as a down beat or bar line and in this way Schillinger explains the phenomenon of metre. Meter only occurs when A is an integer multiple of B, i.e. A/B = n where n can take the value of 2,3,4,.... etc.

In Figure 2.2, the pulse B does not occur in every time interval. The periods are characterised by the number of time units between each pulse, as shown in the left hand column. If the period of B ≠ 1 and the relationship between the periods of A and B is such that there is no common divisor other than 1 (for example, 3:2, 4:3, 5:2...), a complex rhythm results.

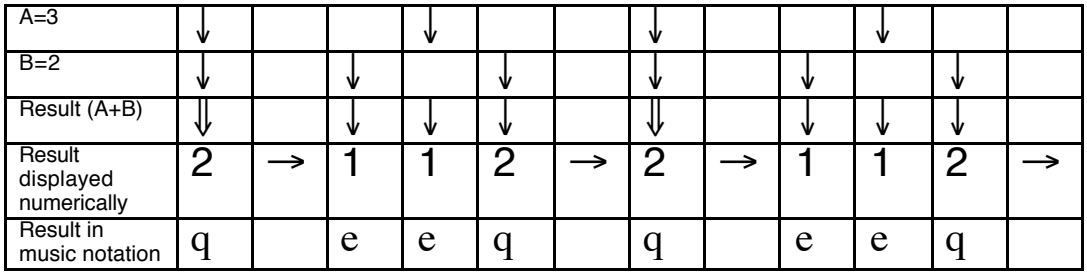


Figure 2. 2 Pulse 'interference' producing rhythm.

[5]This is an example of how Schillinger's terminology may be confusing. Interference actually occurrs between wave forms and cannot be simply applied to pulses.

In Figure 2.2, two complete cycles of 'interference' are shown. Pulse A recurs every 3 units of time and pulse B recurs every 2 units of time (A=3, B=2). The third row shows the result of 'interference', that is, the combination of the first and second rows. In this example the moments when A and B combine are not shown in bold in the result row (A+B) since the resultant rhythm can be *barred* in several different ways as will be explained in chapter 3.
All rhythms generated by this method are repetitive. Each complete cycle is symmetrical around its centre (2,1,↔1,2). Schillinger suggests that symmetrical rhythms have important musical qualities: *economy*, since one half generates the other, *balance* due to the mirror symmetry and a quality Schillinger refers to as *contrast,* the difference between successive numbers. In Figure 2.2, the contrast between the numbers is 2-1=1. The greater the difference between numbers the greater the contrast.

2.2.2 *Instrumental Forms*

Although presented exclusively in terms of rhythm, this technique touches on the field of orchestration, being intended to control the entry of different instrumental groups. The procedure involves the co-ordination of the following components: rhythms, attack groups, places of attack, and metre. The different components of this technique are described in more detail as follows. 'Attack groups' consist of a predetermined number of attacks. Attacks have no duration and only represent a potential event. Attack groups are distributed through the 'places of attack'. 'Place of attack' refers to the source of a sound such as an instrument. For example, two drums represent two different places of attack. However, places of attack can also be different parts within a score or the pitches of a scale.[6]
For example, an attack group pattern of 3,2,3 means that in successive *places* there will be a group of three attacks (group A), followed by a group of two attacks (group B), followed by a group of three attacks (group C). In the following example each of the three groups occupy a different place of attack.

[6]It follows that a place of attack could be represented by timbre or even location in stereo space.

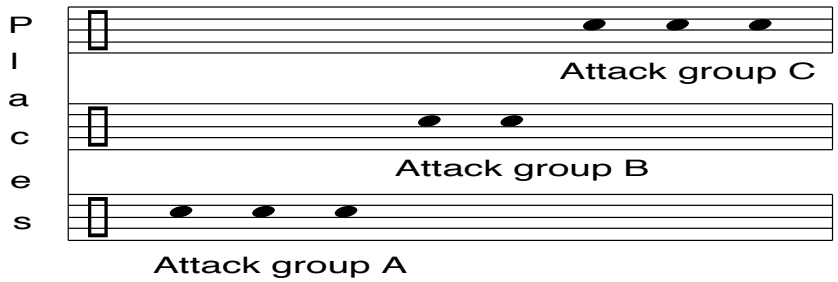


Figure 2.3 Attack groups distributed through places of attack.

The next step is to superimpose a rhythm of durations on the attack group pattern. In Figure 2.4, there are three places of attack (parts). The attack group pattern is (1,3), that is, one attack followed by three attacks. This pattern is distributed through the places of attack but in addition the rhythm of durations 4:3, (312213) is superimposed. The rhythm 4:3, is shown above each part in small type and the attack groups are labelled with bold type below the parts. Short solid lines show how the attack groups are distributed through the places of attack.

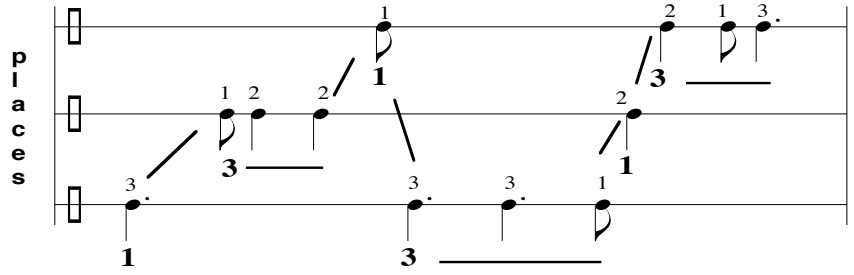


Figure 2.4. Rhythm superimposed on attack groups and places of attack

The final step is to introduce metre, and in Figure 2.5, the above example is now shown barred in 3/4, a metre.

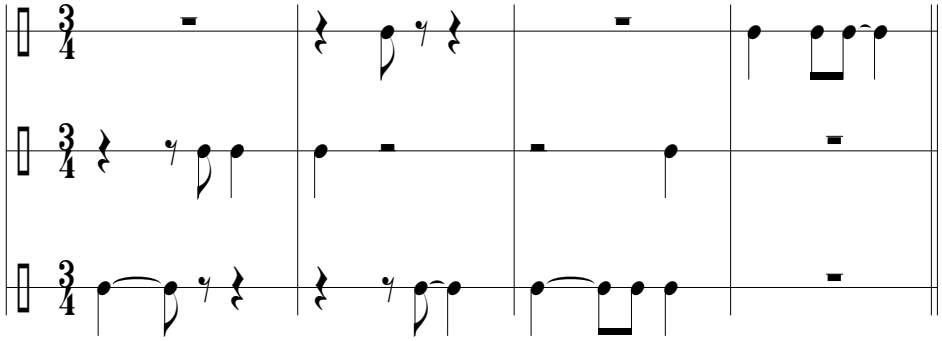


Figure 2.5. Metre applied to Figure 2.4.

2.2.3 The determinant or master time signature

Schillinger develops a number of powerful techniques based on a function he calls 'The Determinant'. The determinant is simply the numerator of the time signature or the number of beats in the bar. From now on I will refer to the 'determinant' as the master time signature. Schillinger states that the master time signature represents the rhythmic style of an entire piece[7] or even the rhythmic origin of a national style (Schillinger 1978 page 72). In addition the master time signature is at the centre of a several important techniques (described in more detail in chapter 3) which generate rhythmic structures.

1)The master time signature can be divided into sub-groups in order to evolve a set of related rhythmic patterns. This method is described in detail in Chapter 3. Each pattern created by this method fills one bar. For example, if the master time signature = 4 a typical sub-group would be 3+1. The following diagram shows this realised in music notation.

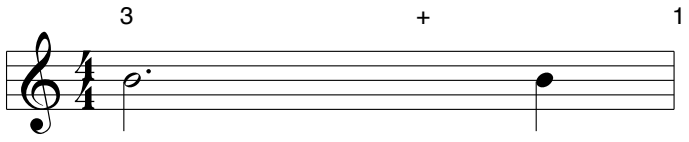


Figure 2.6. Sub-group of the master time signature

[7]I refer the reader to Chapter 11, (section 11.6.2), which is a discussion of my orchestral composition, *Trilogy,* in which all rhythms originate from the master time signature 7.

2) The master time signature not only determines the number of beats in a bar but also the number of bars in a more complex structure which I refer to as a *bar group.* This simple rule ensures that the number of *beats in the whole bar group* will always be a number that can be generated by squaring the master time signature. For example, 4 bars of 4/4 will have a duration of 16 crotchet beats.

3) Patterns created by method 1) can be extended by a squaring formula (described in detail in chapter 3) to fill the entire bar group. This technique lies at the heart of the system because by this method a pattern contained in one bar can directly exert its influence over a much larger duration or number of bars.

Schillinger develops a further technique in which patterns generated through the interference of pulses (see section 2.2.) can be combined with the structures created by the master time signature which I have just described. In this way the products of the various techniques described in *The Theory Of Rhythm* are co-ordinated into a single complex and sophisticated structure. In Chapter 3, these techniques and their practical applications are described in more detail.

2.2.4 Rotation and re-ordering

Schillinger's primary technique of creating variation is by the re-ordering of elements of a group whether they be those of a rhythm, a scale or the sections of a composition. Two methods are presented and referred to as 'general permutation' and 'circular permutation'. 'General permutation' reveals all possible combinations of the elements of a group. However, Schillinger only tells us how to calculate the total number of combinations (factorial n, or n! where n= the number of different elements in group) and does not provide a method for deriving the various combinations. For example, a group with four different elements (A,B,C,D) has 24, variations (4!=1×2×3×4=24): (A,B,C,D) (A,C,D,B) (A,D,B,C) (A,C,B,D) (A,D,C,B) (B,C,D,A) etc. It can be seen that this process involves the rotation of three of the four elements until all possible combinations have been exhausted. Rotation of the elements in a group is, therefore, the principle method by which variations are produced. Confusingly, Schillinger presents rotation as a second, alternative method of producing variants which he refers to as 'circular permutation'. The only difference between the two types of rotation is

that the rotation of *all* the elements of a group ('circular permutation') produces a more limited number of combinations than 'general permutation', in which one element remains stationary while the others rotate. Schillinger first illustrates 'circular permutation' with two elements.

(A,B) →(B,A).

The variant is the retrograde of the original. With three or more elements the direction of permutation (clockwise or counter clockwise) becomes important.

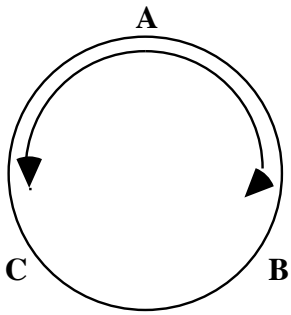


Figure 2.7. Circular permutation (rotation) of three elements.

In a clockwise direction, rotation produces the following variants:
ABC, BCA, CAB.
In a counter clockwise direction, rotation produces the following variants:
ACB, CBA, BAC
The method of rotation described may appear simple but it is an excellent way of revealing the potential of a musical idea.

2.2.5 Growth series

Number series which are characterised by growth, such as the harmonic series (1,2,3,4,5.....) the Fibonacci series (1,2,3,5,8,13...) and other forms of summation series are introduced as methods of generating rhythms useful for controlling rallentando, accelerando and flow in general. Schillinger refers to these as 'rhythms of variable velocity' and they will be discussed in more detail in chapter 3, section 3.5.

2.3 Book II: *The Theory Of Pitch Scales*

2.3.1 System of selection

Schillinger begins by discussing 'primary' and 'secondary selective systems'. The 'primary selective system' is the method of defining which frequencies, out of all possible frequencies, are to be used for music; by convention this is now agreed to be the system of equal temperament. The 'secondary selective system' can be any method of arranging the pitch units of the equal temperament system into musical scales. Scales are defined by the intervals between pitch units and are represented numerically. The major scale for example, is represented as (2,2,1)(2)(2,2,1) where 1= a semi-tone. All scales ranging from one pitch unit ('Monotone') to twelve pitch units are acceptable and Schillinger provides an apparently complete list of scales containing 2,3 and 4, pitch units. He does not attempt to list scales with more than four pitch units partly through lack of space but also because four unit scales include tetrachords and therefore provide a convenient platform from which to launch a discussion of traditional diatonic scales.

Traditional music theory views a scale, such as C major, as having a single tonic. Schillinger identifies four types of scale: those with one tonic contained within the range of an octave, those with one tonic which exceed the range of an octave, those with more than one tonic contained within the range of an octave and finally those with more than one tonic which exceed the range of an octave. Such scales with multiple 'tonics' are referred to by Schillinger as 'symmetric scales'.

2.3.2 Application of rhythmic techniques to scales

Scales can be represented by number sequences and subjected to many of the rules governing rhythmic techniques offered in *The Theory Of Rhythm* (Schillinger 1978). Rhythms generated by the 'interference of pulses' (see section 2.2) provide excellent material for pitch scales.

The following example uses the rhythm produced by the interference of pulses 4:3 (3,1,2,2,1,3) to determine the intervals of a scale.

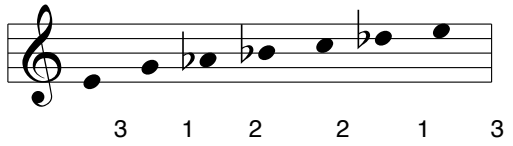


Figure 2.8. 'Interference' rhythm determines intervals of a scale.

Another method of generating pitch scales involves the technique of sub-dividing the master time signature (see section 2.2.3) to make a series of 'hybrid' scales. In the following example the octave (12) is sub-divided according to this method.

12→(7+5)→(5+2+5)→(2+3+2+3+2).

These number sequences are realised in music notation in the illustration below.

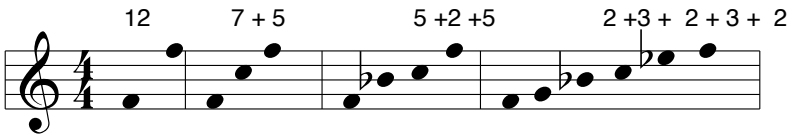


Figure 2.9. Scales derived from sub-groups of 12.

It can be seen that exactly the same techniques used earlier to generate rhythmic structures are also used to generate melodic structures.

A number of techniques are designed to reveal the melodic potential of a scale. These methods involve the re-ordering of the pitches or intervals of the original scale, a process based on rotation.

The following examples show just a very few of the possible variants generated by the re-ordering of pitches and intervals.

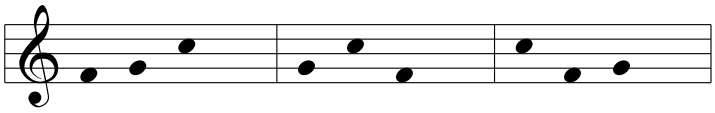


Figure 2.10. Re-ordering of pitches

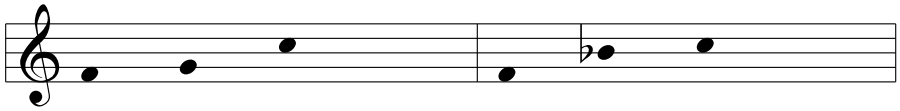


Figure 2.11. Re-ordering of intervals

The melodic variants of a scale, such as those in Figure 2.10 and 2.11, are referred to as 'melodic forms,' and can be joined in sequence to produce a 'melodic continuity'. It is suggested that the pattern of repetition of the variants is (see section 2.2) best determined using rhythmic patterns such as those presented in Book I.

2.3.3 The primary axis and modal modulation

Schillinger states that modulation requires a melody to have a clear 'Primary Axis' (P.A). The P.A. is a pitch which occurs more frequently and/or for a greater duration than any other pitch during a phrase of the melody. The P.A. may change over a relatively short period of time (a few bars). The P.A. is a *root tone* of a scale and defines the modal identity of the melody. For example, if the P.A. was the pitch D, and the key signature was C major, the melody would be rooted in the Dorian scale. This is only true in the *absence of harmonic accompaniment* which will override the P.A. of the melody as the root of a scale. Establishing the P.A. is essential to the success of the various techniques for modulating between different portions of melody and is central to Schillinger's '*Theory Of Melody'* which is fully developed in Book IV.

2.3.4 Scales constructed on symmetrically spaced 'tonics'

Schillinger shows how the octave can be divided into five symmetrical scales. Each scale has only one type of interval: a chromatic scale of semi-tones (1+1+1+1.....), a whole tone scale (2+2+2+2+2+2), a scale of minor thirds resembling a diminished seventh chord (3+3+3+3), a scale of major thirds resembling the augmented triad (4+4+4) and the tritone division of the octave (6+6). These scales are not used in the ordinary manner as a means of making melodic forms. Instead each pitch in the scale is treated as a root tone ('tonic') on which other scales are built. Schillinger suggests that polyphonic music based on symmetrically spaced tonics is the key to successful polytonal writing.

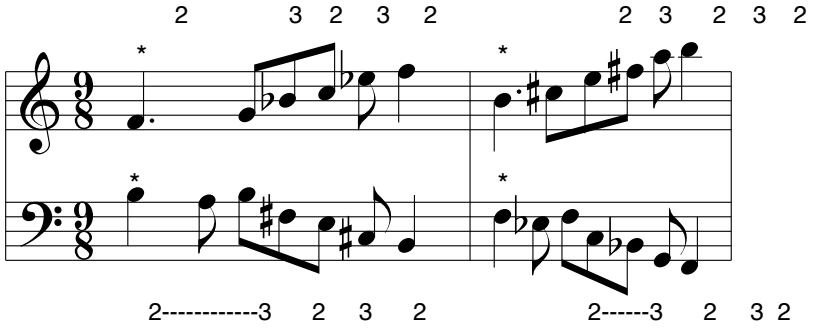


Figure 2.12. Two parts based on symmetrically spaced tonics.

In Figure 2.12, a single scale (2,3,2,3,2), is built on two 'tonics', separated by the interval of a tritone (6+6). Each tonic (B and F) is marked on the diagram by an asterisk.

2.3.5 Scale expansion and the harmonic potential of scales

Schillinger describes a method of re-ordering the pitches of a scale which results in an expansion of its range over more than one octave. The process of re-ordering involves stepping through the scale omitting adjacent pitch units. For example,

Original	C	D	E	F	G	A	B
First expansion	C	E	G	B	D	F	A

Figure 2.13. Scale expansion.

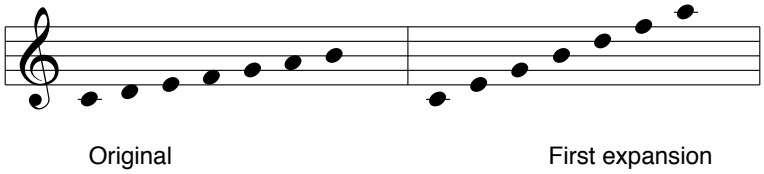


Figure 2.14. Scale expansion in music notation.

An exploration of scales naturally leads to a discussion of their harmonic potential. This is a preliminary discussion of harmony and in no way pre-empts those parts of the text which deal exclusively with that subject. Expanded scales such as that in Figure 2.14, clearly have harmonic potential. Schillinger uses the term 'sigma'(∑) to describe a structure in which all pitches of the expanded scale are superimposed. He describes techniques for deriving the diads, triads, tetrads and pentads of any particular scale.

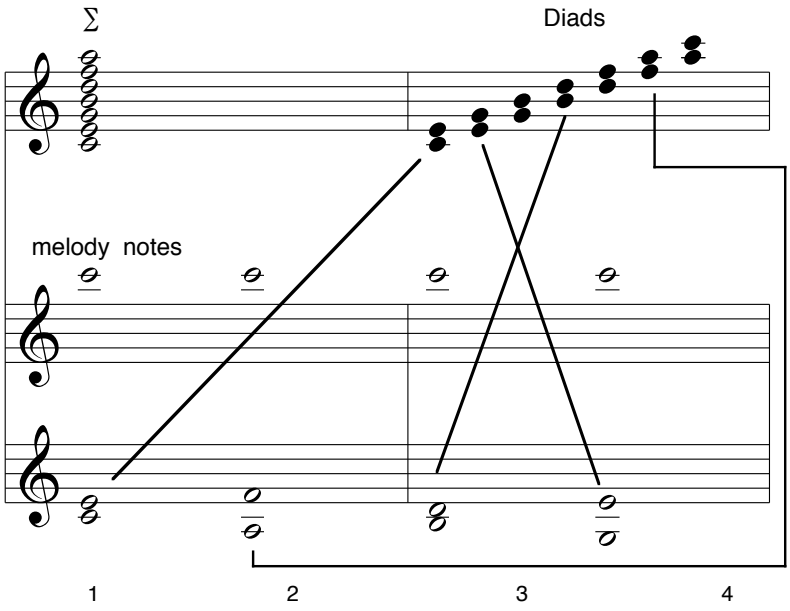


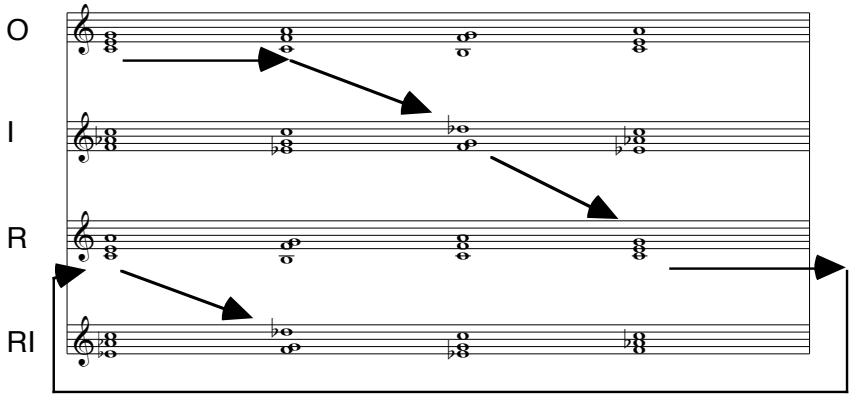
Figure 2.15. The harmonic potential of an expanded scale.

Figure 2.15, shows an expanded scale and its diads. The lower line shows an arrangement of some of those diads. The middle line represents a melody note above the diad. In this case the melody note is always C, as a constant reference showing the changing level of tension between harmony and melody. Schillinger describes tension as measured by the distance between pitches of the original expanded scale. If the pitches of melody and harmony lie far apart in their common scale the tension is greater than if they

are close. For example chord 1, is the least tense as the melody note is identical to the root of the diad beneath. Chord 4 has tension equal to that of chord 2, as both are equidistant from the note C, in the scale. Chord 3 is the most tense as the melody note and the root of the diad lie farthest apart in the original expanded scale.

2.4 Book III: *Variations Of Music By Means Of Geometrical Projection*

In this portion of the text Schillinger describes methods of creating geometrical variations derived from the rotation of co-ordinates through the four quadrants of a graph. These are familiar to musicians as terms which indicate direction: original, inversion, retrograde, retrograde inversion. There is nothing new in Schillinger's discussion of these traditional ideas but he presents useful examples of how these methods might be used to make variations in melodic sequences. One unusual technique concerns the generation of chord progressions[8]. Figure 2.16, shows an original progression (O) and its three geometrical variations. These are used to form a mixed sequence of chords shown on the bottom stave (Result) in the illustration. Lines with arrows indicate the 'route' taken through the different variations. The numbers above the 'result' stave show how many consecutive chords have been used from a particular variation: two chords from O, one chord from I, two from R, and one from RI. These quantities and the fact that the scheme progresses by step (stave) through each variation is purely a matter of convenience and is not the result of any rule imposed by the method. Chords in the result stave have been re-arranged to facilitate voice leading.



[8] I refer the reader to Chapter 11, section (11.5.1), in which this technique is described in relation to the middle section of my orchestral composition.

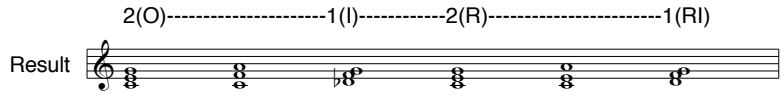


Figure 2.16. Chord progressions derived from 'geometrical projections'

Schillinger observes that the relationship between an original chord and its inversion is like that of major and minor but he argues should more accurately be called 'psychological' major and minor as the chords generated in this method are not linked by the same scale in the way that the relative major and minor keys are related.

A chapter on *Geometrical expansion* is concerned with the expansion of intervals in a score through multiplication by a coefficient of expansion[9]. This process alters the pitch units of a melody and so is not the same as the method of 'scale expansion' described in section 2.3.5.

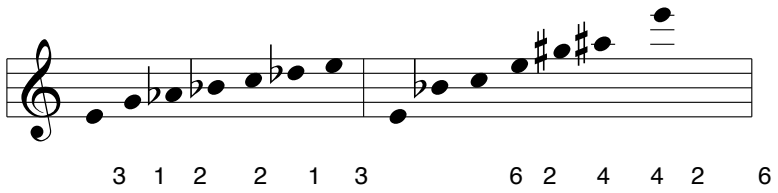


Figure 2.17. Geometrical expansion. Intervals are multiplied by the coefficient 2.

2.5 Book IV: *The Theory Of Melody*

In *The Theory Of Melody*, Schillinger reveals some of his most interesting ideas concerning the nature of music alongside his most disappointing techniques. Schillinger believes that melody has a biological origin. The information flowing through our sense organs stimulates our bodies to produce electrochemical and bio-mechanical responses. For example, fear invokes muscular contraction. Joy, lust or desire produces expansion. Schillinger suggests that our primitive spontaneous vocal responses to these stimuli eventually crystallised into formal melodic utterances. In between the

[9]Schillinger observes that music written in the 17th century can be 'modernised' by interval expansion. This seems to me to be one of his more absurd ideas although his observation that the history of music shows a general trend towards expansion of intervals is, in my opinion, convincing.

extreme forms of response (such as fear and joy) there is the 'resting state' characterised by regular motion such as regular breathing or heart beat. Schillinger attempts to translate these ideas into the contours and direction of melody. The Primary Axis, (see section 2.3.3) represents the point of balance or rest. Moving away from the P.A, either above or below it, represents expansion. Moving towards the P.A. represents contraction. These movements around the P.A. are termed 'secondary axes'.

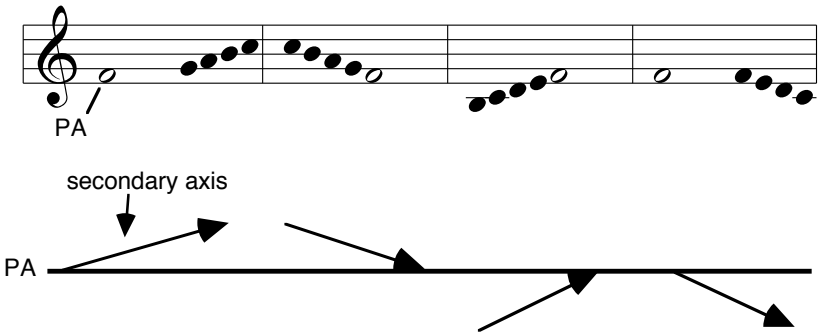


Figure 2.18. The axes of melody.

Figure 2.18, shows melodic contours or secondary axes, above and below the primary axis represented by the pitch F. Once a pattern of secondary axes has been decided, a rhythm is superimposed giving duration or proportion to the contour of the melody. The secondary axes represent the direction of the melodic contour and not its detailed surface motion.

For this reason different forms of oscillatory motion are superimposed on the secondary axes in order to create a more typically melodic outline as in figure 2.19.

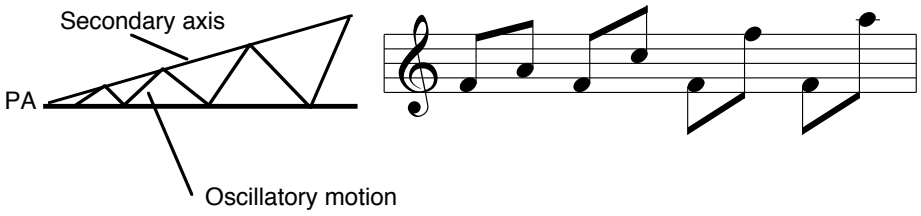


Figure 2.19. Oscillatory motion applied to the secondary axis.

The final chapter of Book IV, *Organic Forms In Melody* is in my opinion, of great interest and will be discussed in more detail in Chapter 3, section 3.5.2. It deals with the practical application of growth series (such as the Fibonacci series) to melodic structures.

In conclusion, I would say that *The Theory Of Melody*, is generally too ambitious in its aims and does not succeed in revealing exactly why a melody is satisfying or otherwise although many of the observations and insights it contains are of use to the composer. It seems to me that melody is a far more complex a phenomenon than Schillinger claimed while the techniques he devised for its 'synthesis' are far too cumbersome for practical application.

2.6 Book V: *Special Theory Of Harmony*

The Special Theory Of Harmony, deals specifically with techniques pertaining to traditional harmony derived from diatonic scales. Schillinger makes a strong distinction between root progressions (bass progression) and the chord structures which are built on those roots. Both root progressions and chord structures are derived from the same scale through the method of scale expansion, first described in Book II, (see section 2.3.5). The first expansion produces a scale whose intervals are major and minor thirds (see Figure 2.14). Schillinger refers to this as the 'cycle of the third' and it alone is used to generate the diatonic triads. Figure 2.15 illustrates the process in the case of diads but the principle is the same for triads.

2.7 Book VI: *The Correlation Of Harmony And Melody*

Book VI, the *Correlation Of Harmony And Melody*, is a bridge between the subject of diatonic harmony and counterpoint. It describes techniques for the composition of melody with harmonic accompaniment, a type of music that might be referred to as homophonic. The subject is divided into three chapters: 1) *The Melodization Of Harmony,* 2) *Composing Melodic Attack Groups,* 3) *The Harmonisation Of Melody.* Schillinger states that the most satisfactory melody/harmony relationships are those in which melody is derived from an existing chord progression (the subject of Chapter 1), although the opposite method, deriving harmony from an existing melody, is

covered in Chapter 3. Both Chapters 1 and 3, describe numerous relationships between melody and harmony most of which depend on the theory presented in Book V, *Special Theory Of Harmony* and Book IV, *The Theory Of Melody*. Techniques are largely dependent on the hierarchical arrangement of chord functions (1,3,5,7,11,13) and the organisation of the axes of melody (see sections 2.6 and 2.5 respectively). On the whole, Schillinger develops techniques in this portion of the text on the basis of the observation of conventional practises. For example, it is stated that in general when the 9th or 11th chord function appears in the melody it must be immediately preceded by the 7th or the 9th respectively and that the root of the harmony must be in the bass. 'Rules' such as these are apparently justified on the grounds of the 'statistical rarity' of alternative forms. Many of the 'techniques' are to do with ornamentation, involving the insertion of chromatic tones between the main 'functional' pitches of a melody.

Chapter 2, is, in my opinion, the most significant portion of Book VI. It concerns the composition of 'melodic attack groups', which in this case refers to a group of melody notes belonging to a particular chord. Rhythmic patterns derived from techniques presented in Book I, *The Theory Of Rhythm,* are used to determine both the quantity of pitches in a group as well as the duration of each pitch and in this way the rhythmic flow or 'animation' of the melody can be controlled. The most interesting techniques concern the rhythmic relationship between melody and harmony. These will be described in detail in Chapter 3, and also in Chapter 11, in connection with my orchestral composition *Trilogy.*

2.8 Book VII: *Theory Of Counterpoint*

The Theory Of Counterpoint only deals with counterpoint in two parts. Apparently Schillinger was preparing material dealing with counterpoint in more than two parts before he died (Schillinger 1978 page 822). *The Theory Of Counterpoint,* begins with a traditional classification of intervals and their resolution. Different species of two part counterpoint are described and alternative resolutions of dissonant intervals are given. Schillinger describes four possible tonal relationships between Cantus Firmus (CF) and Counterpoint (CP). This includes ordinary forms of counterpoint, in which both parts belong to the same scale, as well as more exotic polytonal types.

The various relationships are as follows: CF and CP belong to the same scale and the same mode, CF and CP belong to different modes[10] of the same scale. CF and CP belong to different scales (tonics) but are identical in mode. CF and CP belong to different scales and different modes. It is assumed that the two parts (CF and CP) have established Primary Axes, (see section 2.5) and that the initial interval between the two axes is always consonant. The relationship of the contours (secondary axes) of the two voices is discussed using terminology first introduced in the *Theory Of Melody* (see section 2.5).

The techniques described for the composition of canons and fugues are approached as primarily concerning rhythmic structure. An imitative structure can be made by superimposing symmetrical rhythms such as those described in Book I, (see section 2.2).The following diagram shows how the rhythmic resultant 5:4 (4,1,3,2,2,3,1,4) might be arranged as a two part canon.

	Announcement	Imitation	Continuation
Voice 1	4,1,3,2	2,3,1,4	4,1,3,2
Voice 2	----------	4,1,3,2	2,3,1,4

Figure 2.20. Rhythmic structure of a canon based on 5:4.

The following example shows the above rhythmic structure realised in music notation where 1= ♪(Figure 2.21)

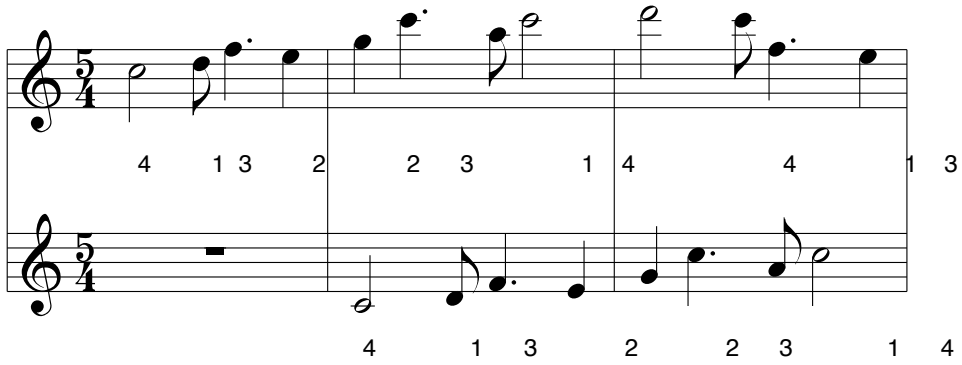


Figure 2.21. The rhythm 5:4 realised in notation as a canon.

[10]Mode, refers to a variant of the original scale derived by the rotation of its pitches.

In the case of imitative forms such as canon, it is implied that as long as the tonal relationship between the two Primary Axes is consonant, the other interval relationships between the two parts will take care of themselves (Schillinger 1978 page 783).

2.9 Book VIII: *Instrumental Forms,*

2.9.1 Arpeggiation

The Theory Of Instrumental Forms elaborates upon the ideas first presented in Book I, *The Theory Of Rhythm*, (see section 2.2.1). Techniques are suggested for the development of melodic figuration through the ornamental variation of harmony. Schillinger sets out the scope of the discussion as follows:

> "What we are to discuss here is all forms of arpeggio and their applications in the field of melody, harmony, and correlated melody" (Schillinger 1978, page 883)

A large portion of the *Theory Of Instrumental Forms* is devoted to tables illustrating how attacks (notes, events, durations) may be distributed between the voices of a harmony.

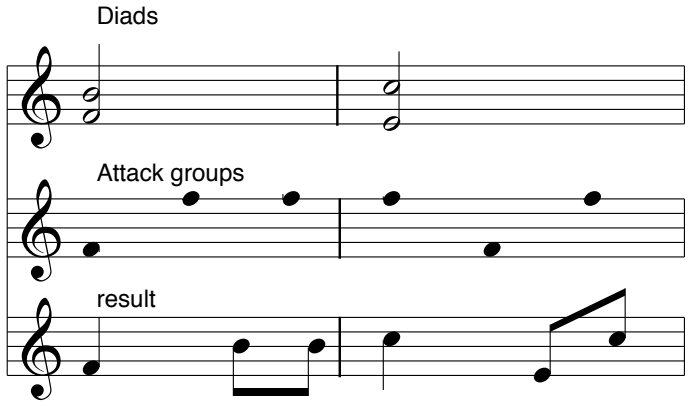


Figure 2.22. Two part harmony, attack groups and decorated variation.

Figure 2.22 shows two diads (top line) which are modified by two attack groups each containing 3 attacks (middle line). The result of combining the

two upper lines is shown on the bottom stave. The durations of each attack have been chosen freely. Figure 2.22 is an extremely simple example of a technique that can be made to produce highly complex results. Schillinger lists all possible arrangements for attack groups ranging from 2 to 12 attacks distributed through harmony of two, three and four parts. A large number of examples of ornamented harmonic progressions accompany these tables.

2.9.2 Harmonic strata

Schillinger introduces the possibility of duplicating or doubling chordal structures or harmonic blocks which are referred to as 'strata'. In some respects this discussion would seem more appropriate in the context of Book IX, *The General Theory Of Harmony*, which is concerned with all aspects of 'strata' combination. However, chapter 6 is exclusively concerned with the octave doubling of identical harmonies. When strata are superimposed the resulting assemblage is referred to as a Sigma (Σ). Schillinger discusses this in relation to orchestration and it is suggested that combined strata may represent different instrumental ensembles within an orchestra. A harmonic strata may be doubled at the octave under certain conditions: the position or spacing of the two strata must be identical or else the resulting harmonics and difference tones will cause distortion leading to loss of clarity and balance (Schillinger 1978 page 1003). When combining strata with non-identical positions (inversions), the chord function (1,3,5,7....) in the uppermost voice of each strata must be identical. Two strata with non-identical positions must be arranged so that the strata with the most closed spacing is on top. By ensuring that the overall spacing of harmony notes in the score is widest at the bottom register and narrowest at the top, the composer mimics the natural spacing of the harmonic series and ensures maximum acoustical clarity.

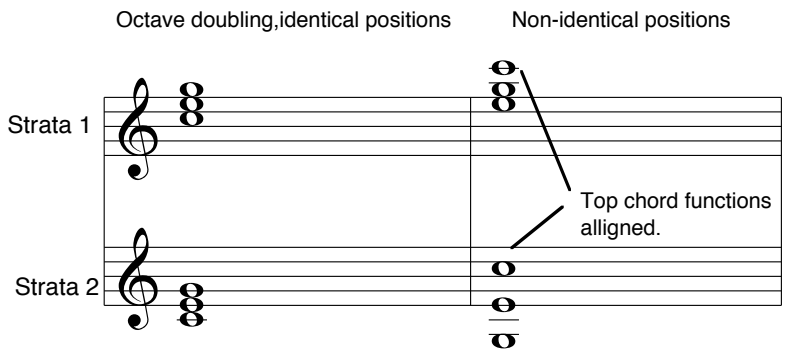


Figure 2.23. Doubling of harmonic strata.

2.10 Book IX: *The General Theory Of Harmony*

2.10.1 Strata harmony

The General Theory Of Harmony, develops principles for the construction and co-ordination of harmonic groups or 'assemblages' of all types. Schillinger clearly distinguishes between the *General* and the *Special Theory Of Harmony.*

> Contrary to what was the case in my special theory of harmony, this system has not been based on observation and analyses of existing musical facts only; it is entirely*inductive*.....special harmony is but one case of general harmony.
> (Schillinger 1978, page 1063).

This portion of the system pertains directly to the field of orchestration providing techniques by which the various instrumental groups within an ensemble can be controlled and differentiated through the co-ordination of independent, simultaneous blocks (strata) of harmony.

> As the main purpose of the *General Theory Of Harmony* is to satisfy demands for the scoring of all possible combinations of instruments or voices, or both, it should be flexible enough to make any instrumental combination possible. (Schillinger 1978 page 1155)

Schillinger's method of generating harmonic structures is the same as that described in his *Special Theory Of Harmony*, (see section 2.6). This involves the superimposition of pitch units of a scale and its various 'expansions' (see section 2.3.5 and Figure 2.15). Unlike the *Special Theory Of Harmony*, which utilises only the first 'expansion' of a diatonic scale as a source of harmony

the *General Theory Of Harmony*, allows chord structures to be derived from all scale 'expansions'.

A simple case of two part harmony will give the reader a good idea of how harmonic strata are generated and controlled. Figure 2.24 shows a pentatonic scale and its derivative harmonic structures resulting from scale 'expansion'

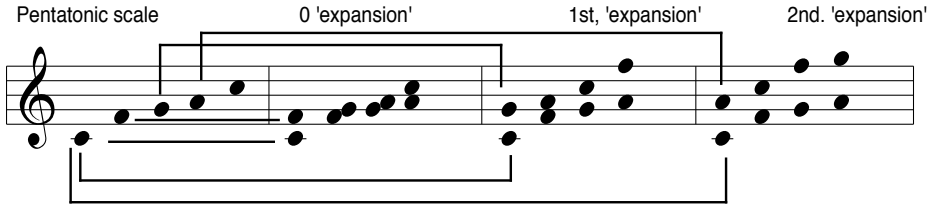


Figure 2.24. Pentatonic scale and its harmonic derivatives.

Schillinger observes that only scales with seven different pitches produce regular structures on expansion, that is, 'expansions' with identical intervals, unlike the products of the scale in Figure 2.24. A strata does not have to originate from a scale and can instead be derived from a single interval. In the case of two part harmony there are only eleven possible two part chords within the octave[11].

In the following diagram, ***a*** represents the root function of the harmony while ***b*** represents a second function which lies at the interval of a major second from the root. Figure 2.25 shows a sequence of two part harmony (strata) in the upper stave and the roots on which it is built in the lower stave. All harmonies are derived from one interval (a major second) and are built on a sequence of root tones which for convenience progress by the cycle of the fifth.

Voice leading (chord connection) in two part harmony is limited to only two possibilities: either chord functions (third, fifth etc.) in a two note chord alternate between consecutive chords ($\frac{a}{b} \rightarrow \frac{b}{a}$) or the functions remain unchanged (parallel) between chords. In Figure 2.25, the alternating voice leading causes inversion of the chord structure: the major second transforms into a minor seventh.

[11] Discounting the octave and the unison.

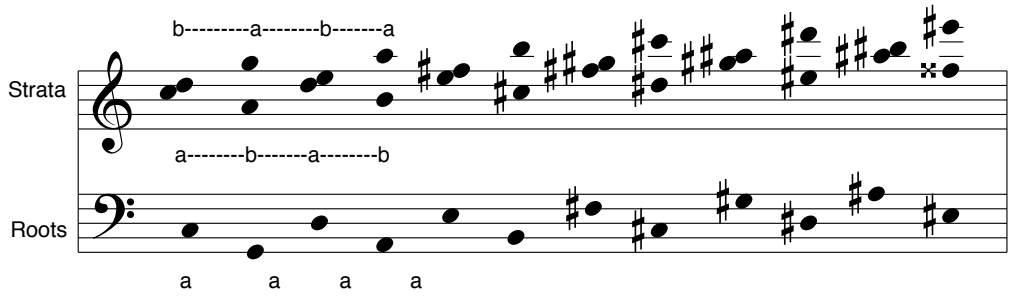


Figure 2.25. Two part harmony with alternating voice leading.

Figure 2.25 represents what Schillinger refers to as 'hybrid three-part harmony'. The roots in the lower stave represent an added strata of one part. Such an arrangement might be suitable for distribution between two distinct instrumental groups. For example, a violin, taking the upper part and bassoon playing the roots in the lower stave. Despite the simplicity of the example shown in Figure 2.25, it should be observed that while the two strata are co-ordinated harmonically, their independence in voice leading facilitates the clarity of the chosen orchestration. Schillinger develops ever more complex combinations of strata ($\sum$) with ever more parts and hybrid doubling. When three part chords are introduced the number of potential voice leadings dramatically increases. Schillinger develops methods of creating scores with huge numbers of parts. Each strata can be defined or independent from the surrounding strata because of its individual voice leading. Strata may be assigned to various instrumental groups within an ensemble helping to create a co-ordinated but defined orchestral texture.
Schillinger describes a number of techniques for converting the strata into musically satisfactory forms. For example, melody with accompaniment and contrapuntal textures including canons in more than two parts. These methods largely involve combining techniques from earlier portions of the system (such as Book VIII, *Instrumental Forms)* and do not merit detailed description here.

2.10.2 Harmonic density

In Chapter 15, Schillinger introduces an idea which he refers to as 'textural density'. This is one of the most impenetrable discussions because it is largely written in Schillinger's own highly complex system of algebraic notation and is accompanied by very few musical examples. However, it is

one of Schillinger's more unusual and far reaching ideas and deserves clarification.

The density of music changes very rapidly: an orchestral work contains numerous instrumental combinations ranging from solo to tutti, this might be described as the density of orchestration. Schillinger suggests that there is another kind of density which he implies is more fundamental to musical flow than instrumental combination. *The General Theory Of Harmony* is based on the idea that a score can be made up of independent but co-ordinated harmonic layers: these collectively are referred to as a 'sigma' (∑). I personally find it helpful to imagine a sigma as being like a geological diagram showing a cross section of the Earth's crust. 'Textural density' depends on varying the number of 'strata' in a score from one moment to the next. Imagine a sequence of slides in which the same three story building appears at first complete, then with its ground and top floors missing, and finally with the top and bottom floors intact but missing the middle story. For the house substitute Sigma, for the floor levels, substitute harmonic strata. A sequence of Sigma such as this would be referred to as a 'density group'. Once a density group has been composed its variations can be generated by rotation. The following diagram shows a three element density group. The first element is a 'sigma' (∑1) which contains three 'strata' (shaded areas). This is the complete form and it is followed by two incomplete versions of itself (∑2 and ∑3).

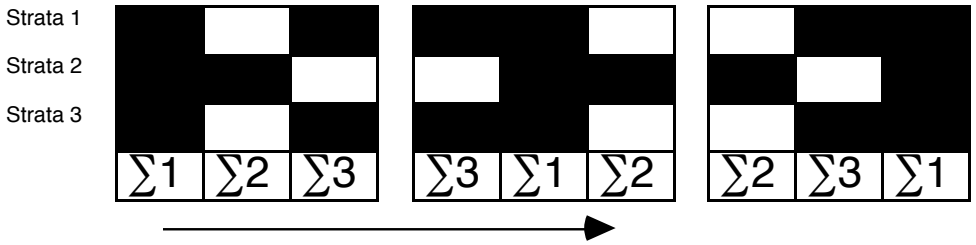


Figure 2.26. A density group of three ∑, and its variations.

Variations of the density group shown in Figure 2.25, can be generated by the rotation of the three ∑. For example, (∑3,∑1,∑2),(∑2,∑3,∑1). The complete procedure for the composition of 'textural density' involves the simultaneous occurrence of a second form of rotation. This is rotation around the x axis of Figure 2.26 which causes the textures *(forms of arpeggiation)* belonging to the various strata to rotate in a vertical direction. It is important to note that the harmonic structures which constitute each strata do not change their position which would radically alter the harmonic structure of

the entire score. The textures, however, are moved. The following diagram shows three variations of the original density group. In each variation the forms of arpeggiation rotate around a horizontal axis moving upwards by one place at a time as indicated by the arrows. I have applied labels to each strata to indicate a hypothetical form of arpeggiation. Let us assume two types of musical texture, H and M. These apply to Figure 2.27, as follows: melodic form 1, (M1), harmonic form 1, (H1), and melodic form 2, (M2). M1, and M2, might be different types of melodic arpeggiation, while H1 might be a form of chordal accompaniment.

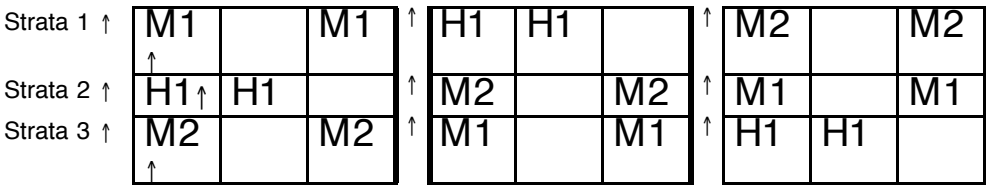


Figure 2.27. Three variations produced by vertical rotation.

The concept of density as a musical dimension which can be used to control the texture and flow of a composition is, I believe, one of Schillinger's more far sighted ideas. It is certainly true that texture and density became important considerations in the work of later generations of composers, such as Stockhausen and Ligeti.[12]

2.11 Book X: *Evolution Of Pitch-Families (Style)*

Book X, is a short summary of ideas found mainly in Book II, *The Theory Of Pitch Scales*, and Book IX, *The General Theory Of Harmony*. It contains no new ideas but is concerned with distilling and combining various techniques into a procedure for developing the full potential, both melodic and harmonic, of any scale.
This is done in order to trace the evolution of a scale from its original (primitive) form to its 'modernised' fully developed hybrid form.

> Often styles of intonation can be defined geographically and historically. There may be a certain national style which, in due course of time, undergoes various modifications. These modifications....can also be looked upon as modernisation of the source.....The various forms of "jazz" and "swing", the "Indian" music of MacDowell or Cadman or

[12]However, it is not my intention here to suggest that they were directly influenced by Schillinger's work.

> Stravinsky (*Les Noces*), are stylised or modernised primitives - each, of course, in its respective field. (Schillinger 1978 page 1255)

2.12 Book XI: *Theory Of Composition*

2.12.1 General approach

In the introduction to Book XI, Schillinger outlines three basic approaches to composing:

1) Composition of parts or themes without prior knowledge of the whole form: this may potentially result in the connection of themes or material which do not belong together;

2) Improvisation, which almost by definition does not anticipate the whole and tends towards loose structures and /or excessive repetition;

3) Conception of the whole form prior to creating its various parts.

The Theory Of Composition deals with the last of these approaches, however, Schillinger's view of composition is perhaps less rigid than one might expect.

> Each approach contains different ratios of the intuitive and the rational elements by which the process of composition is accomplished. Works of different quality may result from each of these three basic approaches. Often these forms of creation are fused with one another.(Schillinger 1978 Page 1277)

The Theory Of Composition, is divided into three parts:

1) Composition Of Thematic Units,

2) Composition Of Thematic Continuity,

3) Semantic (Connotative) Composition.

2.12.2 Part I: *Composition of Thematic Units*

In Part I, Schillinger introduces the idea of the 'thematic unit': the basic building blocks of a composition. A 'thematic unit', otherwise referred to as a *theme* or a *subject*, is a structure which will yield variations and ultimately

whole sections of a composition. Schillinger lists seven sources from which to develop 'thematic units': rhythm, scales, melodies,harmonic progressions, arpeggiated ('melodized') harmony, counterpoint, orchestral resources (Schillinger 1978 page 1279).

These represent the basic technical resources from which the 'thematic unit' is developed. The last entry in the list above (orchestral resources), includes the possibility of tone quality, dynamics, density (see section 2.10.2) and instrumental forms (see section 2.9) as potential components for the composition of a 'thematic unit'. A 'thematic unit' may often be composed from more than one source. The different sources are referred to as the 'major' and a 'minor' components. For example, a 'thematic unit' derived primarily from rhythm (a 'major' component) might well involve pitch as a secondary ('minor') component.

Schillinger devotes a chapter to each of the seven categories listed above. No new ideas are presented but these chapters are useful summaries of the different subjects and techniques presented in earlier portions of the system.

2.12.3 Part II:*Composition of Thematic Continuity*

Part II, *Composition Of Thematic Continuity*, is a discussion of musical form and how 'thematic units' (themes or subjects) are joined to form a 'thematic sequence'. Each 'thematic unit' is represented by letters of the alphabet. A few examples of different schemes of 'thematic sequence' are as follows: binary forms (A+B), symmetrical forms (A+B+A) and rotational forms (A+B+C)(B+C+A)(C+A+B). The most interesting of these, in my opinion, is the so called 'progressive symmetric' form. Here a subject ('thematic unit') gradually looses its dominance to another subject. For example, in the following scheme, subject A, is replaced by subject C: A+(A+B)+(A+B+C)+(B+C)+(C). Such an arrangement offers possibilities for the gradual transformation of one idea to another.

Chapter 12 *Temporal Co-ordination Of Thematic Units* outlines methods of controlling the dominance of a subject ('thematic unit') within the composition as a whole. Rhythms, such as those presented in Book I, (see section 2.1) are used to determine the duration of the 'thematic units'. For example, the sequence of 'thematic units', (A,B,C) could be assigned the following durations, (2,2,1) resulting in (A2T, B2T, CT) where T represents a

predetermined unit of bars. In this arrangement, C, is relatively less prominent than subjects A and B. Schillinger is very clear on the matter of the relative importance of the various subjects.

> This theory repudiates the academic point of view, according to which some themes are so unimportant that they function as mere bridges tying the main themes together. If a certain thematic unit is unimportant.....and merely consumes time, it should not participate in the composition. (Schillinger 1978 page 1335).

When a subject ('thematic unit') is repeated in the course of a composition it does not necessarily occupy the same length as in its original exposition. In Chapter 13, *Integration Of Thematic Continuity,* Schillinger suggests that 'thematic units' should initially be composed in their 'maximal' form (longest duration) after which they may be subject to fragmentation or contraction.

In Chapter 14, *Planning A Composition,* Schillinger describes the process of composition in ten stages.

1) Decision as to total length of composition in clock time.
2) Decision as to degree of temporal saturation.
3) Decision as the number of subjects and thematic groups of subjects.
4) Form of thematic sequence.
5) Temporal definition and distribution of thematic groups.
6) Organisation of temporal continuity.
7) Composition of thematic units.
8) Composition of thematic groups.
9) Intonational co-ordination (key structure).
10) Instrumental development (orchestration / instrumentation).
(After Schillinger 1978 page 1353).

'Temporal saturation' (point 2) is the degree of density of events (notes, attacks, harmonies etc.) within a given time. Schillinger believes that our perception of musical time is dependent on the saturation of events: the greater the density of events, the longer our perception of time. 'Temporal definition and distribution of thematic groups' (point 5) refers to the different weight or duration applied to each subject - the ratio or balance between

subjects and the form of their distribution. 'Organisation of temporal continuity' (point 6) refers to the basic duration unit (crotchet, quaver, triplet quaver etc.) for each subject or 'thematic unit'. The remainder of Part II, Book XI, is devoted to working out examples of monothematic (theme and variations) and polythematic compositions.

2.12.4 Part III:*Semantic (Connotative) Composition*

Part III, Book XI, *Semantic (Connotative) composition*, is based on the idea that musical forms are 'sonic symbols'.

> As the response to sonic forms exists even in so-called inanimate nature in the form of sympathetic vibrations or resonance, it is no wonder that primitive man inherited highly developed mimetic responses. From this we can conclude that a great many of the early sonic symbols probably originated as imitation of sonic patterns, coming as stimuli from the surrounding world (Schillinger 1978 page 1411)

Schillinger points to forms of language, the meaning of which is influenced by intonation, and asserts that at some point in human evolution a single 'language' of sonic symbols separated into two forms: speech and music. He concludes that,

music is capable of expressing everything which can be translated into form of motion (Schillinger 1978 page 1411)

The composition of notation to describe 'sonic symbols' begins with the development of a 'psychological dial' (Figure 2.28), on which the various possible responses to stimuli are represented.

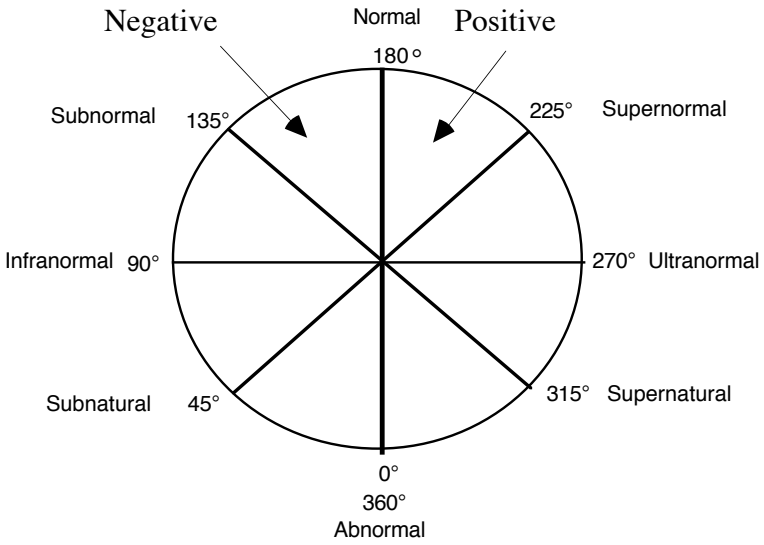


Figure 2.28 Psychological dial (After Schillinger 1978 page 281).

Schillinger illustrates the use of the 'dial' through anecdote. For example, a man who enters a bargain basement store expecting to pay no more than ten cents for any item has his expectations confirmed, his response is 'normal', which is represented on the dial at 180°. Alternatively he is asked to pay $100 for a pencil, his response is astonishment or disbelief which can perhaps be represented on the dial at 90° (infranormal). The theory by which events influence psychological states and are in turn translated into music is developed from ideas first presented in Book IV, *Theory Of Melody*. The dial is divided vertically into two halves, the left half is negative ('loss of energy and decline') and the right half is positive ('gain of energy and growth). As described in the *Theory Of Melody*, Schillinger believes that the direction of melodic contours in relation to the primary axis corresponds to contraction or expansion, negative and positive respectively (see section 2.5). Consequently any point on the dial can be translated into the motion of a secondary axis. When the secondary axis moves away from the primary axis it corresponds to the positive zone of the 'dial', when moving towards the primary axis it corresponds to the negative zone. The more extreme the required stimulus and response, as suggested by the dial, the steeper the angle of the axes with respect to the P.A..The following diagram shows five 'dial' positions and their corresponding potential axial configurations.

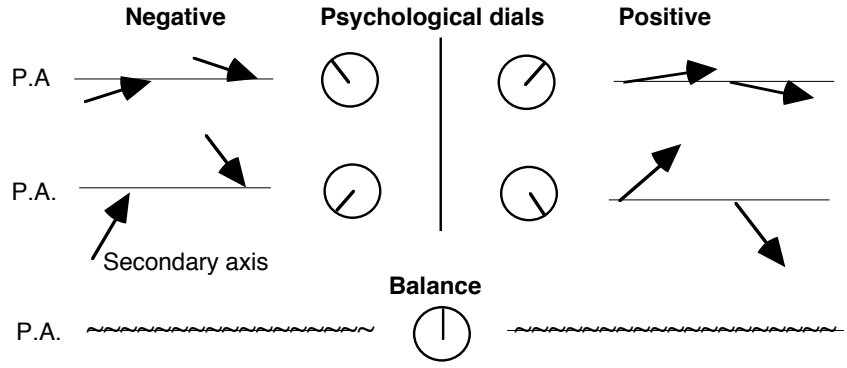


Figure 2.29. Psychological dials and axial correspondences.

Schillinger gives lists of examples of how such correspondences can be translated into rhythm, melody, harmony, timbral density and so on. There are musical examples and verbal descriptions. For example,

Normal: 

Associations: Balance, Repose, Quiescence, Passive, Contemplation,Uniformity, Inactivity, Monotony.

> (1) **Temporal Rhythm**: Durations ranging from very long to moderately long, depending on the degree of activity, in uniform or nearly uniform motion.
> (2) **Pitch Scales**: Scales with a limited number of pitch units and fairly uniform distribution of intervals.
> (3) **Melodic Forms:** Only stationary and regularly oscillating forms, within a moderate pitch range for association with small dimensions, and a wide range for association with large dimensions.
>
> (Schillinger 1978 page 1433)

Schillinger discusses how sonic symbols may be combined into sequences. He suggests that this technique is invaluable for composition based on narrative forms, such as programme music or film and stage music (Schillinger 1978 page 1461). The qualities associated with a particular dial position, such as those shown above, are in my opinion only useful to the composer in a general sense: it is valuable to consider melodic contours in terms of expansion, contraction and balance but to take into account the precise angle between two axes while composing is less helpful. It is also true that the qualities Schillinger ascribes to particular axial forms cannot be universally applied. For example, a fashionable device in contemporary film

music is to associate moments of extreme tension with sustained bass tones. Drones such as these, would be classified by Schillinger's method as suggestive of balance, repose, quiescence, passivity and contemplation, quite the opposite from the feeling of suspense and fear they are intended to evoke.

2.13. Book XII: *Theory Of Orchestration*

This portion of the text is mainly a very standard description of the tuning, range and basic performance characteristics of orchestral instruments. Schillinger also includes a chapter on electronic musical instruments which contains a description of different types of Theremin ('space controlled', 'finger controlled', and 'keyboard controlled'). Chapter 8, *Instrumental Combination*, is an attempt to classify and compare instrumental timbres. Chapter 9, *Acoustical Basis Of Orchestration*, is only a few paragraphs long. Schillinger clearly intended to develop an understanding of instrumental combination from a scientific, acoustical basis, but after acknowledging the difficulties inherent in this task the chapter ends. An editorial note suggests that Schillinger left notes on this subject but had not completed them before his death.

2.14. Conclusion

Having summarised *The Schillinger System Of Musical Composition* (Schillinger 1978) in such a compressed form, the reader may be asking the following questions: how do Schillinger's numerical techniques aid the process of composition? Is every part of his 'system' necessary or can some of it be used in isolation from the rest? In answer to the first question, I view the art of composition as a dual problem involving, as it were, the head and the heart. For myself, music begins with an idea, an emotional impulse, which motivates me to compose. The original impulse is realised and nurtured into maturity by intellectual effort and technical knowledge. Schillinger's techniques satisfy the second part of this process, they are tools that enable the composer to build structures. The quality or beauty of a structure depends on the imagination and cultural experience of the artist. By comparison, one might say that the tools traditionally used by cabinet makers assist in the accurate manufacture of furniture but they hardly guarantee the quality of the design. This seems generally to accord with Schillinger's own point of view (see Chapter 2, section 2.12) which acknowledges a mixture of the rational

and intuitive. However, the balance between intuitive and technical decision making is not easy to define and in my opinion there is still a polarisation of opinion in the world of music between those who believe only in structures consciously devised by the intellect and others who adopt the opposite point of view. An editorial footnote in the introduction to Schillinger's *Theory Of Melody*, describes the latter attitude well using a quotation from the poet Robert Burns:

> "Gie me ae spark o' Nature's fire,
> That's a' the learning I desire"
>
> (Quoted in Schillinger 1978 page 227)

In answer to the second question, I personally find all of Schillinger's work thought provoking. His approach is remarkably consistent, attempting to reveal a 'methodological way to arrive at a decision" (Schillinger 1978 page 1356). However, there is much that I cannot agree with or else believe to be irrelevant to my own work as a composer. For example, parts of his 'system', such as *The Theory Of Composition*, are presented as the pinnacle of his work, and yet I find the ten point plan for making a composition (see Chapter 2, section 2.12.3) extremely unappealing as it attempts to order, by step, a complex process that I believe happens in a more complex simultaneous manner. Consequently, in those of my compositions that have been influenced by his work I have used only a very few of his methods and these have mainly been techniques relating to the composition of rhythmic structures. There are original and surprising concepts contained elswhere in the system but one finds throughout that the rhythmic techniques described in Book I, *The Theory Of Rhythm,* are applied consistently to all branches of his system.

Chapter 3 Seminal techniques

3.1 Introduction

The aim of this chapter is to amplify those of Schillinger's ideas which are important to my own work. I will try and show how they can be applied in practical composition and in this way I intend to make later discussions of my own music more easily understood.

3.2 Rhythms Produced By Pulse Interference

In Chapter 2 (section 2.2.1) I described how pulses of different frequencies combine to produce rhythm. Rhythms produced in this way are always symmetrical around their centre point. For example, (2,1-1,2). Schillinger refers to this process as 'pulse interference' and represents the various pulse relationships using ratios such as 3:2,4:3,5:2 etc. The numbers in the ratio are referred to as the 'major' and 'minor' generator according to their relative size. Two methods of generating rhythms are offered, the first method was described in Chapter 2. The following diagram is presented to remind the reader who will find the full explanation of this method in Chapter 2 section 2.2.1 and in particular Figure 2.2.

A=3	↓			↓		
B=2	↓		↓		↓	
Result (A+B)	⇓		↓	↓	↓	
Result displayed numerically	2	→	1	1	2	→
Result in music notation	q.....	....	e	e	q.....	....

Figure 3.1. Pulse 'interference' of 3:2.

The 'generators' provide information about possible barring of the rhythm.

Figure 3.2, shows how the rhythm 3:2, (2,1,1,2) can be grouped in bars of 3, or bars of 2, or bars of 6 (the product of the generators). These groupings represent the most efficient barring of the rhythm and reveal potential contrasts .

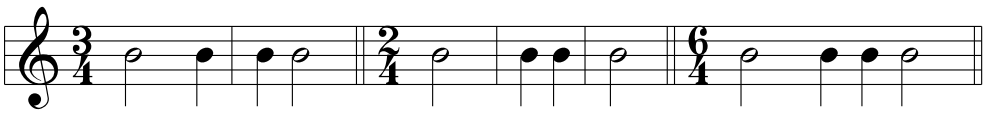


Figure 3.2. Three groupings of the rhythm 3:2.

In Chapter 2, I alluded to a second method of generating rhythm through pulse 'interference'. This technique is the more significant because it produces results which can be combined with the structures generated by other methods such as those associated with the 'master time signature' (see Chapter 2 section 2.2.3). In order to distinguish between the two methods I shall adopt Schillinger's notation: a ratio without underlining (3:2) represents method 1, a ratio underlined (3:2) represents method 2. The key difference between the two methods is in the duration of the resultant rhythm. Method 1 produces rhythms whose duration is the *product* of the two generators. In Figure 3.2, the rhythm 3:2 has a duration of 6 time units (2+1+1+2). Method 2 uses the *square* of the larger 'generator' to determine the duration of the resulting rhythm. For example, in the case of 3:2, the duration of the rhythm will be 9 time units. The following diagram shows the graph of 3:2, it will be observed that in order to complete a cycle of 'interference' several groups of the 'minor' generator are required, each group starting on succeeding phases of the major generator.

* **

↓			↓			↓			3 × 3
↓		↓		↓					3 × 2 (phase 1)
			↓		↓		↓		3 × 2 (phase 2)
↓		↓	↓	↓	↓	↓	↓		Result
2		1	1	1	1	1	2		Numerical result

*=phase 1 of 'major' generator . **=phase 2 of 'major' generator.

Figure 3.3. The second method of generating rhythm.

Schillinger refers to the process shown in Figure 3.3 as 'fractioning' and it produces results which are very obviously related to the results obtained by the first method. Compare the following rhythms produced by the two methods:

3:2 by method one = (2,1,1,2)
3:2 by method two = (2,1,1,1,1,1,2)
4:3 by method one = (3,1,2,2,1,3)
4:3 by method two = (3,1,2,1,1,1,1,2,1,3)

Both methods produce symmetrical rhythms, the results of which are related to one another, being made up of different quantities of the *same* numbers.

3.3 The master time signature

3.3.1 Sub-grouping the master time signature

The master time signature controls both rhythm on the small and large scale: the rhythm within the bar and the rhythm of the bars themselves. Consequently an entire rhythmic scheme develops from a single number. In Chapter 2 (section 2.2.3) I described how the master time signature could be used to create patterns within bars as well as bar groups. I described the following rule: the number of beats in the bar equals the number of bars in the bar group. This ensures that the total number of beats in the whole bar group is a number that can be generated by squaring the master time signature. The second method of pulse 'interference', described above (see Figure 3.3) is also based on the process of squaring and this common process allows the results of the two techniques to be combined into a single structure. Squaring the master time signature is a process Schillinger refers to as 'involution', that is evolution by means of a power series[13]. Below is an illustration showing the development of the master time signature, 2.

$\frac{1}{t^3}$	$\frac{1}{t^2}$	$\frac{1}{t}$	$\frac{t}{t}$	t	t^2	t^3
$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{2}{2}$	2	4	8

Figure 3.4. Evolution of the master time signature through a power series.

[13]looking at figure 3.4, it might appear that Schillinger contemplated the use of powers higher than 2. In fact he suggests that cubes may be used as the upper limit after which the bar groups and meter become too large.

In Figure 3.4, the master time signature is shown at the centre of the series (shaded area).[14] The letter t represents time units and or bars. On the lower line, to the left hand side of the master time signature, fractions represent the number of units or beats in a bar while the right hand side represents the number of bars in the bar group. For example , the first box to the left of the master time signature, $\frac{1}{2}$, means one bar of 2 beats. It is related to the first box on the right of the master time signature, 2, which means a bar group of 2 bars. Continuing to compare equivalent boxes on the left and right hand sides we get the following relationships: bars with 4 beats, groups of 4 bars, bars with 8 beats, groups with 8 bars and so on[15]

The choice of the master time signature and the process of defining bar groups and metre is the first step in the application of this technique. Once the total length of bars and beats has been determined it is necessary to create the rhythmic material that will be contained by the bars. It is important to stress that this is not a mechanical process. The composer who practises this method soon learns to analyse his or her spontaneous imaginative thoughts for their potential use with this particular technique. However, Schillinger suggests a method of generating basic rhythmic material with which to start the process. This involves sub-grouping the master time signature, (see Chapter 2, section 2.2.3, method 1). Sub-grouping (fragmentation) of the master time signature may be accomplished by any means as long as the resulting fragments are whole numbers whose sum equals the master time signature. In practise, however, it is useful to apply Schillinger's special technique of fragmentation. This produces increasingly fragmented sub-groups which are 'related' to one another. The master time signature (a single number) is divided into two parts. For instance, if the master time signature were 5, the first sub-groups would be (1+4) or (2+3). In the case of a master time signature that is an even number, such as 4, It is always better to avoid dividing it into equal portions which lead to less dynamic rhythms. The two fragments are then subject to rotation in order to

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[14]For the complete table see Schillinger 1978 page 71.

[15]Shillinger believed that the 2 series has greatly undermined the development of western music because its use has inhibited the evolution of other series. For example the rarity of true 3 and 9 bar groups in classical music is attributed to the influence of 2. Composers arrived at 3 bar groups by expanding a 2 bar group or contracting a 4 bar group. Another example would be the rarity with which music in bars of 3 beats evolves into bars of 9 beats. It is more usual that each beat is divided by 2, creating a bar of 6, than evolving through its power to 9.The 6 series is described as a typical 'hybrid' of the 3 series and the 2 series.

produce a variant (see Chapter 2 section 2.2.4): (a,b)→(b,a). The two variants are then combined through 'interference' (see Chapter 2, section 2.2) to produce a new sub-group with more elements: a two element sub-group combined with its variant by rotation will produce a three element sub-group. A three element sub-group combined with all of its variants by rotation will produce a five element sub-group. This process can be continued until 'uniformity' (1+1+1+1.....) is reached. For example,

5→
(2+3) rotation (3+2).
(2+3) combined with (3+2)→
(2+1+2) rotation (1+2+2) rotation (2+2+1).
(2+1+2) combined with (1+2+2) combined with (2+2+1)→
1+1+1+1+1 (uniformity)

The method just described is now shown in the form of a table.

↓			↓		3+2
↓		↓			2+3
↓		↓	↓		2+1+2
↓	↓		↓		1+2+2
↓		↓		↓	2+2+1
↓	↓	↓	↓	↓	1+1+1+1+1

Figure 3.5. Sub-groups of the master time signature 5.

3.3.2 Squaring the sub-groups

A sub-group represents a rhythmic pattern of one bar and should in practise be a carefully considered motif. This is important because it will be expanded by a squaring formula to completely fill the bar group. In this way a rhythm contained in one bar exerts its influence over many bars. The squaring process is perhaps the most important technique in the entire system because it causes rhythmic material to evolve organically: not only is new material generated but it is distributed in a manner that is harmonious and consistent with the original.

The squaring formula is as follows:

$(A+B)^2 =(A^2 +A.B)+(B.A + B^2)$

In the above formula, A and B represent the two elements of a sub-group derived from the master time signature[16]. The following example shows the same procedure using 5 as the master time signature.

5→(3+2)
$(3+2)^2 =(9+6)+(6+4)=25$

Taking the above example we see that a sub-group (3+2), when squared produces 4 elements (9+6+6+4) and that the result is related to the original by emphasising first one of the original numbers and then the other.[17] The following diagram illustrates this relationship.

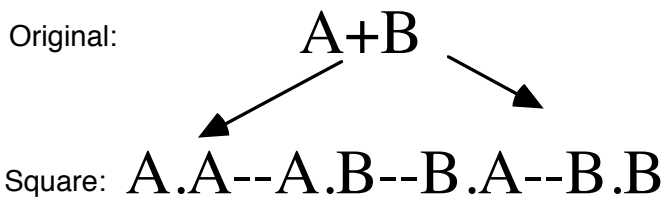

Figure 3.6. The relationship of the original sub-group to its square.

Realising the results as a score

Continuing our example of 5 as the master time signature, and (3+2) as its sub-group, the results of the squaring process are combined into a 5 bar score as shown below. As in most other branches of the system a rhythm can be used backwards or forwards or in some kind of rotated variation. The squared sub-group and its retrograde are, in my opinion, most interesting as they are rhythms which accelerate or retard. Furthermore it is possible to create 'interference' between the two to create yet another rhythm.

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[16]The formula can be simply modified to accomodate any number of elements in a sub-group. Eg.$(a+b+c)^2$ =(a.a+a.b+a.c)+(b.a+b.b+b.c)+(c.a+c.b+c.c)

[17] This aspect of the process is related to a much later part of the system in which types of progressive symmetry are described, that is the arrangement of elements so that the dominance of an element changes over time. E.g. A AB ABC BC B. See Chapter 2 section 2.12.3.

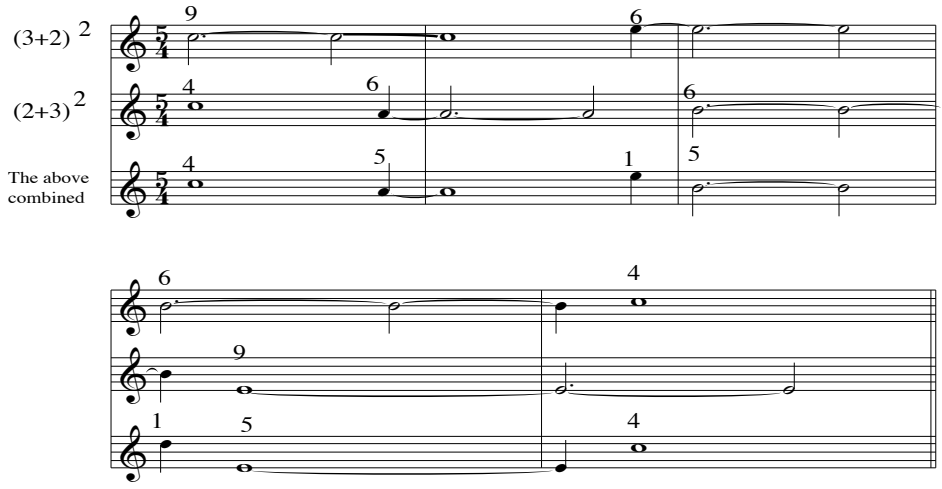

Figure 3.7. The results of squaring realised as a score.

3.3.4 Incorporating the original sub-group

It would be possible to repeat the sub-group or a rotated variation of it, in every bar of the score, until the bar group was filled. However, Schillinger provides another, more elegant method, of incorporating the sub-group. The sub-group can be combined with its square by applying the following formula:

A[A+B] +B[A+B]

For example,
A=3, B=2

3[3+2] +2[3+2] =15+10=25

In effect this expands the original sub-group allowing it to be combined with its square. It is important to note that no new elements are generated, as with the squaring formula (see section 3.3.2), only the original elements of the sub-group are enlarged.

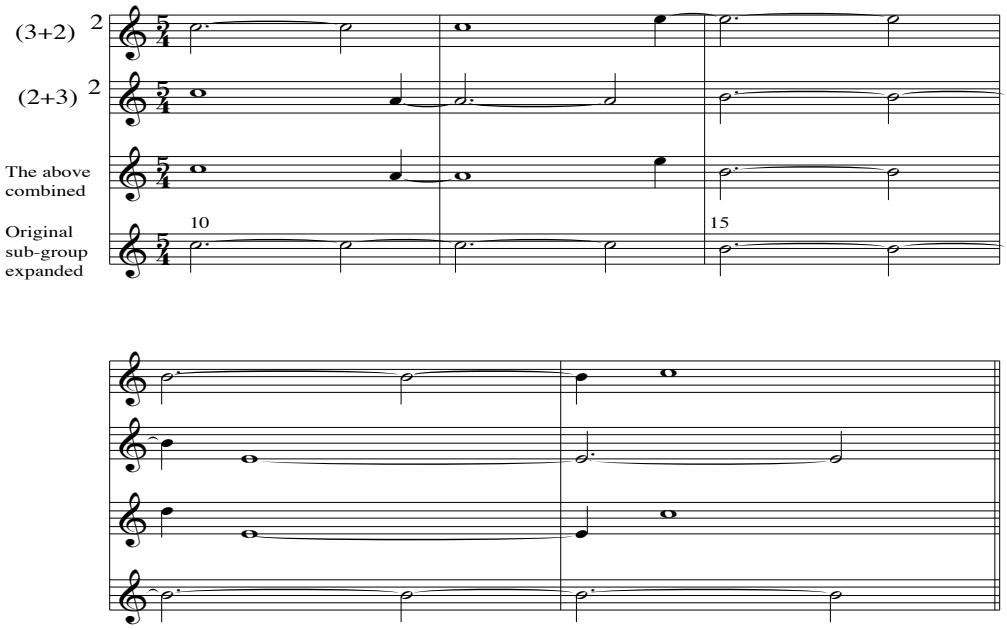

Figure 3.8. Expanding the original sub-group.

3.3.5 Incorporating rhythms produced by 'fractioning'

The method described of creating rhythms by the 'interference' of pulses (see Chapter 3, Figure 3.3) in which the duration is determined by squaring the 'major' generator can also be combined into the score so long as the major generator is identical to the master time signature.

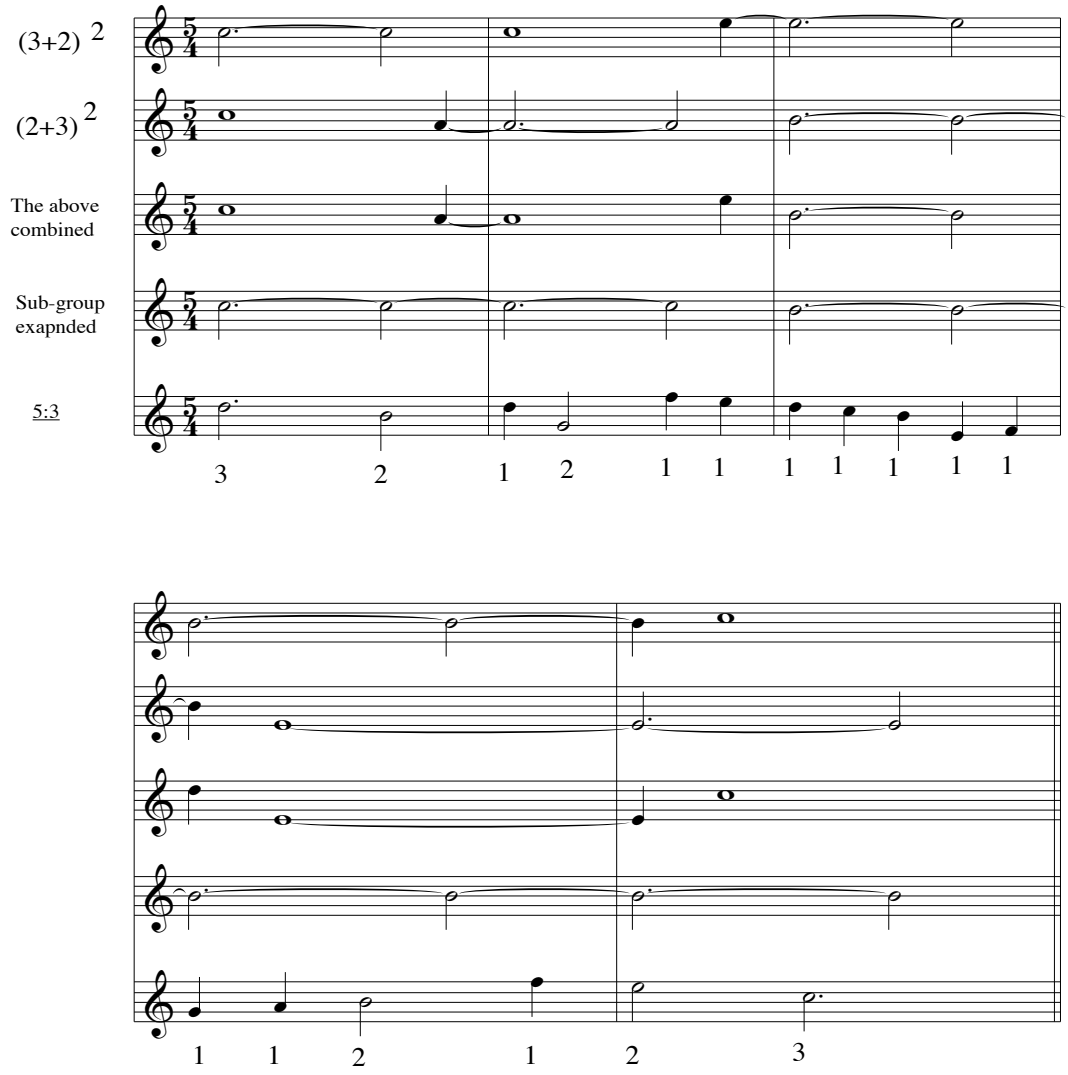

Figure 3.9. Incorporating 'fractioned' rhythms.

Square structures such as the one shown in Figure 3.9, can be generated with a very large number of parts. They are stable structures which I can only describe as possessing a satisfying rhythmic wholeness. There is diversity and syncopation of rhythm within the structure combined with a cyclical inevitability of the whole. The entire structure is generated from a single bar's worth of material.

3.4 Jazz and Funk Rhythm

3.4.1 Introduction

One of the attractive aspects of Schillinger's work is that it does not attempt to exclude any style of music on the grounds that it is not worthy of theoretical study or so loosely structured as to make analyses impossible. My own research began with the aim of revealing structure in improvisation and in my composition I have always been influenced by the flow and spontaneity of semi-improvised music such as jazz. Schillinger's observations on the rhythmic structure of jazz have been of considerable interest because they deal with jazz as it was in the 1930's and 40's. More recent forms of Jazz and funk are very different from the swing music Schillinger describes and yet his observations can be extended to provide insight into more modern styles. Schillinger's *Theory Of Rhythm,* (Schillinger 1978 page 85) suggests that much music and particularly Jazz is based on the combination of more than one master time signature [18]. For example, 'Charleston' type rhythms come about through combining the master time signatures of 6 and 8. In Figure 3.10, patterns of durations derived from the number 6 are placed in bars with 8 beats creating an accented or syncopated 'jazz' feel. In fact it would be more accurate to describe Figure 3.10 as the result of combining the master time signatures 3 and 8.

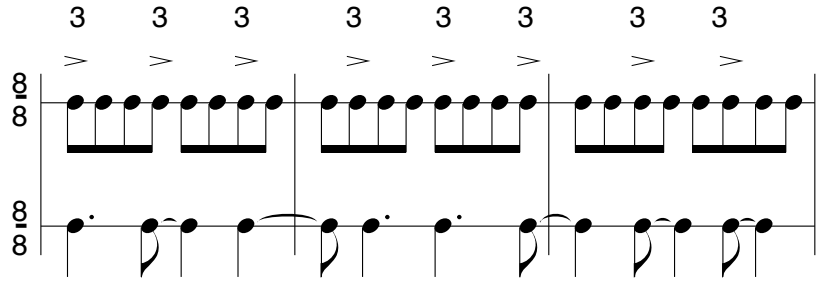

Figure 3.10. A 'Charleston' type rhythm (after Schillinger 1978 Figure 140, page 86.)

Figure 3.10 shows how durations (3,3...) are distributed in bars of 8 beats. These patterns can be represented as durations tied across the bar lines (bottom stave) or as a pattern of accents in quavers (top stave).

[18]See Chapter 2, section 2.2.3.

Schillinger suggests that swing music such as that performed by Benny Goodman and his band (Schillinger 1978 page 88) is the result of the combination of the master time signatures 8 and 9. He observes that although the music is notated as though it conformed to patterns derived from 8, it is by convention automatically *performed* in triplets. Schillinger suggests that the number 3, of the triplets, reveals the influence of the power series of which 9 is a member. Figure 3.11, illustrates the development of swing rhythms.

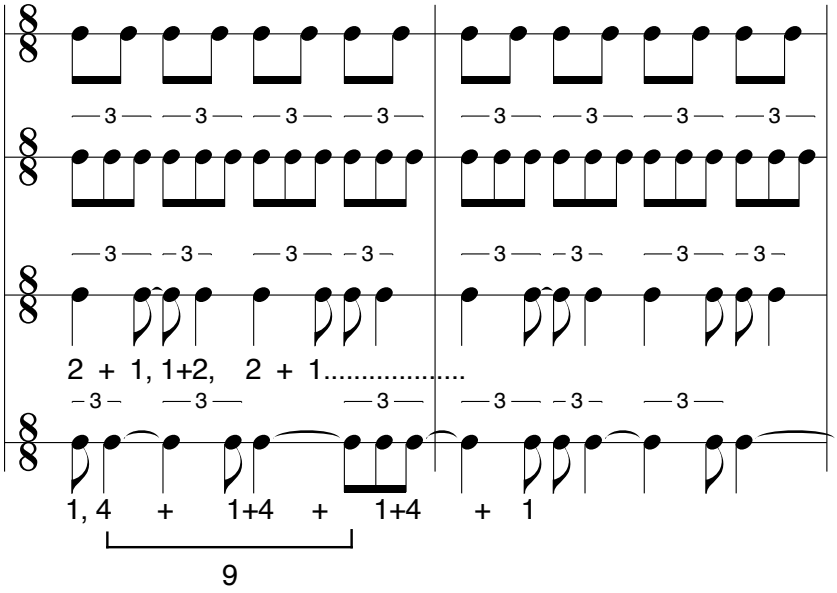

Figure 3.11. Swing, the result of combining patterns of 8 and 9.

In Figure 3.11, the top stave shows bars of 8 beats which 'evolve' into bars of 12 beats (second stave) through the influence of triplets. At this point the reader may reasonably consider that 12 is really the dominant influence on the rhythm. However, Schillinger believes that this is not really the case: both 3 and 9 belong to the same power series. It is this common factor that establishes their dominant influence on the rhythmic patterns. The third line shows typical swing patterns in triplets which are derived from sub-groups of the number 3, (2+1) or (1+2).The bottom stave of Figure 3.11, shows a sub-group of 9, (4+1+4) distributed through bars of 8 beats. Schillinger claims this to be an example of a true hybrid of the 8 and 9 series, however, as can be seen from Figure 3.11, the rhythmic unit (4+1+4) is not consistently distributed through the bars. Schillinger concludes from this that 9, is *"engaged in a struggle for crystalization'* (Schillinger 1978 page 86). Schillinger's analyses of swing and rhythmic hybrids is perhaps somewhat

over-complicated and in practise it is more convenient to think of tuplets of any sort as ornamentation of a background pulse rather than as the hybrid form of two master time signatures.

In the introduction to this chapter I indicated that I would illustrate some of the practical applications of Schillinger's rhythmic techniques. The examples given so far in this chapter are intentionally bland in order to be as clear as possible. It is also true to say that some of the compositions presented in this thesis will serve as illustrations of how the theory is applied in practise. However, I shall present two small examples showing how rhythmic techniques can be applied to the composition of funk and contemporary jazz-type rhythm. Schillinger's observation that patterns of 8 underlie swing and traditional jazz rhythm has lead me to speculate about the developments of rhythm in later forms of jazz. In the decades after his death, jazz evolved into more developed forms as is evident in the music of John Coltrane, Herbie Hancock or the Modern Jazz Quartet. In the 1970's a style of popular music known as funk emerged which could be described as a fusion of Jazz and African music. While I do not wish to suggests that funk or later forms of jazz have only one route of origin, it is useful to consider their rhythmic structure and historical development in terms of Schillinger's theory. I believe that in these later styles, a process of rhythmic evolution has taken place: in funk a whole variety of typical rhythmic patterns can be derived from sub-grouping the number 16, while more contemporary forms of Jazz rhythm can be evolved from sub-groups of 32. Figure 3.12, and 3.13, illustrate these developments.

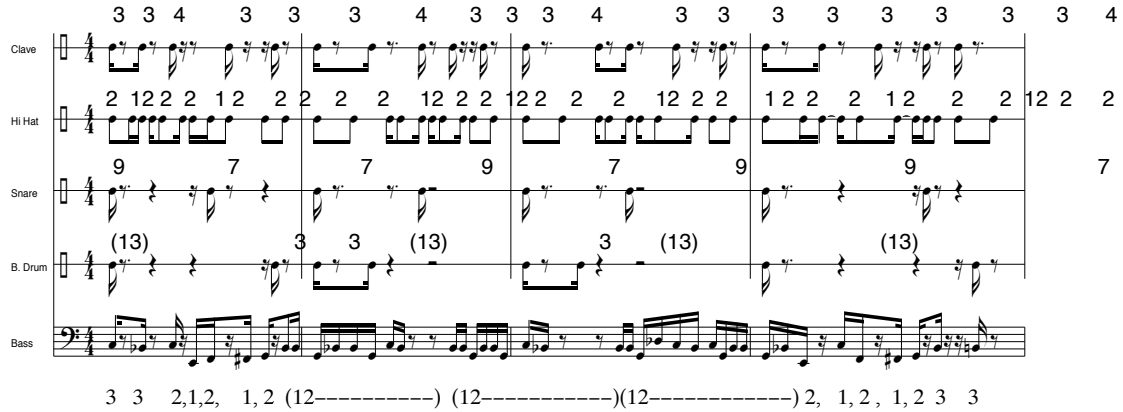

Figure 3.12. An example by the author of a funk rhythm based on sub-groups of 16.

Figure 3.12, shows a typical funk rhythm. Although the music is barred in 4/4 it is conceived as having 16 beats to the bar (semi-quavers).

Nearly all rhythmic patterns in this example come about through the sub-grouping of the number 16, (see section 3.2.1). Once the rhythm has been decided on, variation is achieved in each successive bar through rotation of the elements of the rhythm. The exception to this is the bass line which is a modification of the interference rhythm 8:3 (see section 3.1). This rhythm has a total duration of 64 semi-quavers and will therefore be contained by 4 bars of 4/4. This was desirable because I felt that the bass line, which carries some melodic content, should have a more developed rhythmic structure than the accompanying percussion instruments whose patterns exist within a single bar of 4/4. The complete rhythm of 8:3 is as follows: (3,3,2,1,2,1,2 [36×1] 2,1,2,1,2,3,3). The middle segment of this rhythm is characterised by 36 repetitions of 1. I felt that such a number of repetitions represented too much musical activity and so I modified the central section of the rhythm accordingly. I divided it into three groups of 12 (36) and arranged each group of 12 into 8 semi-quavers followed by 4 semi-quaver rests. This is a good example of how 'ideal' rhythmic structures are modified to serve the musical intention.

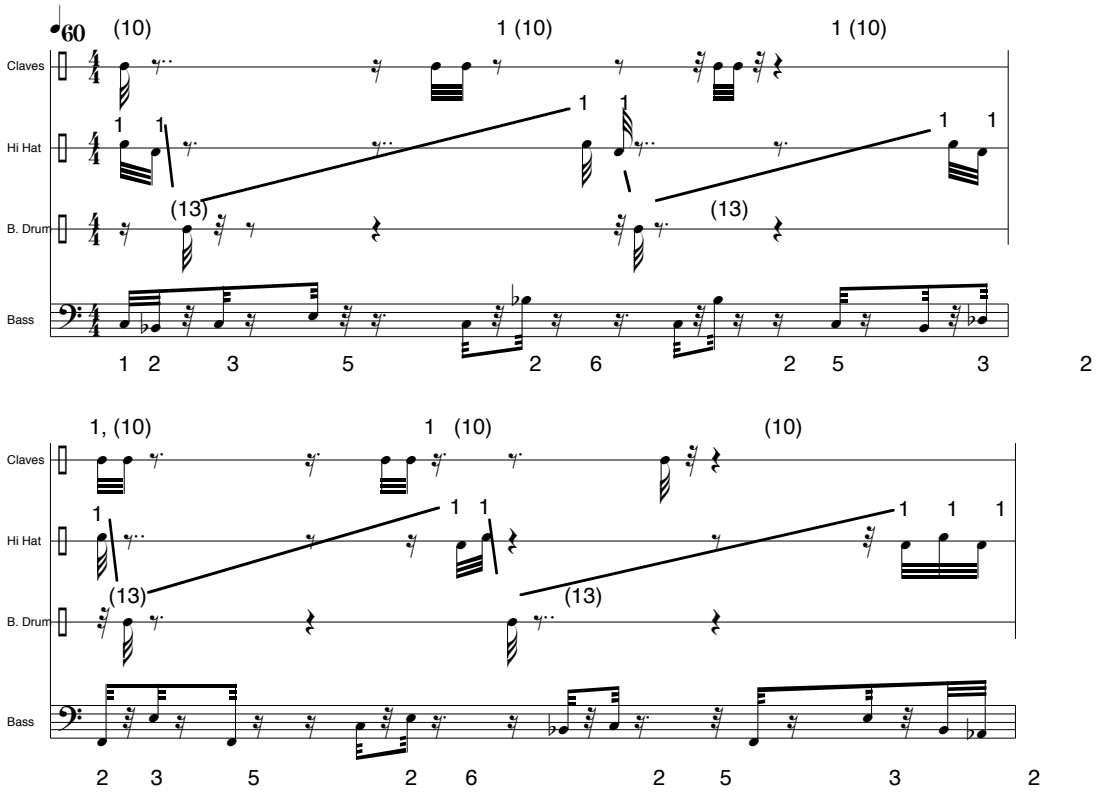

Figure 3.13. Rhythm based on 32 producing a style more associated with modern jazz.

Figure 3.13, illustrates a rhythmic structure which has been conceived in terms of 32 divisions of the bar (demi-semi-quavers). Each part is derived from a different sub-grouping of 32. Of particular interest is the bass line which originates from the Fibonacci series. Schillinger observes that the sum of the first six terms of the Fibonacci series equals 32 (Schillinger 1978 Page 92). I superimposed this sequence on its retrograde to create a variant form.

(1+2+3+5+8+13) superimposed on (13+8+5+3+2+1)=(1+2+3+5+2+6+2+5+3+2+1).

3.4.2. Conclusions

It would be a gross generalisation to claim that the master time signature alone determines the style of the music being composed. If that were true any music barred in 4/4 and based in units such as semi-quavers or demi-semi-quavers would automatically sound like contemporary jazz or funk. Clearly the choice of instrumentation and the composer's intention to create music of a particular type are equally important. However, in my experience,

it is useful and effective to adopt as a general principle the idea that typical jazz rhythms can be evolved using master time signatures which belong to a power series originating on 2. That is, (2,4,8,16,32). As general rule greater musical fluidity and rhythmic subtlety are achieved when rhythmic patterns are based on the larger master time signatures of such a series as the composer must design structures based on ever smaller units.

3.5 Organic forms

3.5.1 *Rhythms Of Variable Velocity*

In Chapter 2, section 2.2.5 and 2.5, I referred to Schillinger's use of growth series ('organic forms') as a means of creating both rhythmic and melodic forms[19]. In fact Schillinger's belief in the importance of growth series extends to art forms such as design and the visual arts.

> The patterns of growth stimulate in human beings a response which is more powerful than many other similar but casual formations. Thus we see that *forms of organic growth associated with life, well-being, self preservation and evolution appeal to us as forms of beauty when expressed through the art medium*. Intuitive artists of great merit are usually endowed with great sensitiveness and intuitive knowledge of the underlying scheme of things. This is why a composer like Wagner is capable of projecting spiral formations.... without any analytical knowledge of the process involved. (Schillinger 1978 page 352)

Building on the idea that "art imitates nature" Schillinger says,

> Musical patterns, viewed in the universe of physical, biological, and aesthetic objects, are only special cases in the general scheme of pattern making. (Schillinger 1978 page 352)

In Book I, Chapter 14, Schillinger introduces techniques of applying growth series to the generation of rhythmic patterns. *Rhythms of variable velocities* can be derived from growth series, such as the summation series, where every number is generated by the summing of the previous two.

For example,

---

[19]There is no bibliography included with *The Schillinger system Of Musical Composition* (Schillinger 1978) but it would seem likely that he would have known the work of the biologist D'Arcy Thompson, in particular *Growth and Form.*

1+2=3, 2+3=5, 5+3=8
First summation (Fibonacci) series. 1,2,3,5,8,13.....

Other series suggested by Schillinger include the following:
Second summation series: 1,3,4,7,11,18.....
Third summation series: 1,4,5,9,14, 23.....
Harmonic series[20]: 1,2,3,4,5,6.....

Although any series may be used to create acceleration, Schillinger believed that the natural choice of a particular series for a particular type of music depends on whether the master time signature of the music occurs in the series. If the master time signature of the music were 9, for example, the most suitable series would be the third summation series.
Rhythms created by growth series can be used to articulate musical form. For example, acceleration suggests beginning, retardation suggests ending. Schillinger suggests that the results of interference between a series and its retrograde produce climactic rhythms as can be seen in Figure 3.14.

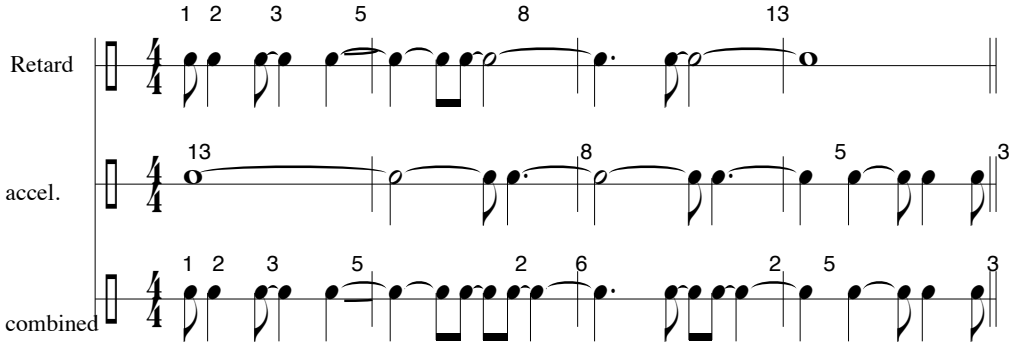

Figure 3.14. Combining rhythms of variable velocity.

In order to produce acceleration in an existing musical rhythm it is suggested the terms of the growth series are used as coefficients of acceleration or retardation. For example,

Original rhythm: (3,1,2,2,1,3)

Growth series: 1,2,3,5,8

[20]The harmonic series is not, of course, a summation series.

(3,1,2,2,1,3)+2(312213)+3(312213)+5(312213)+8(312213)=

(3,1,2,2,1,3)+(6,2,4,4,2,6)+(9,3,6,6,3,9)+(15,5,10,10,5,15).....

Schillinger notes that this technique is particularly useful for composers working in film (Schillinger 1978 page 91). Changes in tempo in a film score traditionally depended on the orchestra following the instincts of a skilled conductor. Schillinger suggests that to rely on a conductor is unwise and that the tempo changes must be reflected in the durations of the music as determined by the growth series.

3.5.2 Organic forms in melody

In the *Theory of Melody* ,Book IV, Chapter 8, Schillinger applies organic forms[21] to melodic progression.

> The growth of semitones through the summation series in unilateral and bilateral symmetry develops motifs, i.e., melodic forms, which are truly organic as they exhibit the processes of growth of intervals. (Schillinger 1978 page 333)

The following example shows two 'spiral' forms, the first developing through the Fibonacci series in one direction (unilateral) the second developing in two directions (bilateral).

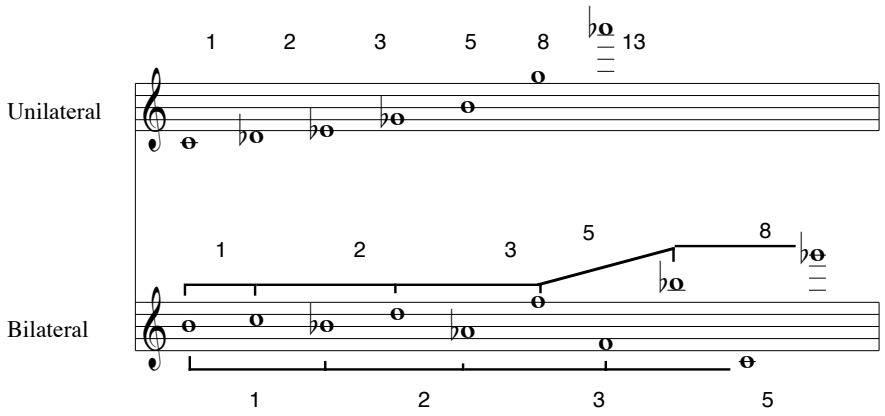

Figure 3.15. Organic forms of melody.

[21] It has been shown that the growth of living organisms can be described using growth series. The configuration of seeds in a sun flower, for example, are arranged according to the Fibonacci series. See Schillinger 1978, Pg 331.

The Fibonacci series is only one of many different summation series, all of which can be applied to melodic forms.

> These series of constant or variable ratios with harmonic arrangement of number values, when translated into an art medium, produce organic or nearly organic effects. Spiral formation as revealed through Summation Series affects us as being organic because there is *an intuitive interdependence of man and surrounding nature.* (Schillinger 1978 page 352)

3.6 Book VI : *The Correlation Of Harmony And Melody*

3.6.1 Introduction

Book VI, *The Correlation of Harmony And Melody*, describes methods of deriving melodic lines from harmonic progressions as well as harmonising pre-existing melodic lines. Chapter 2, (page 642) *Composing Melodic Attack Groups*,[22] deals with methods of controlling contrast, balance and animation in a melody with harmonic accompaniment. This requires rhythmic techniques first presented in Book I. Contrast between successive attack groups of a melody and the overall pattern of distribution of melody notes to their harmonies can be controlled using the following resources: sub-grouping of the master time signature, squaring sub-groups of the master time signature and rhythms produced by pulse 'interference'. Rotation of the elements of a rhythmic pattern can be applied as a secondary technique to all the above.

3.6.2 Sub-grouping the master time signature

[22] The number of melodic attacks/events ocurring over the duration of a chord is called an 'attack group'. See Chapter 2 section 2.7.

The master time signature can be fragmented into sub-groups of two or more elements which can represent attack groups of varying degrees of contrast. For example, a master time signature of 8, might produce the following sub-groups each with two elements: (4+4), (5+3), (7+1). The first represents balance, the second exhibits more contrast between attack groups, the third represents maximum contrast. The attack groups just described are shown below in music notation. Note that *durations* are irrelevant at this stage, since stems are only used to make attack groups clear.

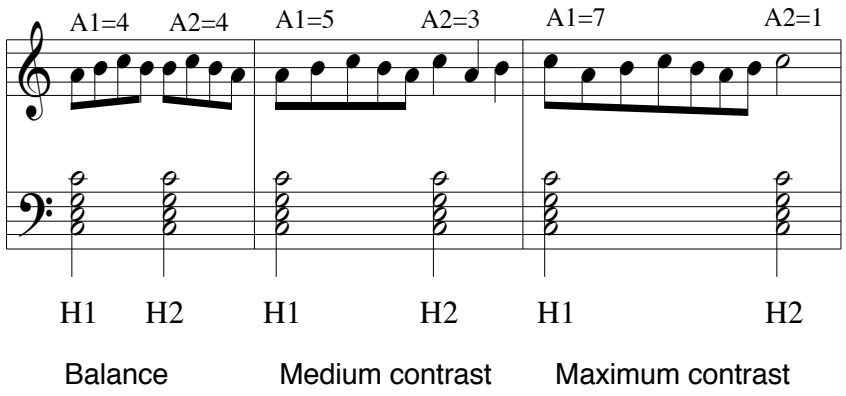

Figure 3.16. Contrasting attack groups.

In Figure 3.16, ***A*** stands for attack group and ***H*** represents its associated harmony. Rotation of the two elements in an attack group produces a variation. For example,

(A_1 = 5) + (A_2 = 3). Rotation produces (A_1 =3) + (A_2 =5)

The above attack groups placed in sequence produces a 'balanced symmetry':

5 3 3 5
---- ---- | ---- ----
H1 H2 H3 H4

The same procedure may be carried out with any number of elements but gradual contrast produced by balancing and unbalancing is not as obvious with more than two attack groups. The following is an example of a three element attack group gradually changing from a balanced state to an unbalanced state:

3,3,3→4,3,2→5,2,1

3.6.3 Rhythms produced by pulse interference and attack groups

The resultants of 'interference' provide excellent material for attack group patterns over longer ranges. For instance 7:6 (6,1,5,2,4,3,3,4,2,5,1,6) potentially provides twelve[23] attack groups. These combine well into pairs such as (6,1)(5,2)(4,3). Contrast between pairs is high at the beginning, balance is achieved at the centre and contrast is re-established at the end. Rotation of the elements of the rhythm often reveals forms which have particular musical functions. For example, a restful ending point can be found through re-arrangement of the elements of the rhythmic pattern. The original pattern ends with a 6, a highly animated attack group, but reversing the order of the last pair produces a less active ending: (6,1)(5,2)(4,3)(3,4)(2,5)(6,1). The following example, shows this re-ordered pattern in music notation. Durations and pitches have been chosen freely in order to give the example some musical realism but these have no relationship to the current discussion. Attack groups are shown by phrasing marks.

[23] The number of elements in the result.

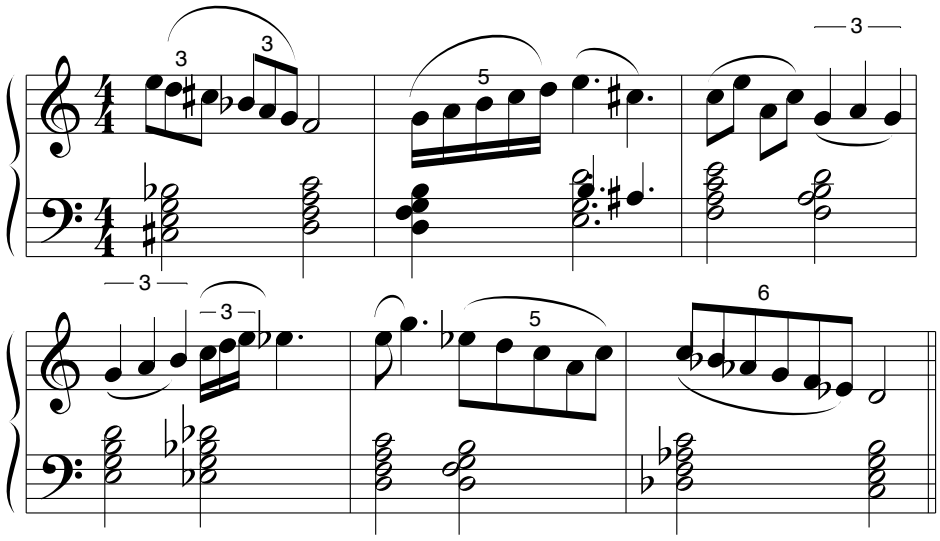

Figure 3.17. Attack group patterns derived from 7:6.

3.6.4 Attack groups and squaring techniques

The techniques described above produced attack groups of melody notes for a sequence of chords but the durations for the attacks in each group or the duration of each chord was not defined. Squaring techniques,(see section 3.3.2 and 3.2.3), can be used to create attack groups and their durations. For example, if the master time signature is 4, and the sub-group was (2,1,1), then the squared sub-group would be as follows:

$(2+1+1)^2 = (4+2+2)+(2+1+1)+(2+1+1)$

By expanding the original sub-group we obtain the following:

$(2\times 4) + (1\times 4) + (1\times 4) = (8+4+4)$

The squared sub-group and the expanded sub-group can now be combined in two parts: the former provides the attack groups and the durations of each attack, the latter provides the durations of each harmony.

Attack groups and durations (4+2+2)+(2+1+1)+(2+1+1)
Duration of harmonies 8 + 4 + 4

The following example shows the above in music notation, where 1= 𝅘𝅥𝅯

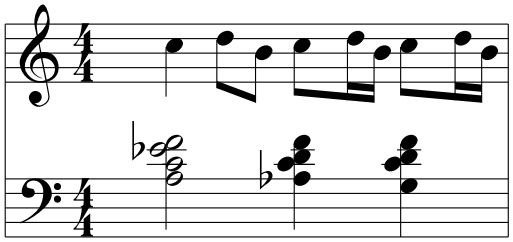

Figure 3.18. Squaring techniques applied to durations of attack groups and harmonies.

3.6.5 The rhythmic co-ordination of melody and harmony

This method involves using two rhythms, one to control the attack groups and the other to control the duration of the attacks. For example, in the following diagram, 7:6 (6,1,5,2,4,3,3,4,2,5,1,6) controls the attack groups (top line), 4:3 (3,1,2,2,1,3) controls durations of attacks,(middle line). The sum of the durations for each attack group will determine the duration of the harmonies (bottom line).

Attack groups	6	1	5	2	4	3	3	4	2	5	1	6
Durations	3,1,2,2,1,3	3	1,2,2,1,3	3, 1	2,2,1,3	3,1,2	2,1,3	3,1,2,2	1,3	3,1,2,2,1	3	3,1,2,2,1,3
Chord duration s	12	3	9	4	8	6	6	8	4	9	3	12

Figure 3.19. Two rhythms determine attack groups and durations.

In Figure 3.19, the first attack group has six assigned durations, (3+1+2+2+1+3), the duration of the chord assigned to that attack group is the sum of those durations, 12. The following score is the realisation of the above diagram, pitches are chosen freely, phrase marks show attack groups, 1= semi-quaver.

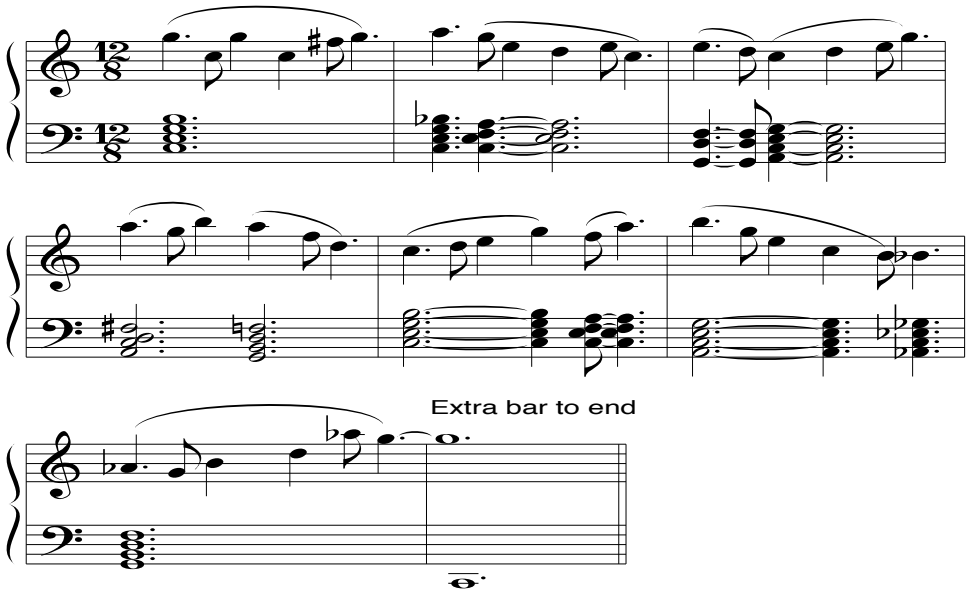

Figure 3.20. The scheme in Figure 3.19, as a score.

3.7 Conclusions

Whatever the shortcomings of Schillinger's methods and writing style, many parts of the system are, to my mind, extremely robust. In my opinion it explains more about the nature and construction of music, the 'nuts and bolts' as it were, than any other theory known to this author. Schillinger puts this point well in the preface to his book, *The Mathematical Basis Of The Arts*.

> Whereas one scientific theory overwhelms another only to be overwhelmed by new facts and new evidence, this system overwhelms the available facts and evidence. Hence its pragmatic validity. (Schillinger 1948)

Chapter 4 Compositions by the author

4.1 Introduction

The compositions in this thesis fall into two main categories.
1) Those composed using techniques derived from Schillinger's work;
2) Those composed without knowledge of his methods.
There is a further subdivision: compositions involving an electroacoustic element and those that are entirely acoustic. The table below shows the various compositions, the order in which they are discussed and the categories to which they belong. The order in which my works are presented in this thesis represents the general evolution of my compositional method.

Chapter 5, *Moon Shaman*	Pre-Schillinger	Plus electroacoustic
Chapter 6, *Riddle*	Pre-Schillinger	Plus electroacoustic
Chapter 7, *Vision and Prayer*	Pre-Schillinger	Acoustic
Chapter 8, *Rêve de l'Orb*	Pre-Schillinger	Acoustic
Chapter 9, *Bayo's Way*	Post-Schillinger	Plus electroacoustic
Chapter 10, *Make Night Day*	Post-Schillinger	Plus electroacoustic
Chapter 11, *Trilogy*	Post-Schillinger	Acoustic

Figure 4.1. Table of works in order of discussion and categorisation.

Each work shown in Figure 4.1, is considered from two perspectives: the aesthetic or imaginative impulse, what might be called the poetic background to the music, and the technical analyses of its method of composition. Wherever possible, I show how the initial inspiration gave rise to the technical approach.

Throughout the following chapters, I use words such as, 'free', 'intuitive' and 'improvised' in relation to the process of composition. At this point I must clarify my use of these terms to avoid ambiguity and confusion. As I explained in the introduction to this thesis, my initial research involved the analyses of MIDI recordings of my keyboard improvisations in order to discover characteristic musical structures. Improvisation, inspired by the 'poetic background' has, therefore, often been the starting point for many of my musical ideas. A single improvisation of this sort would never produce an entire piece or even a significant part of it and so the process of composition developed in stages of improvisation each of which followed periods of deliberate intellectual thought. When I use words such as 'free' or 'intuitive', I am in no way suggesting randomness or chance, I mean rather the absence

of a precise or exact preconceived method but not the absence of deliberate intellectual activity. Consequently, in the music composed before my discovery of Schillinger's work there is sometimes no clearly definable relationship between the stages of imagination and technical realisation. In analysing my own pre-Schillinger compositions I have applied Schillinger's ideas wherever they seem appropriate. This has sometimes revealed structures in my 'intuitive' compositions that were previously unrecognised. In the case of *Moon Shaman,* I have re-composed part of the opening, applying Schillinger's techniques to the original material. However, Schillinger's techniques are designed as tools for construction, not analysis and so there remain aspects of these compositions which cannot be explained in terms of Schillinger's ideas.

4.2 Acoustic and electroacoustic

It is arguable that the computer has been the most significant development and influence on music of the Twentieth century. Schillinger predicted in the 1940's, that the composer would very soon be in complete control of the medium of performance and sound production through the use of machines (Schillinger 1978 page 228). This is the case today but the reluctance of classical music audiences to accept computer generated sound as readily as that made by traditional acoustic instruments and the limitations of simulating acoustic timbre has to some extent made electroacoustic music a specialist field. However, as a composer, I cannot separate the process or the results of composition into mutually exclusive types. My music is intended to be a communication to the listener through structures articulated in the medium of sound and its fundamental reason for existing is not influenced by the means of generating sound. Of course, I place great importance on the aesthetic quality associated with a particular sound source and the aesthetic background to the music will dictate my choice of instrumentation but the meaning, organisation and structure of my work is not primarily determined by the use of acoustic or electroacoustic technology. For this reason the compositions presented in this thesis combine those written exclusively for acoustic instruments and those which involve a mixture of acoustic and electroacoustic sources.

In mixing my colours, as it were, I have given consideration to the very great differences between the two types of sound source. The tape part of a composition and electronic sound in general is free of many limitations and

constraints which have shaped traditional mechanical instruments. This freedom has lead to the creation of many new and exciting sounds but In my view, has also contributed a certain lack of identity. With relatively fewer limitations electronic instruments suffer a loss of distinctive character: physical constraints, it would seem, have greatly contributed to the individual and expressive qualities of traditional instruments. There is a second consideration in the use of computer generated music: events are essentially fixed and rigid once they has been committed to tape; the individual sounds which make up the tapestry are fixed and immutable. In a performance, the projection of sound can increase the level of spontaneity and spatial sensation and live electronics offer still greater flexibility but it remains the case that the most sensitive and varied production of timbre and dynamics are produced by a traditional acoustic instrument in the hands of a skilled performer. For this reason, I have always felt it necessary to place the performer at the centre of the composition. However, musicians often find it rhythmically difficult and emotionally unsatisfying to play against a fixed tape part. I have attempted wherever possible to minimise problems of co-ordination: in *Riddle* or *Moon Shaman*, for example, the tape accompaniment is largely made up of timbres of indefinite pitch and impressionistic textures which relieve the pressure of absolute synchronisation. In *Make Night Day,* the problems of co-ordination are more critical. One solution would be the use of a silent click track, but this seems to impose a distance and rigidity on the performers and so instead I have composed clear pulse and cues into the tape part.

Perhaps the most effective way of combining acoustic and electroacoustic sounds is to conceive of the latter as being extensions of the sound of acoustic instruments. In my composition *Make Night Day,* I have at times adopted this approach which helps form a link between contrasting sound worlds. In general, I choose sounds for computer manipulation and select the results of that process according to how closely they refer to my own aural experience. I prefer processed sounds to be related in some way to environmental, urban, or traditional musical sound. For this reason my electroacoustic work often contains sound that has the quality of animal cries, wind, rain or clocks, for example, but also timbres derived from traditional orchestral instruments. Different types of sound are needed to articulate structure. This includes percussive sounds and sustained sounds, capable of providing harmonic accompaniment.

5.1 Background

Moon Shaman, for bass clarinet and tape, was written in 1991 for the bass clarinettist Hein Pijnenburg. It received its first performance at the Ijsbreker Amsterdam in March 1992. The idea for this composition dates from 1991, the time of Hein Pijnenburg's visit to the City University. Pijnenburg gave a seminar and concert, demonstrating a huge variety of playing techniques ranging from multiphonic sounds to key clatter effects. He also took part in a recording session so that the sound of his instrument could be used for processing and it is from this recording that many of the sounds in the tape part of *Moon Shaman,* originate.

This work was composed before I encountered the work of Joseph Schillinger but the score presented here has been extensively revised using techniques derived from his theories. This newer version has not yet received a public performance but a studio recording is presented with this thesis on the accompanying tape.

5.2 The bass clarinet

One tendency in my work is to compose for bass instruments such as the bass clarinet or the tuba. The bass clarinet has a powerful visual appearance which stimulated and inspired me. It is an instrument that seems to me imbued with mysterious qualities: black and serpent-like, suggesting potency and darkness. The sound is driven by the breath of the performer and the instrument must therefore be connected to his or her body: this provokes the fantasy that the instrument is somehow drawing out the spirit of the performer or that it is, like a pipe, a device for taking something intoxicating into the body. The sound of the bass clarinet has a quality reminiscent of both a human and animal voice. Its lowest notes are powerful and resonant and suggest a velvety omnipotence while its higher range evokes a sense of vulnerability; overblown sounds and multiphonics add a note of pain or anger to its range of expression.

5.3 Narrative and metaphor

The mystery of magic and religious ritual stimulated me to create a series of narrative images which informed the process of composition: a shaman ritual, the conjuring up of magical forces through the repetition of some kind of prayer or spell. I imagine that shamanic rituals involve the expenditure of large amounts of energy and concentration: the shaman appears to hyperventilate thereby inducing a state of trance. In this composition the clarinettist is the shaman, and in invoking spirit forces he must literally *blow* them into life. The initial invocation is represented in the opening section of *Moon Shama*n: a rhythmically challenging solo passage of almost continuous semi-quaver motion. Having called the magic forces the shaman engages in a dialogue with the spirits. This is a mystical communication, the nature of which I have tried to capture in the metaphorical image of a 'celestial dance'. The idea of a dance through the expanses of the universe, around and about the celestial bodies, explains the presence of the word *Moon* in the title of the piece. Finally the magic decays and the shaman begins the opening ritual again.[24]

5.4 Form

5.4.1 Part I: (bars 1-115)

The narrative form described in section 5.3, divides into three parts which correspond to three sections of the piece. Part I reflects the process of invocation. The clarinet begins unaccompanied playing in the lowest register. The music is dominated by rhythm, a constant semi-quaver pulse, occasional leaps to higher registers suggest the rhythm and intensity of prayer or ritual spell. The tape enters at bar 52, suggesting the arrival of the magic forces.

5.4.2 Part II: (bars 160-180)

[24]A very similar image suggested by Shelley's poem *Two Souls* inspired my composition *Make Night Day.* See Chapter 10, section 10.2.

Part II represents the period of mystical dialogue. There are seven phrases for the clarinet separated by short tape interludes. The clarinet phrases are of contrasting character and represent the shaman's questions of the spirits, whose answers are represented by the tape interludes. The first two clarinet phrases are low in register and quite gentle (bar 117 to 118 and bar 120 to 124). They are followed by two phrases in the upper register of far more frenetic character (bar 125 to 139 inclusive). The fifth phrase (bar 140 to 150) is a return to the lower register and the feeling of calm. The sixth phrase (bar 155 to 165) is exuberant and is most obviously expressive of 'celestial dance'. The final phrase (bar 166 to 179) is less energetic and placed in the lower register of the bass clarinet, it is to my mind something of a lament and represents the fading of the magic.

5.4.3 Part III: (bars 181-254)

In part III the invocation of the opening section begins again and at bar 220, material first heard in the middle section returns but in a more strained and distorted manner which represents a sort of death - the shaman leaving the physical context of the listener. His departure is confirmed when the tape part continues after the soloist has finished, suggesting that some of the magic remains but that the shaman has been transported into another world.

5.5 The tape

5.5.1 The relationship between tape and soloist

In composing *Moon Shaman,* I deliberately created a flexible relationship between the soloist and the tape part. Without wishing to stretch the comparison too far, the tape is somewhat like an opera orchestra, setting the scene, providing atmosphere and supporting plot - the music of the bass clarinet in the middle section is like an aria. However, the tape is also one of the protagonists in the drama and in a very real sense is not under the control of the soloist. It is made up of largely unpitched sounds and impressionistic clouds of rhythmic texture which, representing unpredictable magical forces, occasionally threatens to overwhelm the soloist. This uncertain relationship is reflected in the scoring of the piece which avoids a strict synchronisation between the soloist and tape. The clarinettist must perform several changes of tempo within this sound world without there being a reference pulse of any sort in the tape part. Sounds on the tape are

notated in the score only as cue points for the clarinet to begin a phrase. This has two important effects; first the soloist must take special care to learn the tape part and not rely on a click track and secondly he must play his part with a flexibility, almost an improvised quality, which is appropriate to the dramatic content of the piece.

5.5.2 Sounds of recognisable origin

Sounds on the tape were chosen because of their potential to create mood and convey the theme of the work. As a consequence there is a varied mixture of sounds from a number of sources. At times I deliberately use sound derived from the instruments of the standard orchestra (for instance, gongs, bells and double basses) partly to suggest the traditional relationship between orchestra and soloist but mostly because I felt they had a unique power to suggest atmosphere. For example, the use of a sampled orchestral bass drum (see bars 155 ff.) or a modified double bass tremolo combined with a bass clarinet sound (see bar 88, "Rotating Bass", tape time 2'16"). For me, both these sounds have a particular expressive quality. The bass drum is used to accompany the bass clarinet in its 'celestial dance' and its thuds punctuate the bass clarinet's tumbles and somersaults suggesting an acrobatic performance. The same effect occurs in *Bayo's Way* for tuba and brass ensemble during a section originally given the mnemonic tag 'the beast enters the ring'[25]. Here the brass ensemble punctuates the tuba's leaps and tumbles. In both pieces there is an element of circus at these moments, but in *Moon Shaman*, the bass drum has the added effect of suggesting magical ritual. The double bass/bass clarinet sound, in the score called "Rotating bass," is a modified composite sound but has a recognisable origin. Its low register and tremolo component suggest a fervour of activity and the impending presence of powerful forces.

Finally there are numerous bell sounds modified through programming with envelopes and filters. All of these suggest to me atmospheres associated with religious ritual.

5.5.3. Contextual sounds

[25]See Chapter 9, section 9.4.

Sounds which have recognisable origins such as those based on orchestral instruments have their effect partly because of their cultural and historical associations. However, the tape part also includes sounds that have no recognisable origin. These sounds might be described as contextual as they tend to be used to create a sense of physical surrounding. For example, the sound described in the score as "Cymbal Swell" (Tape time 5'06") is in fact derived from a scraped piano string and to me suggests the huge expanses of space and the rushing winds created by the magic forces or, for example, at tape time 5'13" (bar 151) there is a sound derived from the key clatter of the bass clarinet. It is used mainly in the middle section of the composition between clarinet phrases and is associated with the responses of the spirit forces. I have called this sound *'water'* because for me it suggested the crisp energy of a water fall or spring.

5.5.4. Bass clarinet sounds

A number of sounds derived from the reed sound of the bass clarinet have the quality of an animal cry, such as a sea bird or a hyena and in this context represent the bleak wailing or chattering of the spirits: see for example, "Waa", (tape time 3'33") or "Ah Ha" (tape time 3,07").

5.6. Revision of the score

5.6.1 Introduction

One of my tendencies as a composer has been to write lines of music which have a continuous semi-quaver pulse. *Bayo's Way, Rêve de l'Orb, Vision and Prayer* and *Moon Shaman* all exhibit this feature to some extent. In the original score of *Moon Shaman*, the opening bass clarinet solo was composed of continuous semi-quavers, however, at relatively high speed and in the lowest register this material proved impractical for the performer. I therefore re-composed the opening attempting to preserve the character of the original while removing the element of extreme difficulty. However, in the intervening period since the first performance my interest in the work of Joseph Schillinger (see Chapters 2 and 3) had developed. It therefore seemed appropriate to attempt to apply some of the ideas in the process of re-composition.

5.6.2 Pulse analysis

As rhythm is central to Schillinger's methods, I decided to analyse the rhythmic structure of the opening section of *Moon Shaman.* It is characterised by continuous semi-quavers which form groups due to accent, phrasing or pitch changes: sequences of these groups suggest pulse. For example,

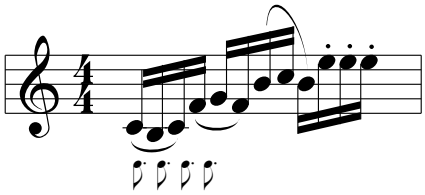

Figure 5.1. Groups of Semi-quavers suggest pulse, shown below the stave.

In Figure 5.1, pulse groups of three semi-quavers are defined by pitch and are identified by phrase mark. During the opening section of *Moon Shaman,* pulse groups are not regular but are continuously varied. A pulse group establishes itself and is then replaced by a longer or shorter pulse group. Although the composition of this section originally involved improvisation, analysis revealed some interesting patterns which can be interpreted by adapting a concept found in Schillinger's work. The pulse groups appear to be balancing and unbalancing around a rhythmic axis. The idea of balance and imbalance occurs regularly in *The Theory Of Rhythm* (Schillinger 1978) and elsewhere in Schillinger's writings[26]. Schillinger believed that unbalancing two equal quantities was one of the processes by which rhythmic patterns could be generated. Furthermore, he thought imbalance was a tendency necessary to produce forward momentum in music. This can be seen, for example, in the process of fragmenting the master time signature (see chapter 3 section 3.2.1). Fragmentation of the master time signature is the process of creating rhythmic patterns within a bar.

[26]See *The Mathematical Basis Of The Arts,* (Schillinger 1948), Chapter 6, Page 184: "*Balance, Unstable Equilibrium and Crystallisation Of Event".,*and Chapter 2 section 2.2.0, last paragraph.

For example, a master time signature of 8 (beats in the bar), divides into two equal (balanced) portions 4+4. The 'unit of deviation' used to bring about unbalancing is $\frac{1}{8}$.

$$\frac{4}{8} - \frac{1}{8} + \frac{4}{8} + \frac{1}{8} = \frac{3}{8} + \frac{5}{8} \quad \text{or (3+5)}$$

Balance and imbalance are also discussed in relation to pitch and in particular to movement around the axes of melody.[27] As far as I know the idea of an axis of pulse is not explicitly mentioned by Schillinger but can be seen as a straightforward development of his ideas following from his discussion of pitch axes and symmetry in general. Figure 5.2, shows the semi-quaver pulse groups as they appear in the opening of *Moon Shaman.* These pulse groups are arranged into bars of 4/4 shown by bold vertical lines. Where a pulse group falls over the bar line, creating syncopation, it is indicated by shading and there is no bold line.

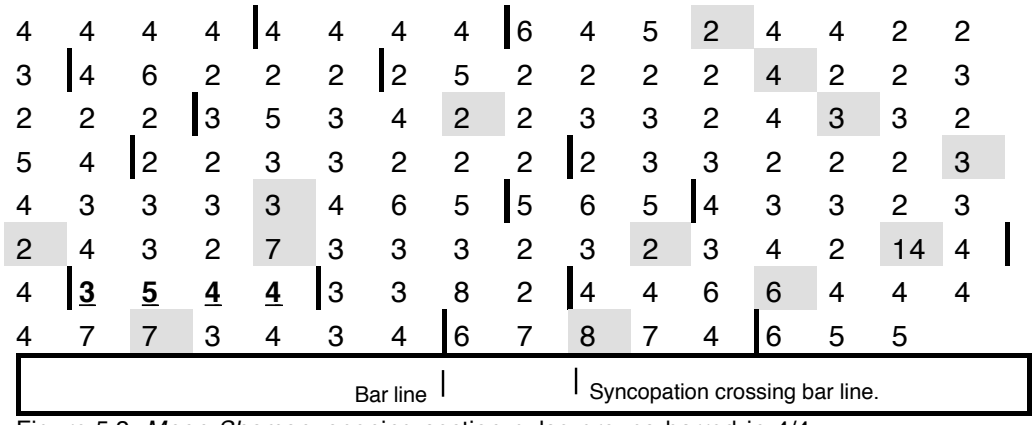

Figure 5.2. *Moon Shaman:* opening section pulse groups barred in 4/4.

Each row of Figure 5.2, should be read from left to right starting at the top. Numbers indicate the number of semi-quavers in the pulse group. It can be seen from Figure 5.2, that groups of 4 semi-quavers are established over the first two bars and could be said to represent an axis or a point of balance around which later pulse groups expand or contract by 2, 3 or occasionally 4 semi-quavers.

[27] See Chapter 2, section 2.5.

The following table shows the weighting (number of occurrences) of the different pulse groups.

Pulse Group	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**14**
Number of occurences	**36**	**31**	**34**	**9**	**8**	**5**	**2**	**1**
Total duration	**72**	**93**	**136**	**45**	**48**	**35**	**16**	**14**

Figure 5.3. *Moon Shaman:* the weighting of pulse groups in Figure 5.2**.**

It can be seen that the pulse group 4 has 34 occurences and a total duration of 136 semi-quavers making it the most dominant pulse group, exactly what one would expect from the axis of pulse. Furthermore, it lies more or less equidistant between the extremes of the range of pulse groups[28] a necessarry feature if it is to function as an axis or pivot. The process of balancing and un-balancing can be seen on the local level, within a single bar. For example, the sequence (3,5,4,4), (boldened and underlined numbers in Figure 5.2), can be interpreted as the unbalancing (-1) and overbalancing (+1) around the axis. Developing this interpretation it would appear that the axis is strongly present for the first two bars but is rapidly undermined by over-balancing in bar three (6,4,5,2) and then under-balancing in bar four (4,4,2,2,3). Overall this section might be described as a journey around the axis of pulse at first through the establishment of shorter pulse groups and then by contrast, through longer pulse groups. Finally, the axis of pulse once again becomes more dominant and there is a partial re-establishment of balance. For example, the pulse group 2 dominates bars five to seven and is then challenged for supremacy by the pulse group 3 in bars nine to thirteen. From bar 14 onwards pulse groups of 5,6 and 7 appear more frequently. The fluctuations of pulse around the axis produce a feeling of drama or tension in the opening section of *Moon Shaman.* Pulse groups smaller than the axis tend to produce an effect of higher tension and greater effort, the longer pulse groups produce the effect of dissipation of energy or dying away. The music is at its most rhythmically dynamic when there is a strong fluctuation around the axis, for example the sequence (4,6,2,2,2,) in bar 5, or the sequence. (2,5,2,2,2,2) in bar 6.

[28]The pulse groups 8, and 14, can be considered as insignificant because of their limited number of occurrences.

5.7 Approach to re-composition

5.7.1 Introduction

Having observed a scheme of pulse groups in the opening section of *Moon Shaman,* I was faced with the question of how, if at all, I could improve on it. After much consideration I decided to preserve the original scheme of pulses: during the original composition process the rhythm and proportions of the opening had been a matter of careful consideration and I felt that to alter it would be rather like trying to shift the foundations of a building. I decided to break up the continuous semi-quavers of the original by introducing rests thereby allowing the performer time to breathe and prepare for the next phrase. For example, where in the original there were 4 semi-quavers in a pulse group, there would now be 2 semi-quavers followed by a quaver rest. Figure 5.4, illustrates this process.

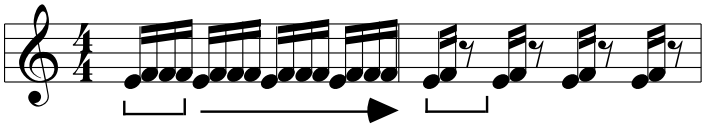

Figure 5.4. Pulse groups are modified by the insertion of rests in place of semi-quavers.

5.7.2 Re-barring

As a consequence of introducing rests it was necessary to completely re-bar the opening section to indicate more clearly how the pulse groups should be articulated. The original was barred in 4/4 for visual simplicity which was acceptable because there was continuous semi-quaver motion which allowed the use of phrase markings and accents in order to show the different pulse groups. Once rests had been introduced, bars of 4/4 were misleading: phrase marks (traditionally not placed over rests) could not be used to indicate the start and end of pulse groups mixed metre was the only accurate way of doing so.

5.7.3 Re-composing pitch

The introduction of rests meant that many pitches in the original were lost. In another context the loss of a large number of pitches from a score would be catastrophic but it was clear to me that rhythm was the most important feature of the Introduction; the primary role of pitch was to help articulate the rhythm groups. I decided to completely re-compose the pitch content of the opening in a more structured manner than the original which had come about through improvisation. I made use of two techniques described by Schillinger: symmetrically distributed pitch units[29] and *progressive symmetry*.[30] In *The Theory Of Pitch Scales* (Schillinger 1978), Schillinger introduces the idea of dividing the octave into symmetrical portions. This produces five "scales" with a varying number of pitch units

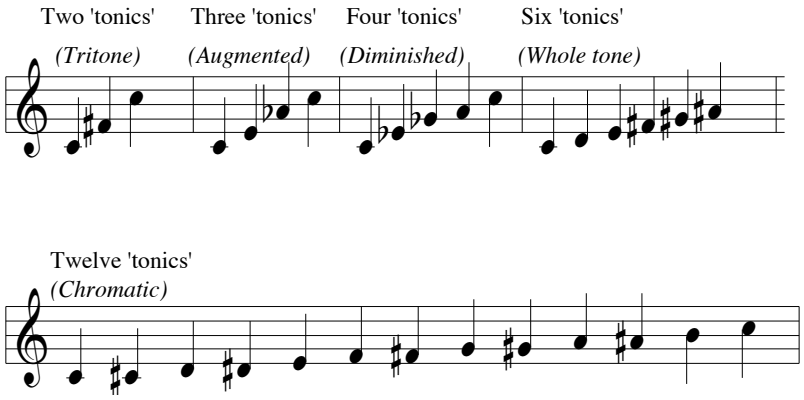

Figure 5.5 The octave divided symmetrically in five different ways.

Schillinger describes each pitch of such a scale as a 'tonic' because further 'sectional scales' are built on each of them. For example,

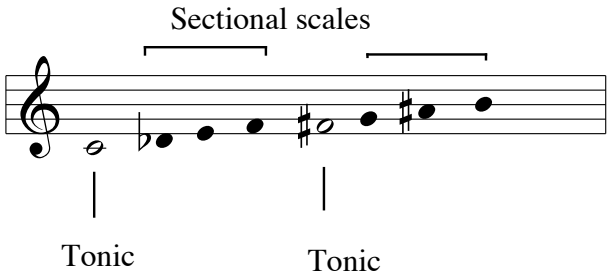

Figure 5.6. A two 'tonic' symmetrical division of the octave with 'sectional scales'.

Schillinger suggests that the effect of polytonality can be achieved by using these scales simultaneously in different parts of the score. As *Moon Shaman* is a solo composition I used this method, not as a means of effecting polytonality but in order to create a feeling of continuous modulation,

[29]See Chapter 2, section 2.3.3.
[30]See Chapter 2, section 2.12.3.

expressive of the progressive working of the magic. I used a symmetrical scale of four 'tonics': C, E flat, G flat, and A, and ornamented each 'tonic' with its upper and lower semi-tone neighbour notes.

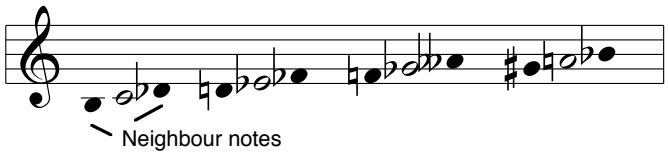

Figure 5.7 A four 'tonic' symmetrical division of the octave with neighbour notes.

I chose a scale starting on the pitch C, in order to correspond with the lowest note of the bass clarinet. I wanted this note to be heard most often during the opening and for there to be forays to the other 'tonics' culminating in a return to the C 'tonic'. The sequence in which the tonics are heard is controlled using a technique described by Schillinger as *Progressive symmetry*. This method allows any number of different elements to be arranged in a 'symmetrical' and 'progressive' form. In this case, four elements, ***ABCD,*** represent the four 'tonics':

A= the pitch C,
B= the pitch E flat,
C= the pitch G flat,
D= the pitch A.

The elements ***ABCD*** are arranged as follows:

(A)(AB)(ABC)(CD)(D)

This is a symmetrical grouping of the four elements which brings about a transformation, a progressive change in the emphasis or dominance of succeeding elements. I modified this arrangement by adding an extra element (***E***), at the end of the sequence of elements:

(A)(AB)(ABC)(CD)(D)(E)

Group ***E***, corresponds to the pitch B natural, the leading note of 'tonic' C (element ***A***), and thereby facilitates the repetition of the scheme.

Having decided on the sequence in which the 'tonics' appeared it was necessary to fix their rate of occurrence. I wanted to evoke a sense of

increasing tension and so I employed a growth series (18,11,7,4,3,1) which seemed to offer the right degree of change and tension. Each member of the growth series served as a coefficient of repetition[31] for each *bracketed* group of elements shown in the scheme of *progressive symmetry*. The growth series and the scheme of progressive symmetry were combined into the following arrangement:

18(A) 11(AB) 7(ABC) 4(CD) 3(D) 1(E)

The final step was to combine this sequence with the pulse groups shown in Figure 5.2. This is described as follows:

The first 18 pulse groups are assigned 'tonic' C.
The next 11 pulse groups are assigned 'tonics' E flat and G flat alternately.
The next 7 pulse groups are assigned 'tonics' C, E flat and G flat, alternately.
The next 4 pulse groups are assigned 'tonics' G flat and A alternately.
The next 3 pulse groups are assigned 'tonic' A.
The next pulse group is assigned B natural.

Of course the pulse groups are highly irregular and when combined with the terms of the growth series (18,11,7,4,3,1) distort its acceleration. As a consequence the rate of change is generally accelerating but is not precise.

Figure 5.8, below shows the final realisation of the score.

[31]Using one group of numbers to control the number of repetitions of a second group of elements is mentioned by Schillinger in *The Theory Of Pitch Scales* (Schillinger 1978, Page 104). The first group become the "coefficients of recurrence" for the second group.

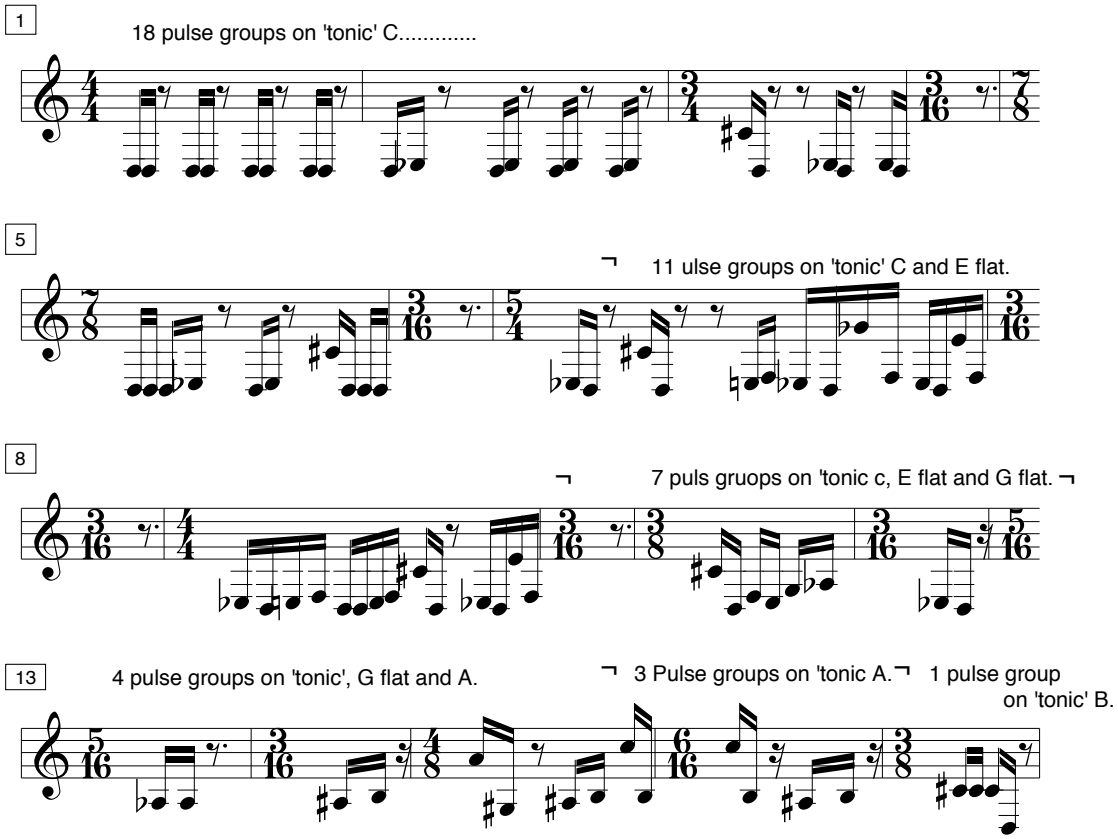

Figure 5.8. *Moon Shaman: bars 1-17.* Coefficients applied to pulse groups and tonics.

5.8. Conclusions

Moon Shaman, was written before my discovery of Schillinger's work and was originally composed intuitively. Although my approach to the technique of composition has changed greatly since the time of writing, the musical substance and poetic motivation remains the same. Most of the score needed only minor revisions but impracticality in the original score was most critical in the opening of the piece and as this material re-appears several times it was essential that I revised it. In describing this process I hope to have shown that analyses and re-composition using techniques derived from Schillinger's work have improved the structure of the opening section. I have attempted to demonstrate that the concept of balance and imbalance around an axis can be applied to areas of music other than those explicitly described by Schillinger and most importantly that, whether or not they have been deliberately considered in the act of composition, they are not just intellectual ideas but real qualities which influence music.

Chapter 6 *Riddle*

6.1 Background

6.1.1 Introduction

Riddle, for contralto and tape is a setting of the first riddle in the *Exeter Book Of Riddles* (Crossley Holland 1979) an ancient anthology of Old English poetry, donated to Exeter cathedral library in 1072 on the death of Leofric, the first Bishop of Exeter, the answer to this riddle is 'a storm'. *Riddle* was composed in 1992 for the singer Loré Lixenberg, with whom I had previously worked as conductor on performances of Birtwistle's *Down by the Greenwood Side* and Maxwell Davies' *Miss Donnithorne's Maggot.* These pieces certainly had an influence on my composition of *Riddle.* The choice of an Old English text and the mystery associated with riddles reflects the influence of Birtwistle's music theatre work while *Miss Donnithorne's Maggot* introduced me to the possibilities of extremes of contrast in vocal style and extended vocal techniques in general. In performing *Riddle,* the singer must embrace the dramatic nature of the piece taking on the role of 'keeper of the riddle', magician and story teller. I have suggested that in performance, the dramatic nature of the piece might be enhanced by lighting. Using the expressive powers of her voice the singer not only imitates the sounds and violence of the storm but conjures up its spirit which is represented by the sounds of the tape.

6.1.2 Collaboration

By the time I came to compose *Riddle,* I was very familiar with Lixenberg's own particular vocal range and especially her repertoire of extended techniques which included the production of multiphonic tones. The process of composition involved extensive collaboration which resulted in a richness of vocal writing which would have been impossible otherwise. The method of collaboration was as follows: I would present notated ideas which Lixenberg would embellish through improvisation and positive results would be incorporated into the subsequent version.

The product of this kind of work can be seen at the end of the score at tape time 3'56". The unusual placement and elongation of vowels and

consonants and the nasal vocal tone, indicated by the direction "Eastern" are all examples of our collaboration, see Figure 6.1

.

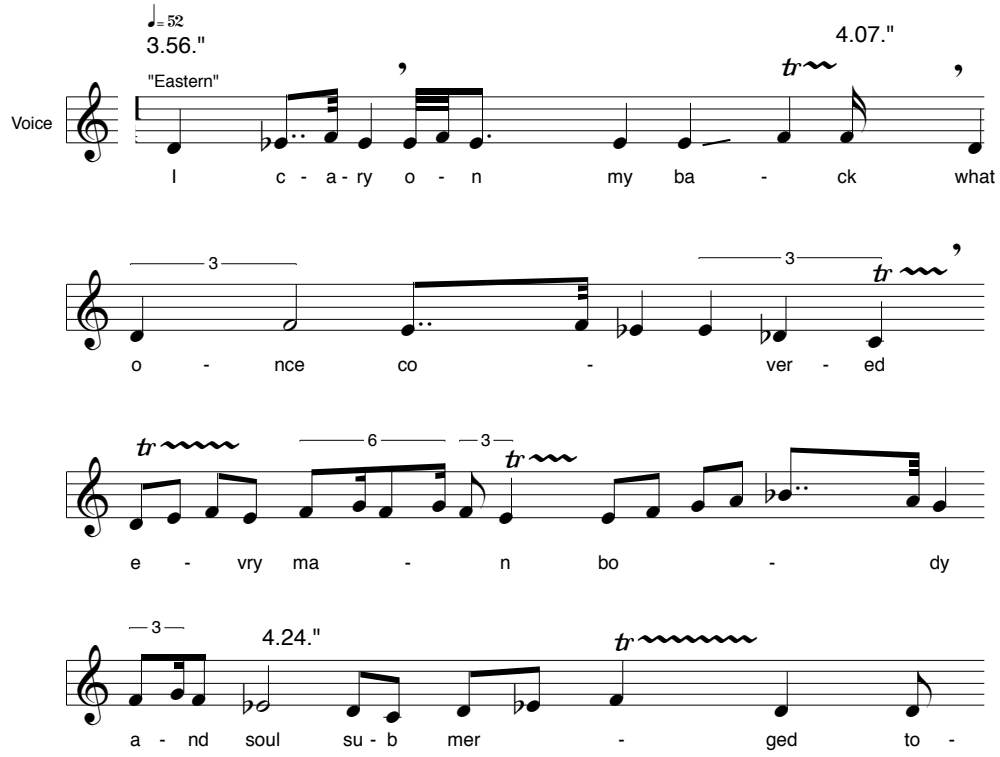

Figure 6.1. Results of collaboration: style and embellishment

Riddle, was completed before I discovered the work of Joseph Schillinger and therefore is representative of a type of approach which depends less on predetermined structural principles such as those described in chapters two and three. In fact the method of collaboration described above meant that the exact rhythm and timing of events was very much determined by the text and the vocal phrasing which it inspired.

6.2. Form

The text of the *Riddle,* naturally divides into three portions:

1) An introduction in which the riddle-teller challenges the audience to guess the answer to the riddle.

2) A dramatic description of the consequences of the storm.

3) A further challenge to guess the meaning of the riddle.

The text is shown below with double slashes marking the different sections and brackets representing words omitted in my setting.

Which man is so sharp and so quick [*witted*]
as to guess who sends me on my journey
//
When I get up, angry, at times awesome:
When I roar loudly and rampage over the land,
sometimes causing havoc: when I burn houses
and ransack palaces? Smoke rises,
ashen over roofs. There is a din on earth
and men die violently when I shake the forest,
the flourishing trees, [*and fell timber-*]
I with my roof of water, driven far and wide
in pursuit of vengeance by powers above;
I carry on my back what once covered
every man, body and soul submerged
together in the water.
//
Say what conceals me
or what I, who bear this burden, am called.

Crossley-Holland (1979) page 21.

I have added the word 'riddle' to the introductory section of the piece. It is broken into its individual syllables which are whispered and sung as fragments in order to disguise their meaning. In this way I have tried to introduce a puzzle of my own and to evoke a sense of mystery at the very start of the piece.

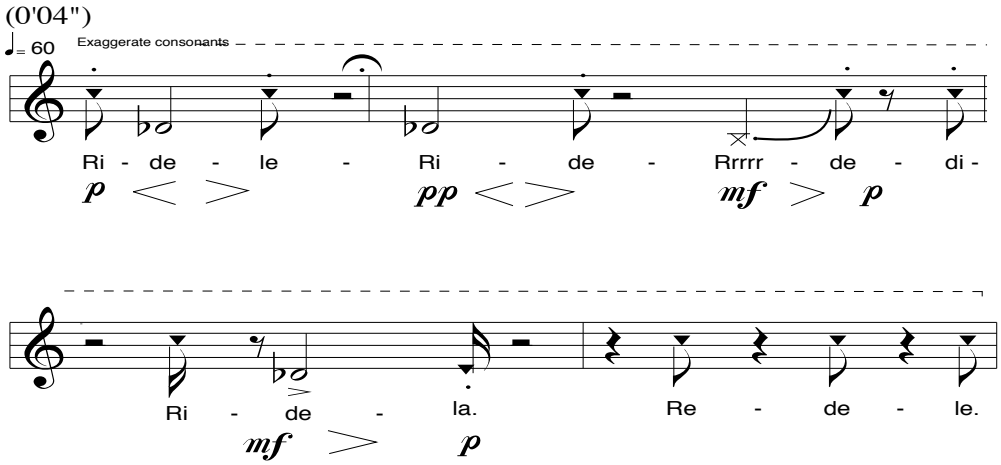

Figure 6.2. *Riddle* (time 0'04"): the composer's addition to the text

6.3. Word Painting

The form and structure of many of the compositions submitted in this thesis, such as *Moon Shaman* or *Bayo's Way*, have been inspired by poetry or narrative. *The Exeter Riddles*, with their rich metaphorical imagery, are full of potential for this kind of treatment. In this case the text was a direct source of inspiration for the vocal line and tape part through the device of word painting. For example, the image of the wind shaking the 'flourishing trees' produces a direct parallel in the vocal part.

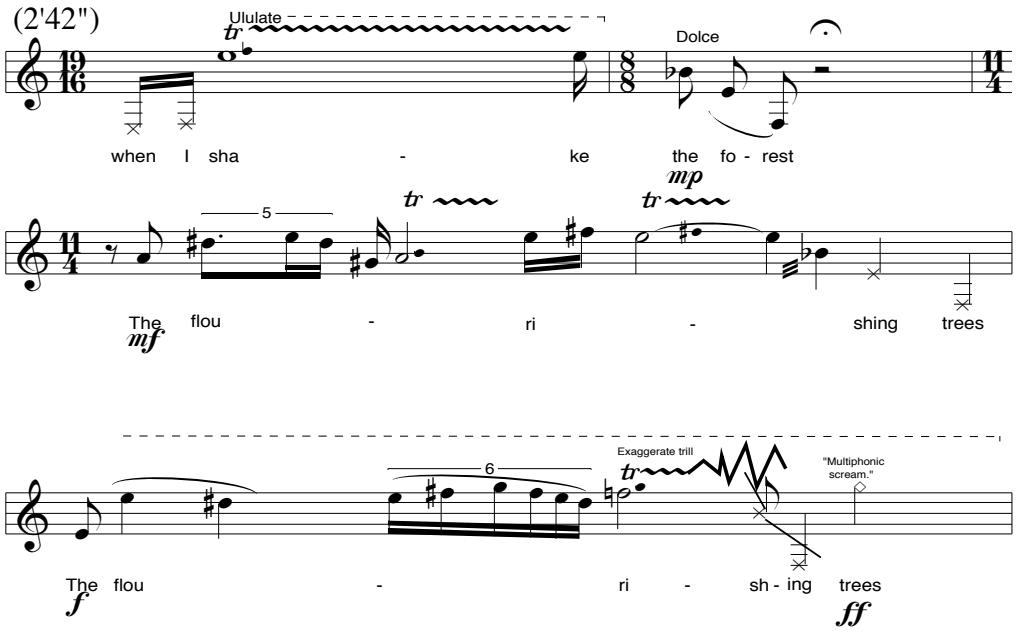

Figure. 6.3. *Riddle* (time 2'42"): examples of word painting.

The singer performs the word 'shake,' by ululating and trilling. Reference to 'the forest' is articulated with a softer dynamic and sweeter tone in order to contrast its fragility with the storm's fierceness. The word 'flourishing' engenders a series of ever increasing trills and embellishments. The final appearance of the word 'trees' is screamed, suggesting the sound and force of the wind. I have injected a note of mischief into the character of the storm. For example, the line "sometimes causing havoc" is marked *piano* and *dolce*, which, coming unexpectedly between violent outbursts, is coquettish.

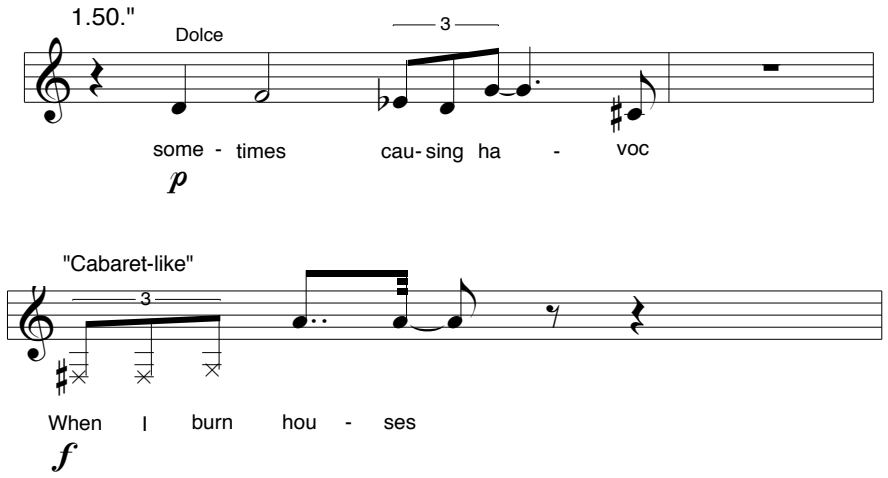

Figure 6.4. *Riddle* (time 1'50"): contrast in characterisation.

The use of *sprechgesang* and the marking *cabaret,* indicate a certain capricious character to the storm.

6.4. Pitch

6.4.1 Pitch Clusters

The choice of pitches was not a result of the collaboration but came about through the use of two different processes: pitch clusters and interval cells. The melodic form of the vocal line and the definite pitched sounds of the tape accompaniment are made up from two main pitch clusters.

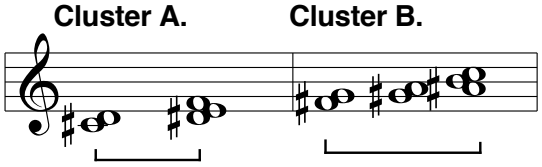

Figure 6.5. The two pitch clusters.

The vocal line alternates between the pitches of the two clusters whenever contrast is required.

For example, Figure 6.5 shows how a switch from one cluster to another occurs between the end of a violent passage and the immediately following softer phrase.

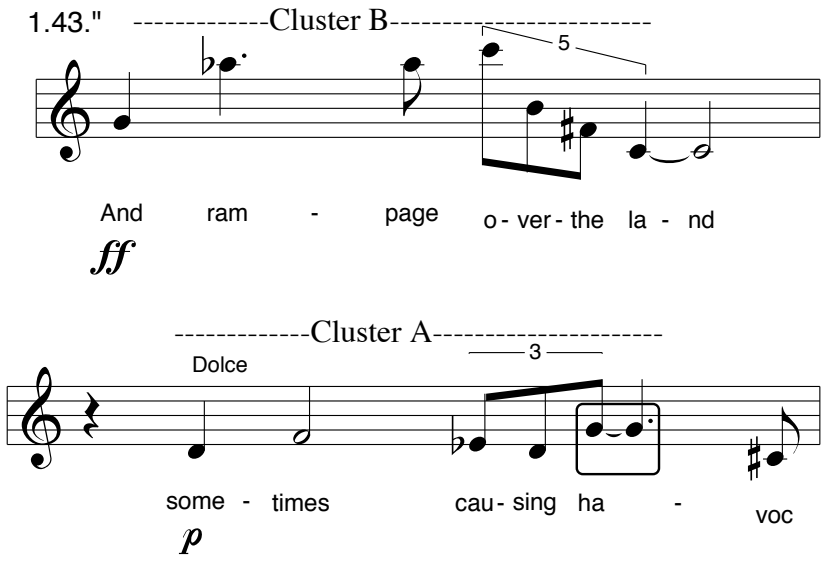

Figure 6.6. *Riddle* (time 1'43"): alternating between pitch clusters

The pitch G natural, enclosed by a box in Figure 6.6, is not a member of cluster A, and is an example of a local deviation from the system.

In order to effect a gradual transition between the two clusters I combined their pitches into hybrid forms. The most obvious example of this comes at the end of the introduction just before the evocation of the storm. The mixed pitches form an augmented triad (G, E flat and B) which for me suggests expansion and transformation especially in the context of the surrounding material made from the relatively dissonant intervals of the clusters.

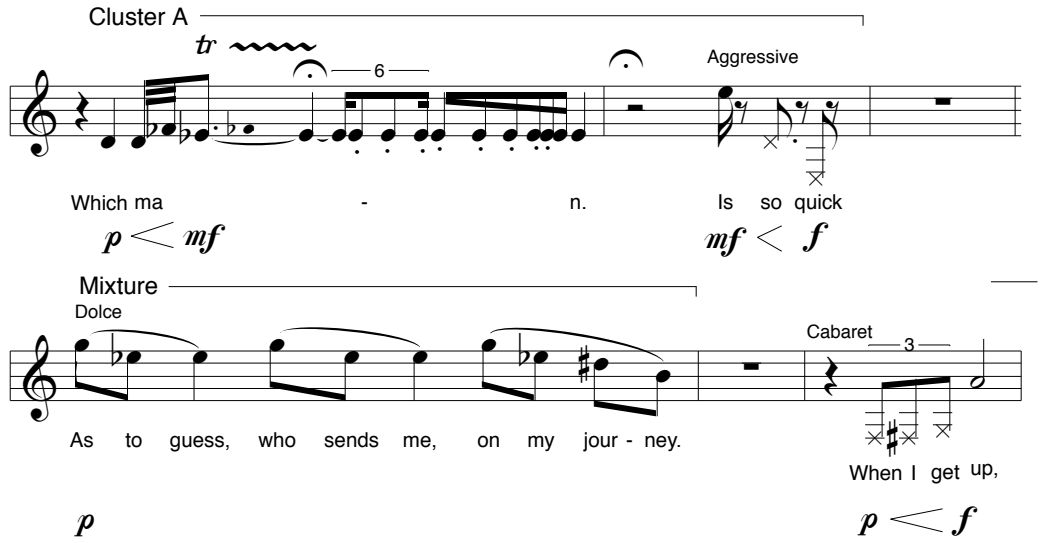

Figure 6.7. *Riddle* (time 0'37" ff): transition between clusters.

6.4.2 Interval Cells[32]

A sequence of intervals, for example a semi-tone and a perfect fourth, can be started from any chosen pitch. The direction of any interval or its inversion is a matter of free choice. This method often creates unexpected variations which are related through characteristic intervals. In the following diagram each bar represents a different 'route' starting from the same point and following the interval pattern (1,5) where 1=a semi-tone.

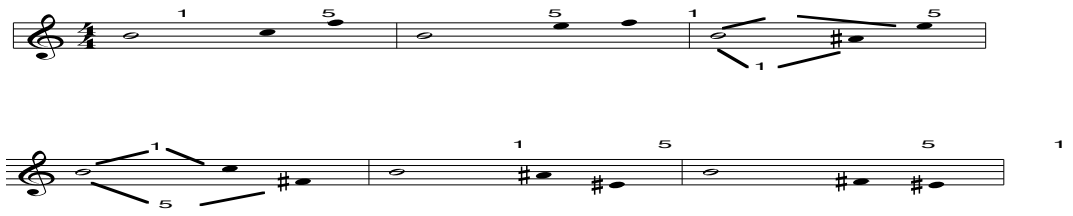

Figure 6.8. Cell construction from a single starting point.

In *Riddle,* I used this method as a contrast to that of pitch clusters. I also found it useful in creating transitions between the two pitch clusters as the

[32]The method of creating melodic forms through connecting a limited series of intervals was described in detail in my analysis of *Rêve de L'Orb.* See Chapter 8 section 8.2.4.

interval cells almost inevitably contained a mixture of pitches from both of them.

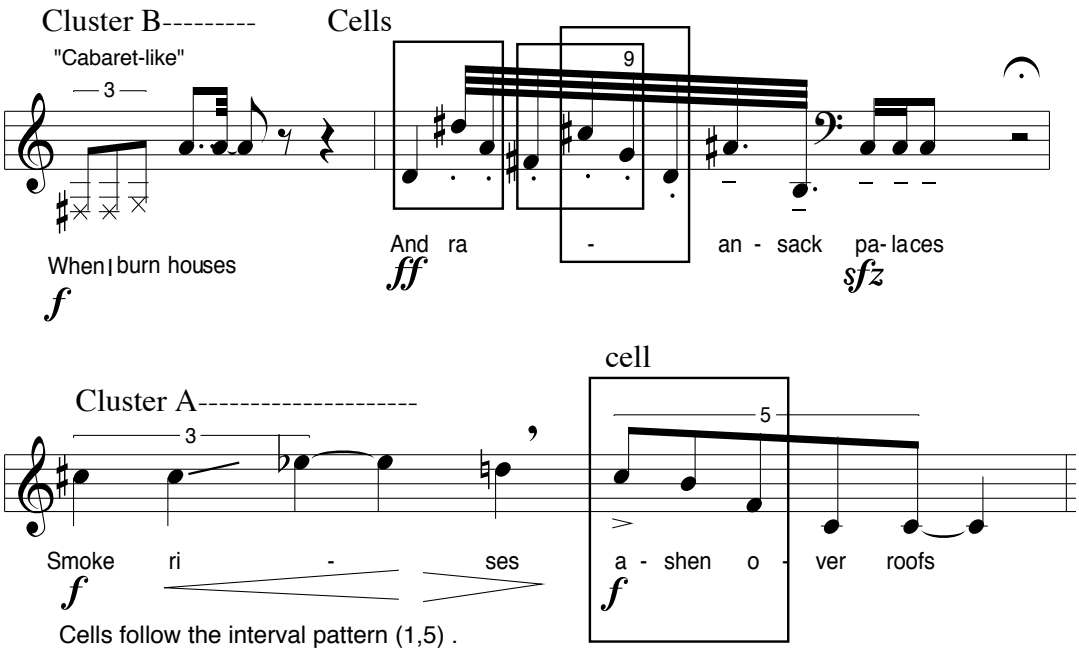

Figure 6.9. *Riddle* (time 2'01"): interval cells

6.5. The tape

The tape part has several different roles. At the beginning of the piece I have used sounds derived from an organ, flutes and bells, in order to evoke a sense of ritual and suggest an aura of power surrounding the performer. The organ and bells are both types of instrument connected with religious ritual, and I also associate the flute and the organ with the mysterious quality of vibrating air columns. These sounds are also intended to remind the listener of the origins of the text and its link with Exeter cathedral.

The tape part suggests location and action in a way similar to contextual sounds in radio drama. It serves to evoke atmosphere and images associated with the text. For example, a reference in the text to the screams of dying men is accompanied by the sound referred to in the score as "Ahh" (2'38").

The words "ransack palaces", (2'04" in score) are accompanied by a sound referred to as "Dog's bark" which I associate with scenes of mayhem as the storm tears through buildings. Other less obvious sound references include "lightning" (2'18") which I have characterised as a high pitched sound played as a volley of descending arpeggios.

The tape part is not just an accompaniment for the performer, providing context but should be experienced by the listener as something created by the performer and which responds to her words and punctuates her phrases. For example, the sound "cymbal swell" (0'37"), a metallic sound which rapidly swells in volume, prepares the word "sharp". The performer should embrace the theatrical potential of this relationship through some gesture indicating that this sound is controlled by her and, as it were, hurled across the performance space.

6.6. Conclusions

Riddle, is unique in terms of the compositions presented in this thesis. It has a strong music theatre element deriving its form and much of its detail from the text. Other compositions in this thesis have been initially inspired by texts but in their final form they have evolved beyond them into works which are largely determined by purely musical language and considerations. This is not the case in *Riddle,* where the text is always central to the work, being performed by the singer and directly inspiring much of the musical detail. *Riddle* is also unusual amongst my compositions in being written for a particular performer and in evolving out of a strong collaboration between singer and composer. *Bayo's Way* is also in this category as it was specially composed to compliment Oren Marshall's style of performance. However, *Bayo's Way* was less directly collaborative than *Riddle*: the soloist is given space in the performance to improvise, whereas in *Riddle,* there is no equivalent improvisation due to the fact that the process of composition itself involved the performer's skill in this field.

Collaborative work of this kind makes theoretical analysis of compositional method relatively redundant. It would be pointless to apply Schillinger's ideas to explain this work as so much of the rhythm and proportions of the music were determined by the rhythm of the spoken text.

It would of course be possible to apply Schillinger's techniques to the further development of material in the piece. For example, in composing the pitches of the vocal line I have adopted a systematic and predetermined approach involving two pools or clusters of notes. As far as I am aware, Schillinger never specifically describes this particular cluster arrangement but in any case would have treated it as just another scale, subject to standard techniques of variation. Similarly, my use of interval cells is not derived directly from Schillinger's theory but could be deduced from *The Theory Of Pitch Scales* as being an example of the evolution of melodic forms from scales containing two intervals.

7.1 Introduction

Vision and Prayer for violin, cello, bass clarinet and marimba was commissioned by the bass clarinettist, Hein Pijnenburg. It was composed in 1992 and given its première at the Ijsbreker in Amsterdam in the same year. In this chapter I will discuss the poetic background of this composition and show the origin of its musical material. *Vision and Prayer* was written before my discovery of Schillinger's work and was composed without the background of such a method. However, I believe that the composition as a whole can be better understood by reference to ideas found in Schillinger's theories.

7.2 Literary source

Vision and Prayer takes its title from a poem of the same name by Dylan Thomas and is a direct response to the poem itself. As the title suggests, the poem resonates with spiritual and religious imagery and in the light of some of my other work inspired by dream states (*Rêve de l'Orb*) or imaginary religious ritual (*Moon Shaman*) it is unsurprising that this poem should provide a source of musical inspiration.

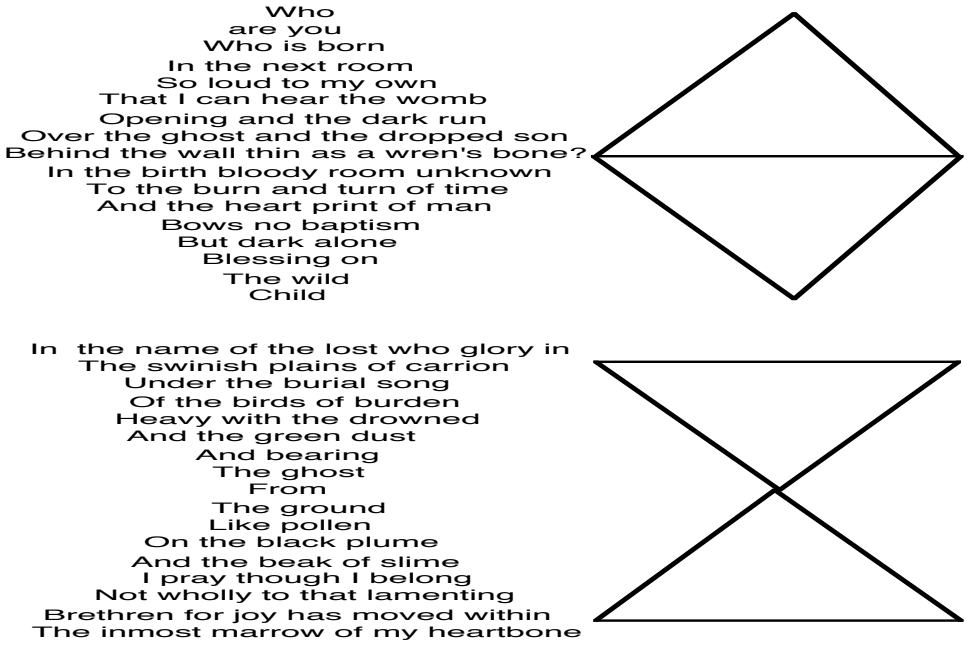

Figure 7.1. *Vision and Prayer*: two verses from the poem and their outline shapes.

The influence of this poem on the composition can be seen in various ways. The large scale or background shape is influenced by the form of the verse. The middle ground of the piece, sub-sections of around 50 bars in length, are inspired by moods evoked by the poem. On the local level, the foreground, certain specific references in the poem have been translated into details of the music.

7.3 Poetic form and background music structure.

The poem itself has an extraordinary form as can be seen from the shape of the verses in Figure 7.1. The first six verses have the shape of two triangles, one inverted and joined to the other at their common base. The final six verses are the opposite: the triangles are joined at their tips. There is striking symmetry in this arrangement of the verses which effected my reading of the poem. In the case of the verses which expand towards the centre, there is a gradual increase in what might be called poetic 'information'. The longer a line, the more complex are the images contained in it and the greater its intensity seems. At the centre of the verse the longest lines occur consecutively producing a period of greatest intensity. After reading past the centre of the verse the mirror image or retrograde form begins and the intensity diminishes. I wanted to compose music which flowed in the same way as Thomas's poem. My observations concerning the rise and fall of intensity in the poem lead me to look for equivalent forms in natural phenomena, such as the rise and fall of a wave or the shape of the breath and from these create musical phrases and the form of the composition as a whole. I arrived at a background form in which the metaphor of the wave was expressed in the rise and fall of the musical dynamic around two points of climax, the second having much greater intensity than the first. Figure 7.2 shows a simple diagram of how the wave shape manifests itself in the form of *Vision and Prayer.*

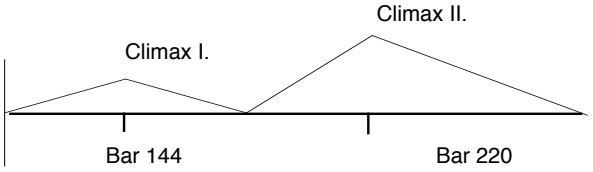

Figure 7.2. *Vision and Prayer:* two climaxes.

In order to compose music based on these two wave shapes I devised a more detailed set of narrative or mnemonic references based on moods and

images evoked by the poem. The scheme and its six sections are shown below.

Section/Bar	Mnemonic/Mood	Form
I:1-92	First meditation/prayer	Introduction/exposition
II : 93-114	Thought rising	Transition
III : 144-122	Incomplete vision	First climax (short)
IV : 123-196	Second meditation/prayer	Second exposition
V : 197-219	Thought rising	Transition
VI : 220-280	Complete vision	Climax and ending

Figure 7.3. *Vision and Prayer*: the sections of the piece, their mnemonic and function.

From this table it can be seen that on two occasions the music reaches a climax progressing from a meditative state to one of vision and revelation. The direction of this progression (meditation→revelation) is the inverse of the direction that would logically be suggested by the title of the poem. This reversal came about unconsciously and illustrates how musical considerations ultimately become more important than the original source of inspiration.

7.4 Local forms

The poem not only inspired background and middleground structures (Figure 7.3) but also a number of foreground, surface details. For example, several references in the poem to the heart inspired a motif which I named 'heart beat'.

"And the heart print of man
Bows no baptism"

Part I, verse 1.

Or, for example,

"Brethren for joy has moved within
The inmost marrow of my heart bone"

Part II Verse 1.

The 'heart beat' motif first appears at bar 52, played by the cello and, as can be seen below, its rhythmic pattern suggests the beating of a heart.

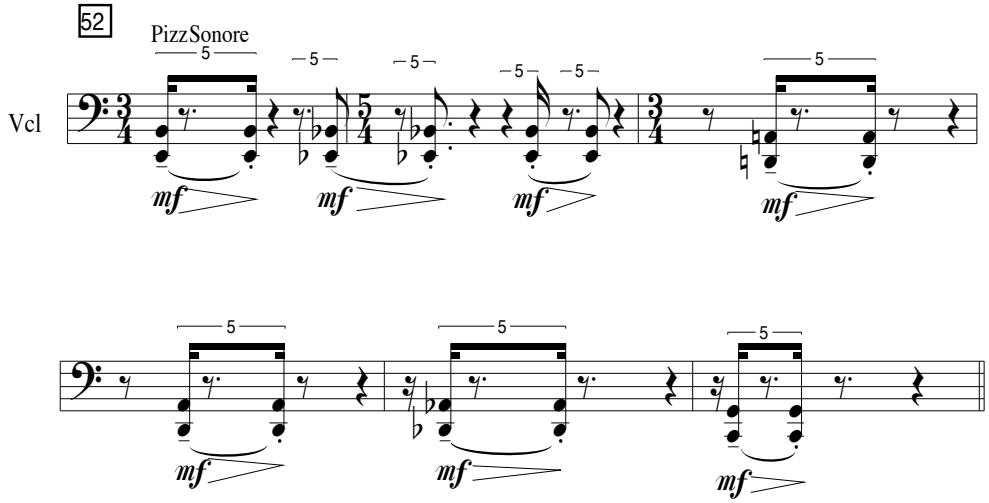

Figure 7.4. *Vision and Prayer* (bars 52-57): the 'heart beat' motif.

The wave shape manifests itself in the instrumental phrasing of *Vision and Prayer*. For example, the solo phrases of both the cello and bass clarinet tend to rise up suddenly and then fall away.

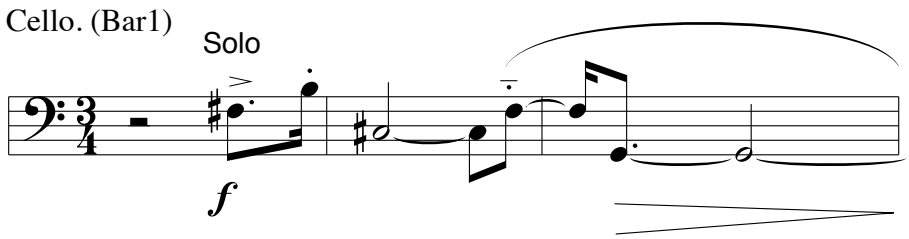

Figure 7.5. *Vision and Prayer* : falling cello Phrase.

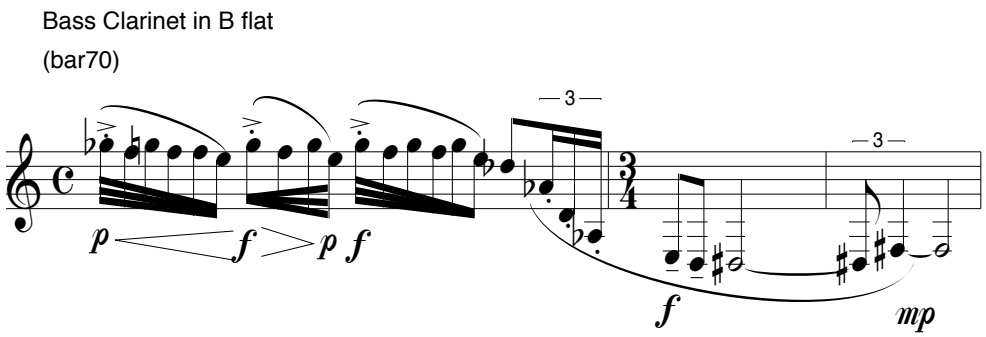

Figure 7.6. *Vision and Prayer*: falling bass clarinet phrase.

This type of gesture is an expression of the wave shape inspired by the poem but also a reference to the human cry, the 'tumbling strain' and forms of incantation or prayer.

7.5 Bars 1-92: meditation and procession

Although vision (in the sense of spiritual revelation) is an idea which inspires this composition, it also has a second meaning: vision in terms of seeing. This inspired what might be called a lateral connection with certain types of visual and religious imagery, in particular that of the early Italian Renaissance, for instance the paintings of Bellini, or the 15th Century Flemish masters, Jan and Hubert Van Eyck. Two aspects of this style of painting were of special interest to me and directly influenced my musical imagination. The first was colour, particularly the use of gold which suggests to me a hypnotic intensity, the second was the symbolic processional nature of the imagery. For example, Jan and Hubert Van Eyck's polyptych painted for the altarpiece of the cathedral at Ghent is a revelatory painting showing the procession of apostles and soldiers of Christ as they make their way through fruit groves towards the altar on which lies the Holy Lamb. I wanted to capture something of the order, clarity and intensity of this painting. Accordingly my composition begins in a very still and focused manner and is meant to evoke a sense of space, a sparse landscape, occupied by musical objects: the solo phrases for the cello and bass clarinet (Figures 7.5 and 7.6), the 'heart beat' (Figure 7.4) and a tutti chord which is discussed later. The order of these events is intended to be processional and ritualistic and thereby evoke the feeling of meditation or prayer. There is a pattern to the procession as follows: solo phrases are followed by tutti chords. For

example, from bar 3 to bar 5, a cello phrase is followed by a tutti chord. This pattern is repeated from bars 7 to 19, and again for a third time from bars 20 to 42, this time with enormous extension of the cello phrase.

A continuous trill on the marimba creates a background to this procession of events. It represents stillness and focus of thought; continuous and relatively unchanging, it soon ceases to be noticed by the listener. When even the smallest change occurs in the marimba part the effect is huge, and might be likened to a sudden change of illumination.

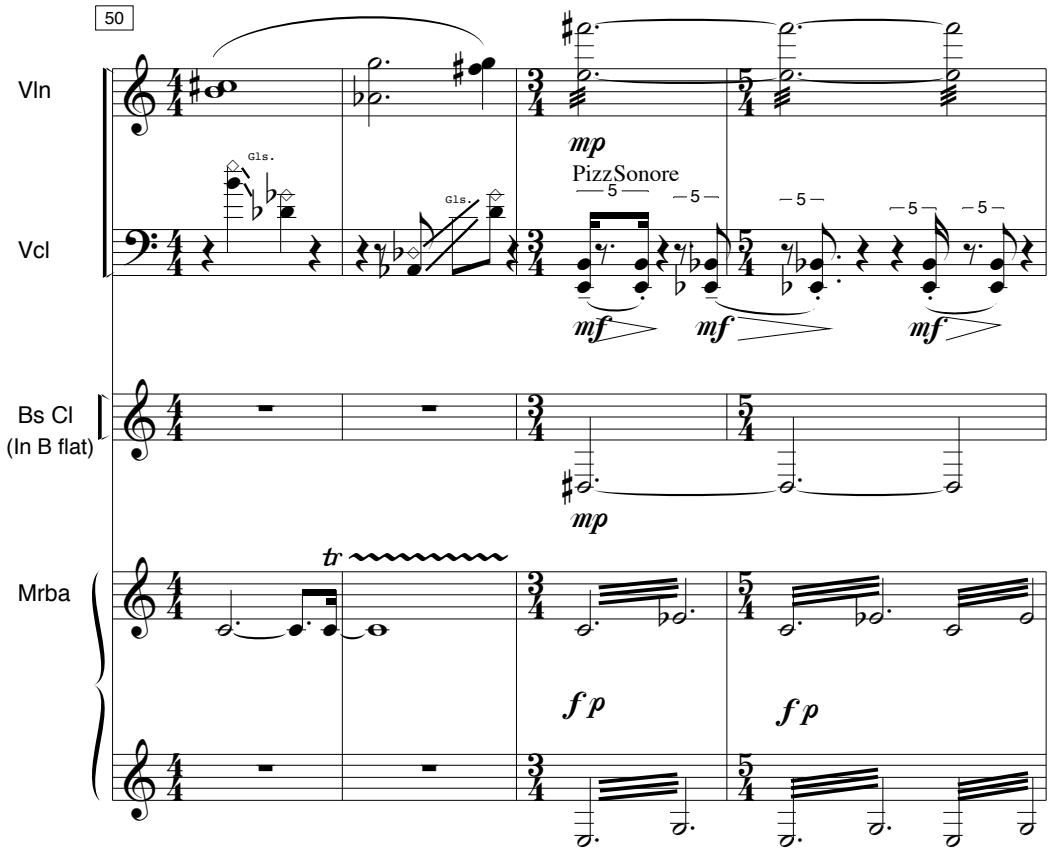

Figure 7.7**.** *Vision and Prayer*: expansion of the trill coincides with the 'heart beat' motif.

In fact the tremolo is not continuous but is punctuated by dynamic accents. These accents create the impression of time passing and soon become part of the forgotten background. Other parts in the score possessing their own individual rhythms and tempos appear to float on the surface of this

background texture. In this way I suggest both the infinite neutrality of time as well as the unique value of every passing moment.
Very gradual modifications in the pitch structure of the tutti chords shown in Figure 7.8, contribute to the general evocation of stillness and subtle change. Figure 7.8, shows that from bar 52, there is a change in the harmony: the root of the chords changes from G to C sharp. The switch of polarity is the only significant harmonic change for 90 bars and contributes to the feeling of stillness in the opening section. This movement is reinforced by the change in the spacing of the chords from relatively closed to open positions.

In the following diagram the marimba notes are in black and always lie at the centre of the chords.

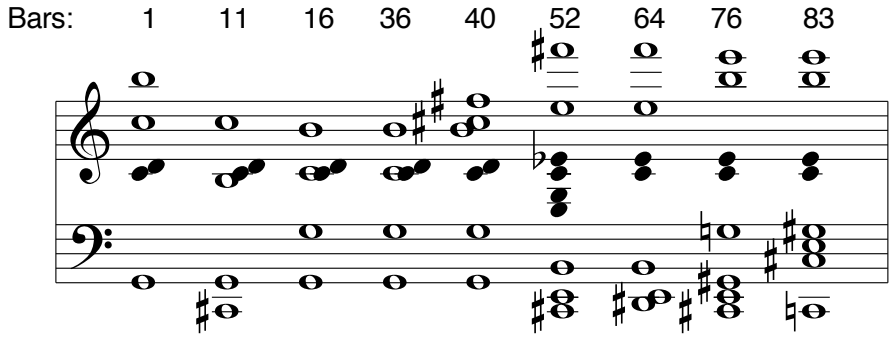

Figure 7.8. *Vision and Prayer*: harmonic structure of tutti chords.

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7.6 Bars 90 to 113: transition

Section two, is a transition between the relatively peaceful atmosphere of the opening and the highly energetic climax which begins at bar 114. The accumulation and subsequent release of energy is another expression of the wave metaphor. The mnemonic tag associated with this section during composition was that of 'thought rising' (see Figure 7.3). The thought is not a peaceful or comfortable one, its formation is represented by the violent coalescing of accelerating parts which culminate in a climax. An image which I associate with this section is of the gradual disturbance of a smooth surface. Analysis of the transition section reveals how the narrative idea is supported by pitch and rhythm. The dissonant harmonic relationships

between the parts and the agitated character suggested by rhythm and timbre conveys a sense of emotional disturbance.
In terms of pitch, two main processes are at work.

1) The tendency for the string parts to fall towards the pitch D.

2) The gradual accumulation of pitches.

These processes add to the effect of increasing density of texture and generate tension. Both can be seen occurring in the violin and cello parts while the marimba and the bass clarinet provide a constant pitch axis or background.

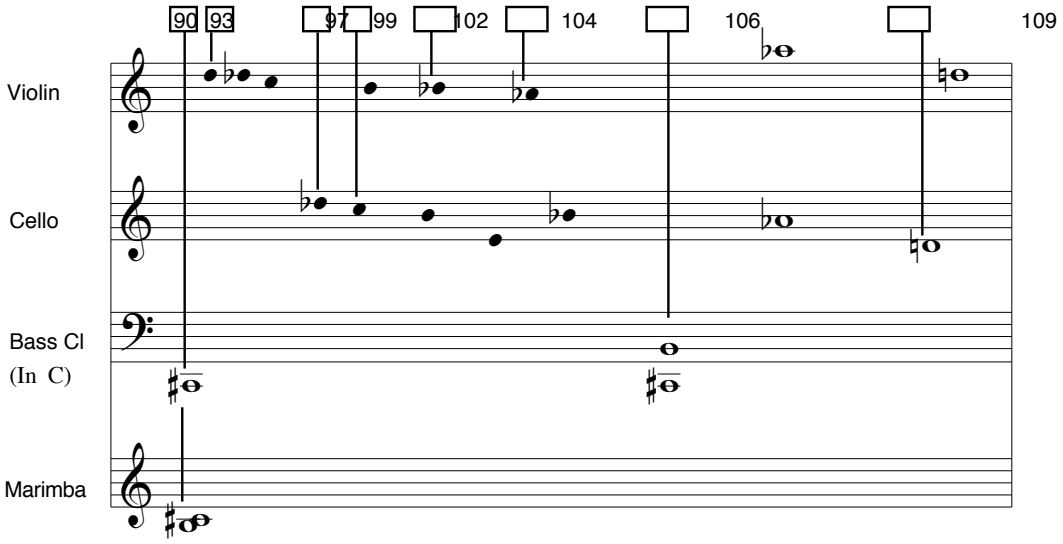

Figure 7.9. *Vision and Prayer*: general movement of pitches from bars 90 to 111.

Figure 7.9 is a generalisation of a complex passage. The pitches in the diagram were chosen because they appear more often or for a longer duration than other pitches. The black note heads in the violin and cello parts show pitches of secondary importance, the primary pitches are shown by white note heads.

Rhythm also plays its part in characterising the movement of the 'rising thought' or growing wave shape. The whole of the transition is dominated by the process of acceleration and an increase in shorter durations. This is

evident in all the parts except for the marimba which provides a constant reference in contrast to the surrounding change.

I did not devise a specific method such as the use of a growth series[33] for controlling the rhythmic development of parts, however, the composition emerged in stages: the violin part was the first to be composed and served as a model for the cello and bass clarinet parts which are compressed versions of it.

The co-ordination and rhythms of the three parts was facilitated by recording them on a MIDI sequencer and making adjustments accordingly. During the transition section each instrument occupies its own register and wherever possible the timbre of each instrument is contrasting. For example, the cello plays *sul ponticello* and *tremolando* while the violin produces glassy harmonic tones. The character of transition is supported by the connection of motifs from different sections of the composition. For example, the violin phrases which begin the transition section, are echoes of cello and violin phrases heard earlier (see Figure 7.10) while the bass clarinet motif beginning at bar 106, presages future events (see Figure 7.11).

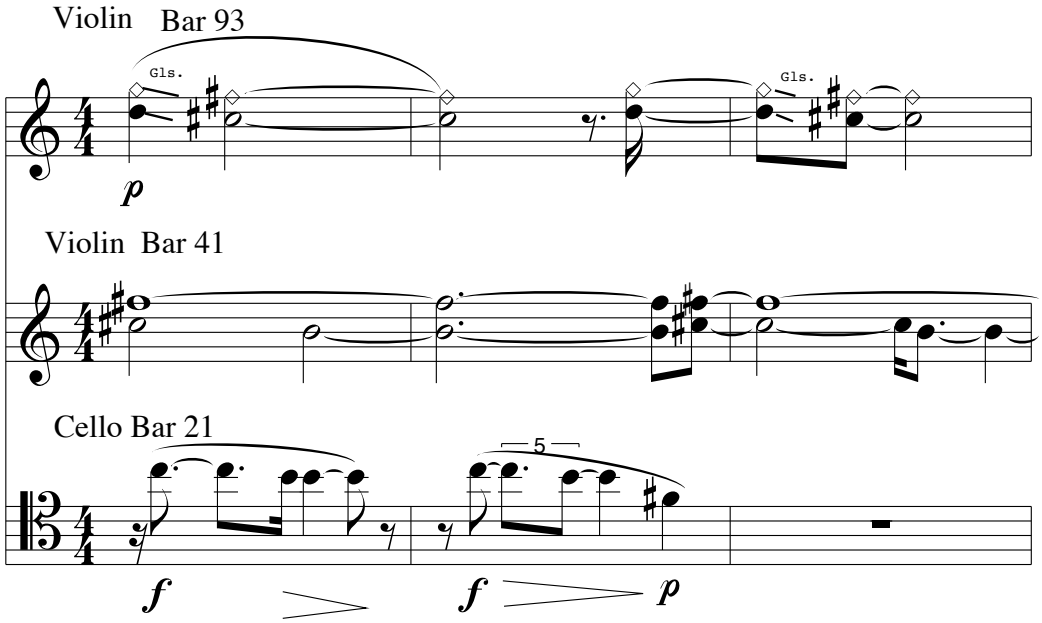

Figure 7.10. *Vision and Prayer*: comparing the violin motif of bar 93 with earlier passages.

[33]See chapter 3, section 3.5.

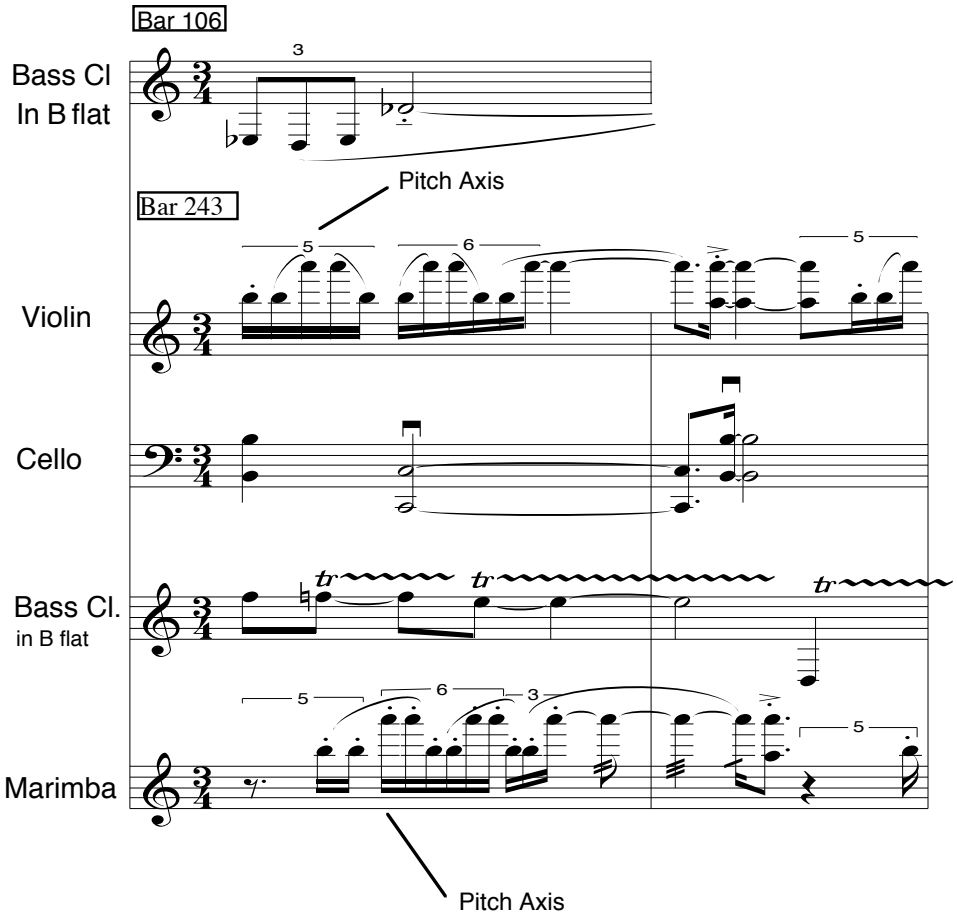

Figure 7.11. Comparing the bass clarinet motif of bar 106 with a passage from the finale bar 243.

In Figure 7.11 the bass clarinet motif of bar 106 (top), evolves into the phrases played by the violin marimba and cello at bar 243 of the finale (bottom four staves). The whole of the finale is saturated with melodic shapes derived from this form.

7.7 Bars 114-122: first climax

The climax at bar 114 represents the goal of the transition section, the crystallisation of the rising thought. It represents the theme of vision and revelation. An image which inspired the character of the climax was that of an imaginary worshipper (declaiming his vision) infused with spiritual fervour or even frenzy. The discharge of accumulated tension is achieved rhythmically by uniting the parts in near rhythmic unison.

The individual rhythm of each instrument is a variation on a pattern which could be described as *short, long*. For example,

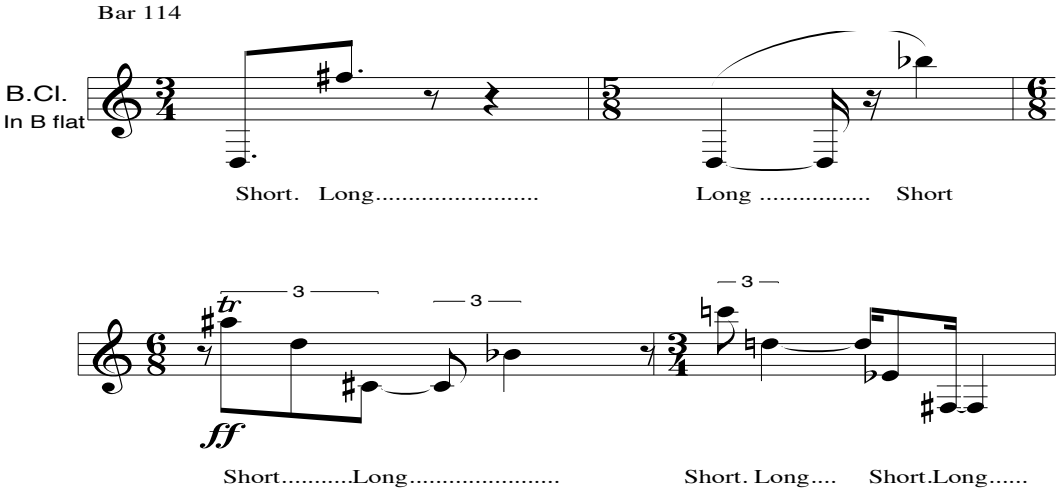

Figure 7.12. *Vision and Prayer*: rhythmic patterns in the climax.

This basic pattern was ornamented with trills and arpeggiation, decoration inspired by the image of the imaginary worshipper.

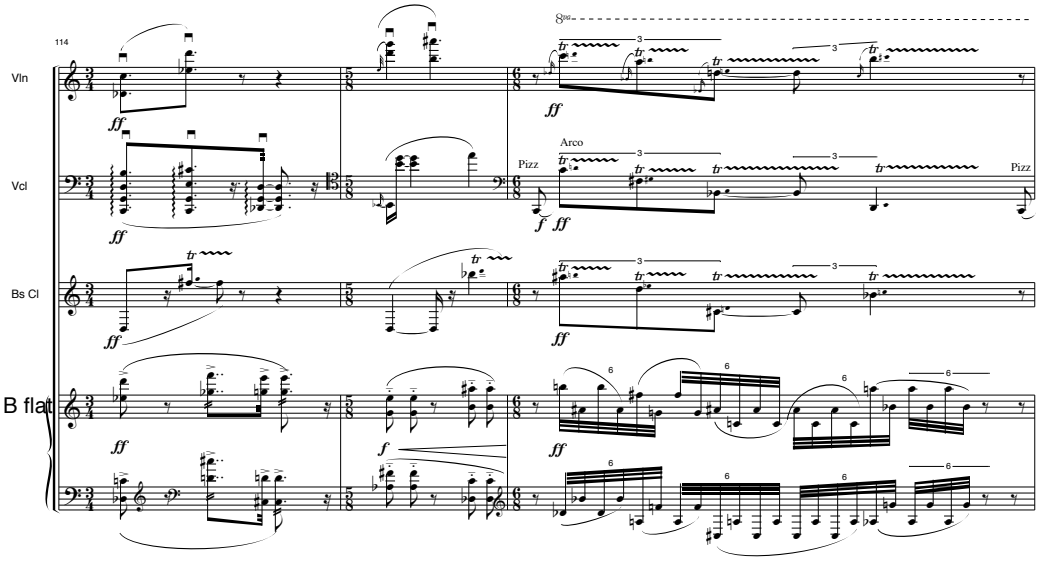

Figure 7.13. *Vision and Prayer*: the basic pattern of Figure 7.12 with ornamentation.

Following the climax at bar 114, there is a return to the meditative opening music which leads to a second transition and then an extended climax and finale. The material for these later sections is essentially the same as that described in sections 7.5, 7.6 and 7.7, and so I will not discuss it further.

7.8 The application of Schillingerian concepts.

7.8.1 Introduction

The claims made for the *Schillinger System Of Musical Composition* in its introduction by Shaw and Dowling (Schillinger 1978. Page XXII) include the following: that it establishes general laws true in any special instance, and provides the foundation for a more objective method of analyses of music. If this is true then it should be possible to analyse and interpret music that has not been produced using the system.

7.8.2 The wave form

In the discussion entitled *Melody: Climax and Resistance (Schillinger 1978),* Schillinger discusses the wave form in terms that are directly relevant to *Vision and Prayer*. His basic premise is that melody is a 'pitch time trajectory' (Schillinger 1978 page 303) or in other words, the wave form describing frequency changes in time[34]. Tension and climax in the musical (specifically melodic) dimension, can be explained in terms of natural and mechanical systems which accumulate energy (tension) for discharge (climax). The accumulation of energy in mechanical systems may be achieved through rotary motion producing centrifugal force. A heavy object attached to a string and put into rotary motion about an axis point accumulates energy causing it to travel a long distance when released. The time taken for the object to overcome inertia and reach maximum velocity after its release (mechanical efficiency) is intuitively understood by us and leads us to certain expectations: we do not expect an object to reach maximum velocity instantaneously. Melody which reaches its peak long before or after we expect it is felt to be unsatisfying or absurd[35]. It is important to note that Schillinger distinguishes between different forms of climax, such as harmonic climax or dynamic climax[36]. Melodic climax is defined as follows:

> The psychological effect of the climax is heightened if the maximum magnitude is reached in a series of increasing 'waves' each 'wave' being higher than the last but falling back only to be succeeded by a greater magnitude until the maximum is reached.
> (Schillinger 1978. page 1609)

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[34]See Chapter 2, section 2.5.
[35]Schillinger 1978 page 283.
[36]See Schillinger 1978, page 1609.

Schillinger's ideas about the nature and behaviour of climactic shapes are highly relevant to my own work, in particular, *Vision and Prayer* which represents my intuitive understanding and realisation of the principles Schillinger discusses in his work. The form of the composition (see Figure 7.2)-two climaxes, the second much larger than the first-is typical of the kind of shape Schillinger refers to as possessing the quality of *resistance* leading to *climax.*[37]

7.8.3 Pitch axes

Schillinger refers to an essential ingredient of melody as the *primary axis*[38]: a pitch which sounds more frequently than any other and for the longest total duration (*pitch time maximum).* A pitch which dominates a portion of music in this way establishes itself as an axis around which the melody evolves.
In *Vision and Prayer,* there are examples of *primary axes,* on the most foreground level. Melodic phrases such as the bass clarinet solo shown in Figure 7.14, articulates a clear *primary axis.*

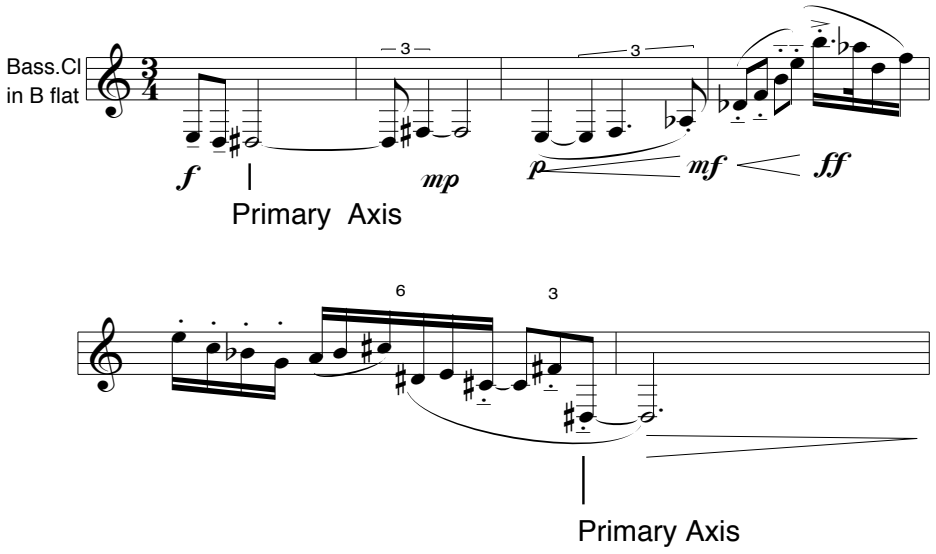

Figure 7.14. *Vision and Prayer*: primary axis in a melodic phrase.

The primary axis is at the centre of the revolving melody just as the hand which controls the stone tied to the circling rope is at the centre of a mechanical system. Schillinger believed that the existence of such an axis was a fundamental requirement of melody. *Vision and Prayer,* exhibits a number of such pitch axes. The most obvious of these occurs during the

[37]See Schillinger 1978, page 296.
[38]Schillinger 1978. Page 125.

climax and finale of the piece. For example at bar 239 ff. of the score (see Figure 7.11), the pitch A occurs in all the parts but most prominently in those of the violin and marimba. In the same passage the pitch B also has a strong claim as a *primary axis* and in this case the two notes form a powerful '*parallel axis'*, one of the various types of axis described by Schillinger in *The Theory Of Melody* (Schillinger 1978. Page 290). I believe that the extended emphasis and duration of these two pitches and the way the music revolves around them adds to the effectiveness of the climax.

There are other examples in *Vision and Prayer* of pitch axes which exist in a context opposite to that of climax. The marimba part in the opening section represents the most extended pitch axis in the entire composition. It is heard constantly which gives it the fixed quality of a pedal point. The register of its part lies at the centre of the overall pitch range (see Figure 7.8) and this contributes to its evocation of peace and stillness. Schillinger makes clear that melody rotates and evolves around the primary axis which therefore represents a point of balance. The sensation of tranquillity evoked by the marimba trill would therefore be the expected effect given that there is no accumulation of melodic energy through rotary motion around the primary axis.

7.9. Conclusions

Vision and Prayer, is a composition informed by a number of different sources. Dylan Thomas's poem was a direct inspiration not only for specific musical material such as the 'heart beat' but also the character and mood of the piece. The shape of the verses and the effect of this shape on the flow of the poetry was especially stimulating and lead me to think about the wave shape as a model for a background form. The painting of the early Renaissance also inspired the character of the music, in particular the processional quality of the opening section. Examining Vision *and Prayer,* in retrospect, it is satisfying that much of Schillinger's work reinforces the ideas that were important in the process of composition. In particular I refer to my intuitive understanding of the importance of natural forms, such as the wave shape, to the flow of tension and release in music. Other ideas, such as the *primary axis of melody,* flow from these ideas and manifest themselves unconsciously in my work.

Chapter 8 *Rêve de l'Orb.*

8.1Introduction

Rêve de l'Orb, is a piece which derives its inspiration from the river Orb which runs through the Langedoc region of southern France. In 1993 I had spent some time near this river and was inspired by the activity of the insect life and by the movement of the river itself this composition in three movements is a collection of impressions from that time. The first movement, *Libellule* describes the surface of the river and in particular the extraordinary dragon flies that hover over it; *Reflections* is about the feeling of peace and melancholy which came over me as I sat on the bank but is also about the perfect stillness of the shallows; *Chaleur,* was inspired by the rippling heat of the sun and the torrents and waterfalls of the river. My experience of the river was dream-like in its overwhelming intensity, and inspired the title of my composition. *Rêve de l'Orb* was composed in 1992 for the Royal Overseas League viola competition. The instrumentation was given by the competition organisers and is based on the scoring used by Ravel for his *Introduction and Allegr0*: flute, clarinet in A, harp and string quartet. There was one stipulation which was that the viola should have a prominent role.

8.2 *Libellule*

8.2.1 Musical tapestry

The opening movement of *Rêve de l'Orb* is an attempt to capture the essence of the river, both its hypnotic beauty and its dark associations with death. My strongest impression was of the huge diversity of life engaged in individual pursuit and yet united by the river and the inevitable cycle of life and death.

The web of activity associated with the river is evoked through a polyphonic tapestry in which parts are independent of one another but contribute to a common texture. The first movement of *Rêve de l'Orb,* is made up of at least five separate strands described below. The flute and clarinet engage in a duet shown in Figure 8.1.

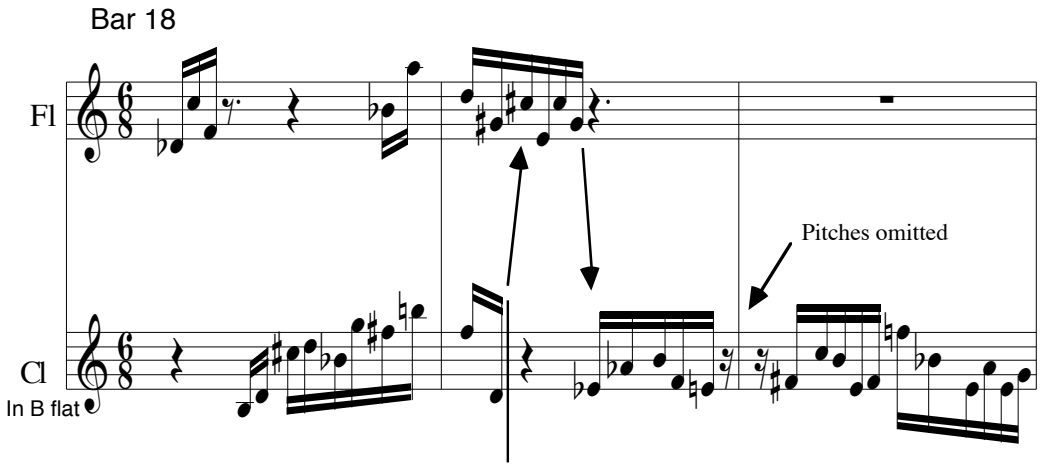

Figure 8.1. *Rêve de l'Orb:* distribution of pitches between parts.

In Figure 8.1, the flute and clarinet provide a constant thread against which the other parts evolve. The dance-like quality of their duet and its continuous presence throughout the movement could be likened to the motion of the hover flies which live by the water or the glinting reflections on the river surface. This is suggested rhythmically through constant semi-quaver motion and in the cycle of pitches (see section 8.3.2 and Figure 8.7) which is never heard in its entirety but only in fragments. The process of omitting pitches of the cycle and distributing them between the two parts (shown by arrows in Figure 8.1) was instinctive rather then systematic, as was the choice of particular sequences of pitches for transposition.

The harp is entirely independent of the other instruments in the ensemble. It might be described as wandering through the musical landscape, its phrases constantly changing speed through a reduction of duration. The harp is distinct from the other instruments partly because it alone plays a diatonic scale, that of E minor.

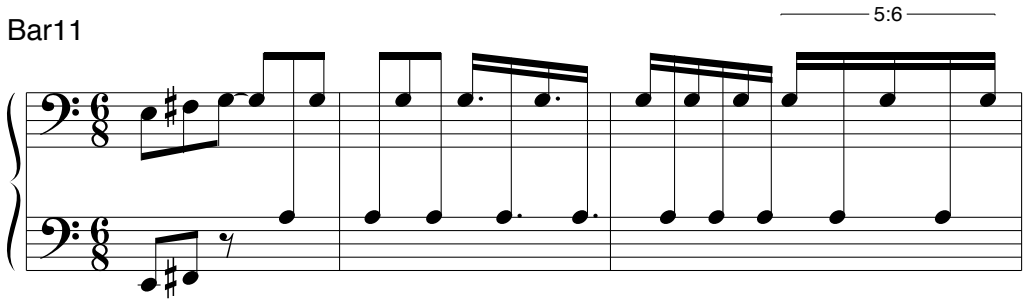

Figure 8.2. *Rêve de l'Orb:* wandering harp.

The varying acceleration of the harp and its explorations around the tonic E, are meant to suggest the eddies and currents which form little whirlpools on the surface of the river.

The two violins at first play in rhythmic unison, like the harp, although the violin parts have a tendency to accelerate. Acceleration through the reduction of duration, rhythmic unison and *pizzicato* articulation suggests the short jerky movements of river birds.

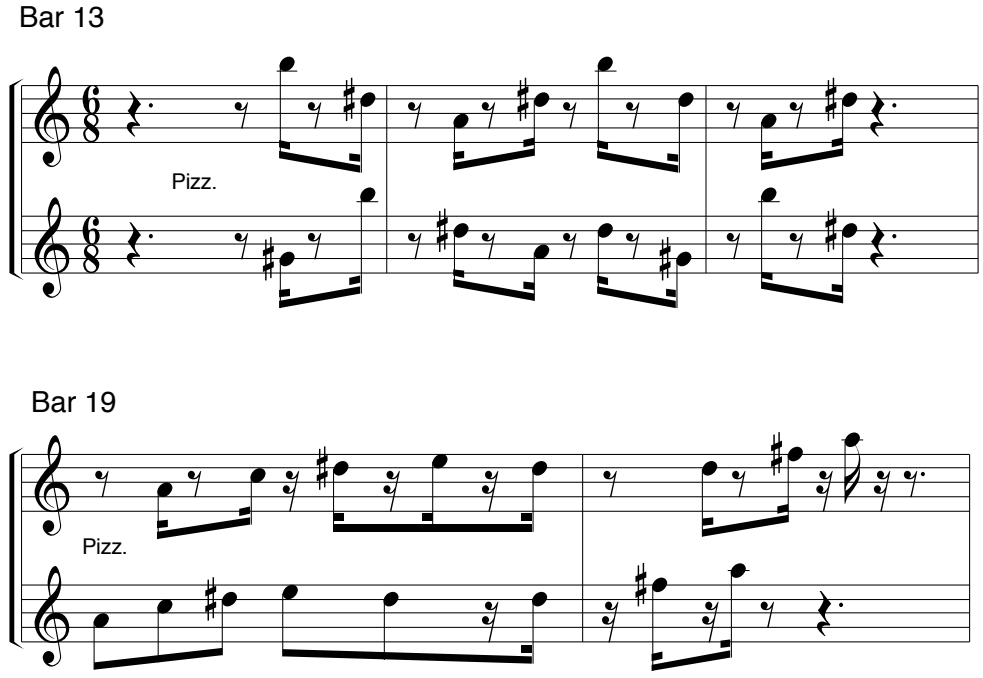

Figure. 8.3. *Rêve de l'Orb:* violins before bar 39

This comparison can be extended. At bar 39, the two violins switch to *arco* articulation and play a vigorous ascending phrase as if, in their bird roles, they had taken to the air. From this point on they are independent of each other: the second violin plays at the top of its register and glides from note to note while the first violin plucks the string behind the bridge in a manner which suggests pecking or clucking.

Bar 50

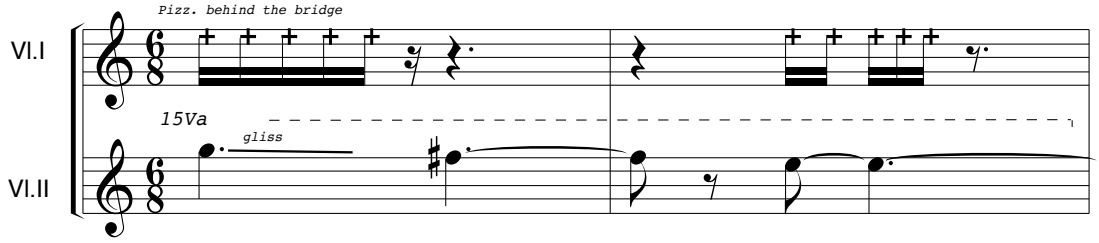

Figure 8.4. *Rêve de l'Orb:* violins take on bird - like roles.

The viola plays a series of long melodic phrases which float above the vibrating and shimmering background. Its tenor song is intended to suggest the presence of a human consciousness in amongst the firmament of river life.

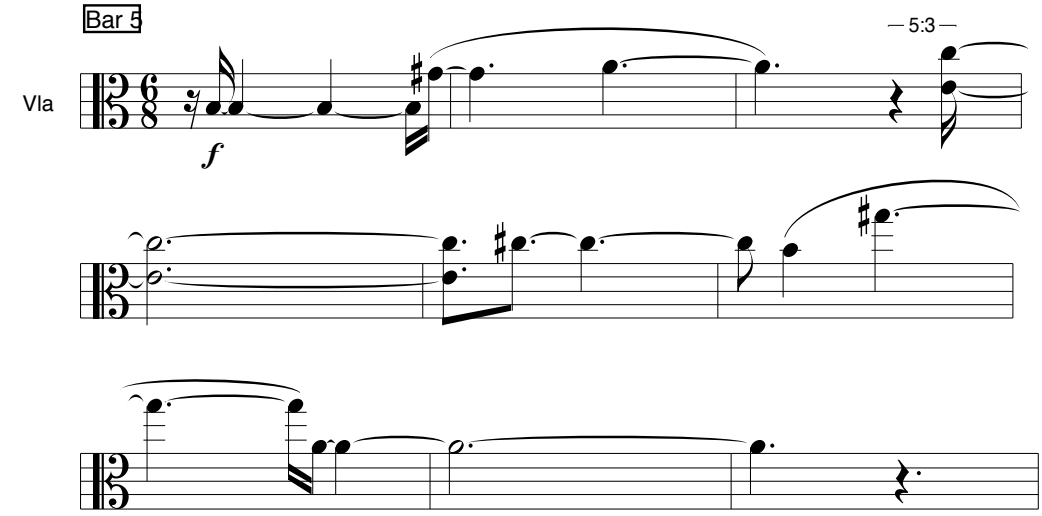

Figure 8.5**.** *Rêve de l'Orb:* viola phrases suggest a human presence.

The articulation of the cello is always pizzicato but its rhythm and pitches are independent of the other parts (see section 8.3.3). It provides a depth to the musical image and to me suggests the reflection of the trees and sky in the water.

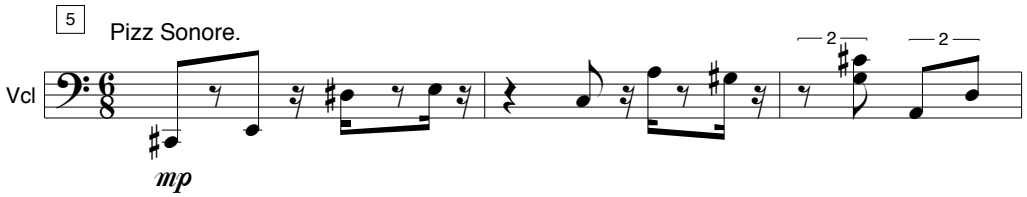

Figure 8.6. *Rêve de l'Orb:* the cello provides depth and resonance.

8.2.2 Time and rhythm

As I have shown, each part in the first movement of *Rêve de l'Orb* is governed by its own particular pulse which to some extent guarantees its individual identity in the aural image. The combination of independent parts creates the complex tapestry-like texture of the movement as a whole. Not having discovered Schillinger's techniques at the time of composing *Rêve de l'Orb,* I had no predetermined system of co-ordinating the various parts and controlling the musical image as a whole. Ultimately I achieved the desired effect through improvisation and experimentation, a process the musical effect of which is comparable to that of the visual artist who deliberately smudges the sharp edges of an image in order to create an impressionistic result. I devised a method of injecting into the score both diversity and coherence, qualities strongly suggested by the metaphor of the river. This involved introducing the elements of one part into another : a sort of cross-fertilisation. This process results in subtle relationships between the parts and helped to bind the various strands of the composition as a whole. The most obvious example of this can be seen in the case of the woodwind and the violins. The pitches played by the flute and clarinet are echoed in the first and second violin parts.

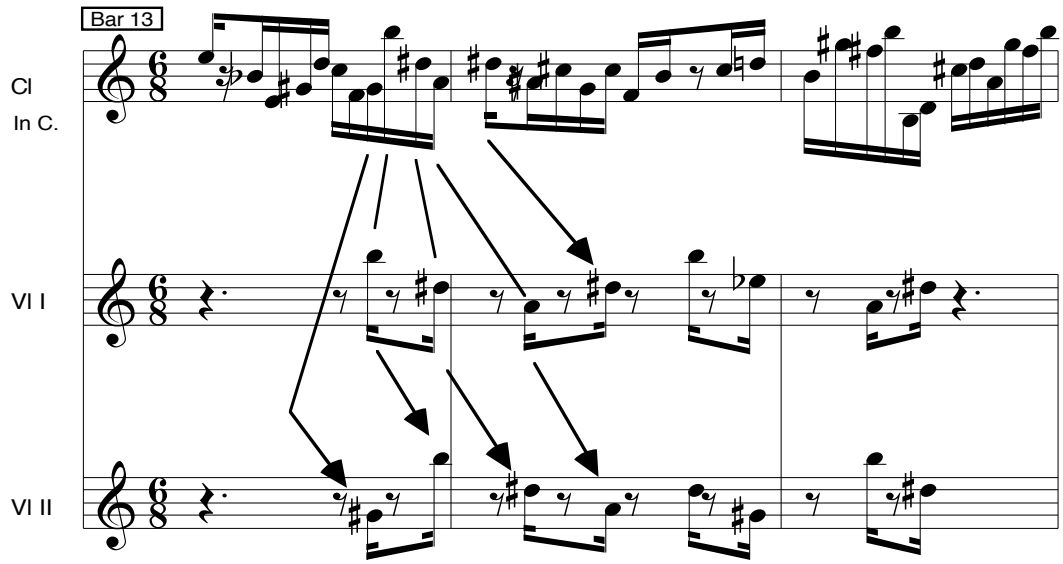

Figure 8.7. *Rêve de l'Orb:* cross fertilisation between parts.

Cross-fertilisation between parts involves both pitch and rhythm. It can be seen from Figure 8.7, that the material in the string parts has been expanded by a ratio of 3:1. Time expansion of this sort produces a reverberation or aura effect because identical material is heard simultaneously at different speeds. To my mind the effect of such an expansion can be interpreted as being like the image of a stone breaking the water's surface : the ripples which expand from the point of impact are a record of a past event.

8.2.3 Pitch relationships

Independence between parts is partly a matter of tonal separation. and can be achieved by assigning a different scale to each part as for example with the harp part which is set in the scale of E minor (see Figure 8.2). Rather than a rigorous polytonality I wanted to create a floating tonality, somewhat impressionistic and disembodied, made up of simultaneous, contrasting and independent intonations. I felt that to use even a distantly related diatonic scale in more than one part would diminish the range of tonal space and so I turned to the octatonic scale. An example of the use of the octatonic scale can be seen below in Figure 8.8.

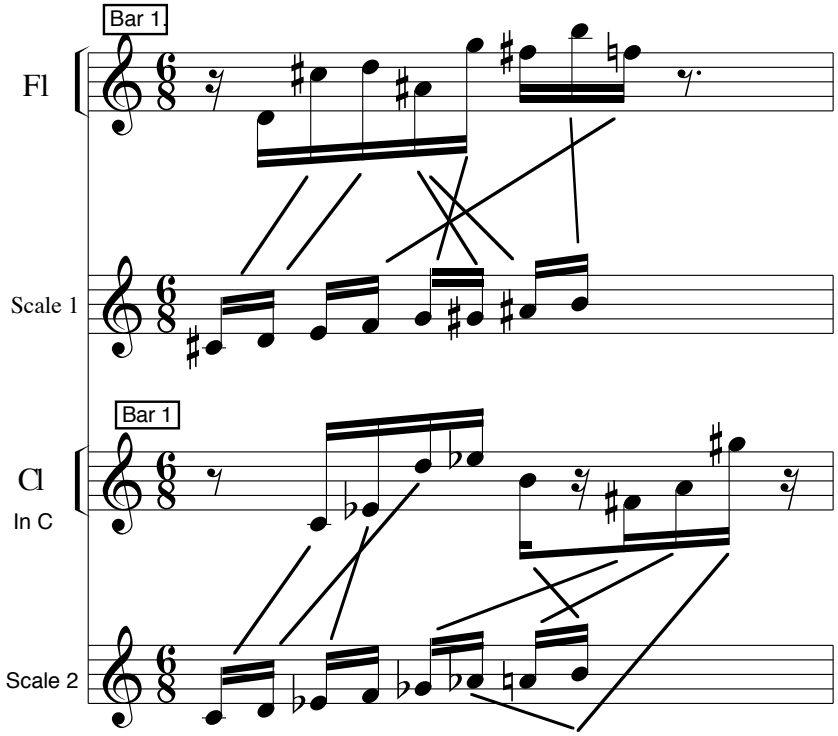

Figure 8.8. *Rêve de l'Orb:* octatonic scales in the woodwind

The octatonic scale[39] has regular interval structure (1,2,1,2,1,2,1,2) which accounts for its neutral, floating and un-rooted quality which is an appropriate quality given the role of the flute and clarinet in evoking the image of dancing, hovering insects. Although both parts share an identical scale structure their key-notes lie a semi-tone apart creating a tension between them which contributes to their dualogue.

8.2.4 The cell method

An alternative method of creating pitch material is the use of overlapping interval cells, to 'grow' a long sequence of pitches. The result is a line of notes saturated with characteristic intervals, in the process one is free to choose the *direction* of each interval which can result in pitch groups with somewhat eccentric contour and pitch repetition. I would liken the process to the *knight's move* in chess which allows a number of different outcomes. In

[39]Only three possible transpositions of this scale are required to complete the total chromatic.

the following diagram each bar represents a different 'route' starting from the same point and following the interval pattern (1,5) where 1= a semi-tone.

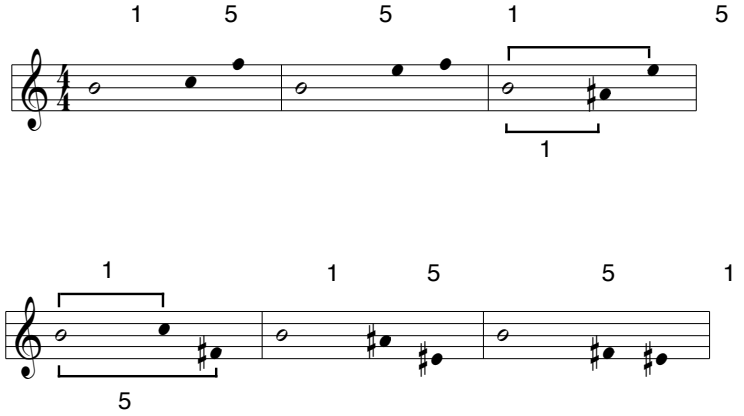

Figure 8.9. *Rêve de l'Orb:* cell construction from a single starting point (after Figure 6.8).

The 'cell method' is a half-way-house between completely free and rigidly structured composition: decisions are made on the local level and the result is a highly varied collection of related melodic shapes. The type of melodic forms produced by this method might be likened to the streets of old towns in which houses (structures) evolve in unusual forms and clusters. The cello part is an example of cell construction. It is made up of two types of cell: semi-tones and thirds (both major and minor) and semi-tones and fourths. These cells form interlocking networks which are shown in the diagram by the overlapping boxes, intervals are shown by numbers where 1= a semi-tone. Intervals are always numbered as though in closed position even though in the score they may be inverted and in the open position.

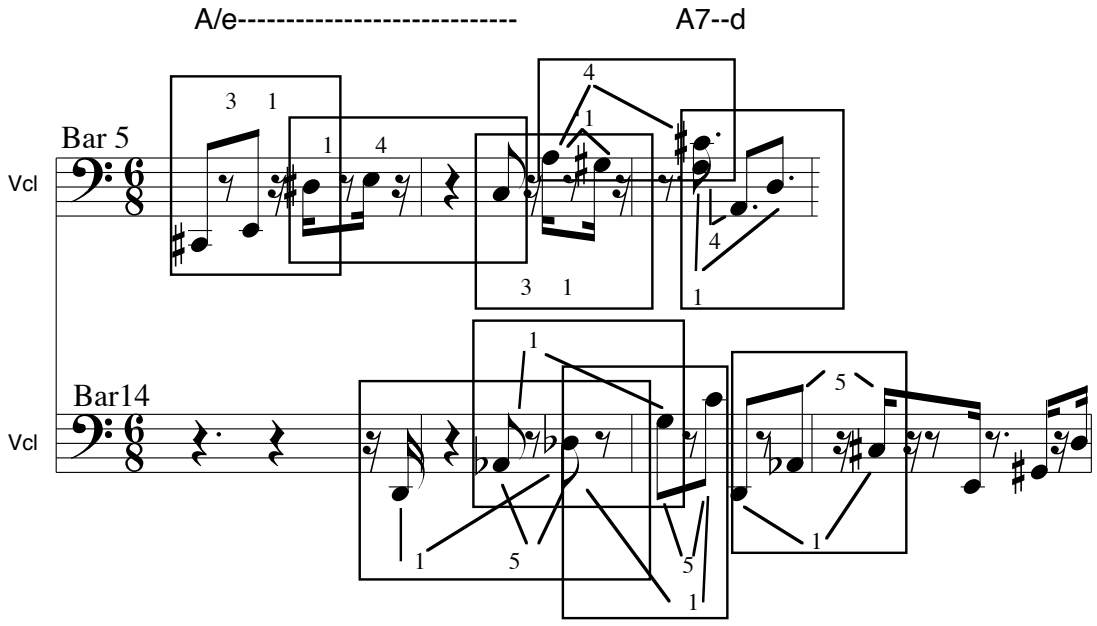

Figure. 8.9.1. *Rêve de l'Orb* : cell networks

The cell method typically produces a collage effect in which contiguous cells at times reinforce or oppose one another. There is an element of surprise when a sequence of cells appear to have some unusual meaning as for example in Figure 8.9, where the letters which appear above the first three bars indicate an unpredicted harmonic progression (A major, or possibly e minor, followed by A7 and d minor) generated as a by-product of the process.

8.3 *Reflections*

8.3.1 Introduction

The second movement, *Reflections,* is scored for only three members of the ensemble: clarinet, harp and viola. As the title suggests it is about contemplation, memory and the surface of the water. Contemplation and memory are represented in the way the viola melody evolves: a phrase is stated and then repeated before continuing to reveal more of itself.

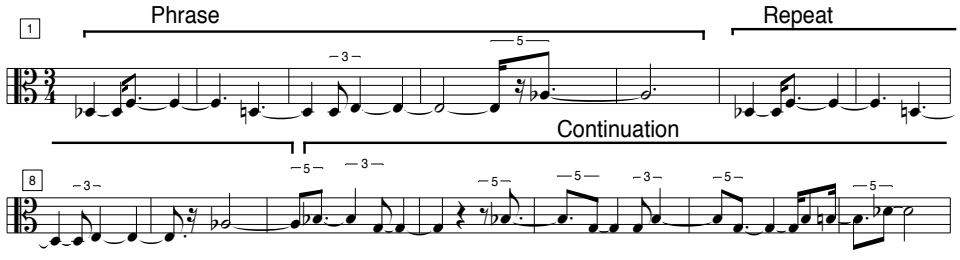

Figure 8.10. *Rêve de l'Orb:* unfolding viola phrase.

The clarinet is like a shadow or a reflection of the viola part. It might appear that the clarinet and viola parts were derived from one another, perhaps related by inversion but in fact there is no strict relationship between the two. The parts often develop in contrary motion shown by the arrows in Figure 8.11 below. This contrary motion suggests a mirror symmetry around an axis point: the three repeated notes in the harp hint at the possibility of such an axis although they are in reality no such thing but are in fact a rhythmic event meant as a symbolic representation of time passing .

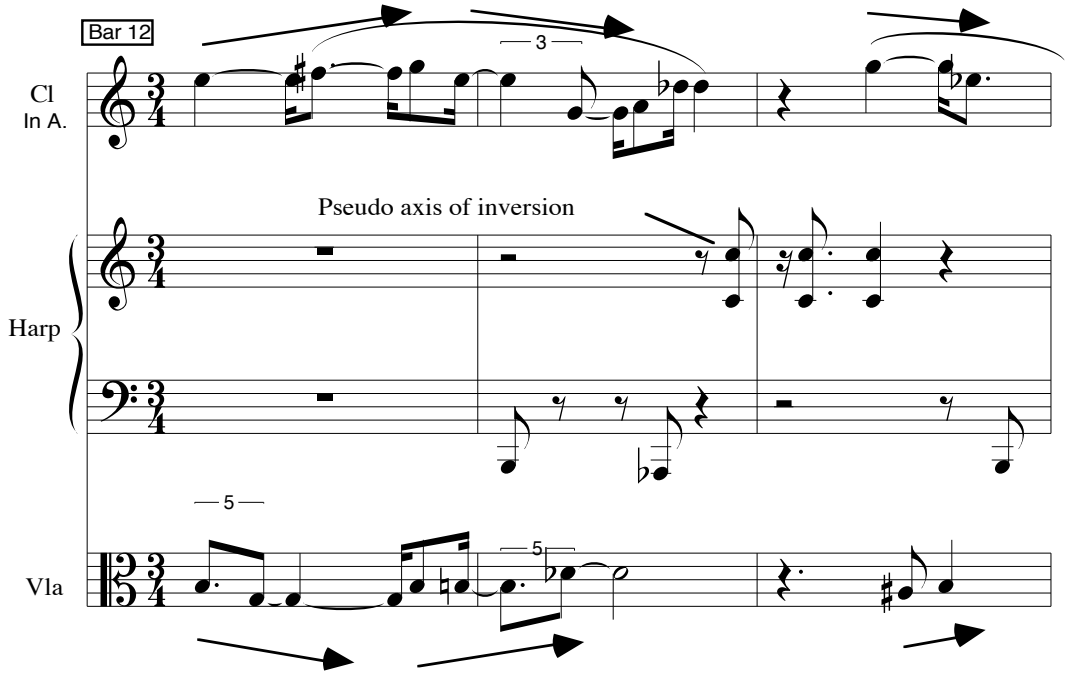

Figure 8.11. *Rêve de l'Orb:* pseudo mirror symmetry.

The position of the clarinet part relative to the viola suggests displacement or echo and expresses the theme of reflection.

8.3.2 Pitch

The three parts of *Reflection* are built around the octatonic scale. Each part has a different origin a semi-tone transposed: the viola on D flat, the harp on D natural and the clarinet on E flat. This arrangement gives each part individuality and also ensures overall the presence of the total chromatic spectrum, a measure which seemed necessary partly because of the movement's length and limited instrumentation but also because of the feeling of intensity I wished to evoke.

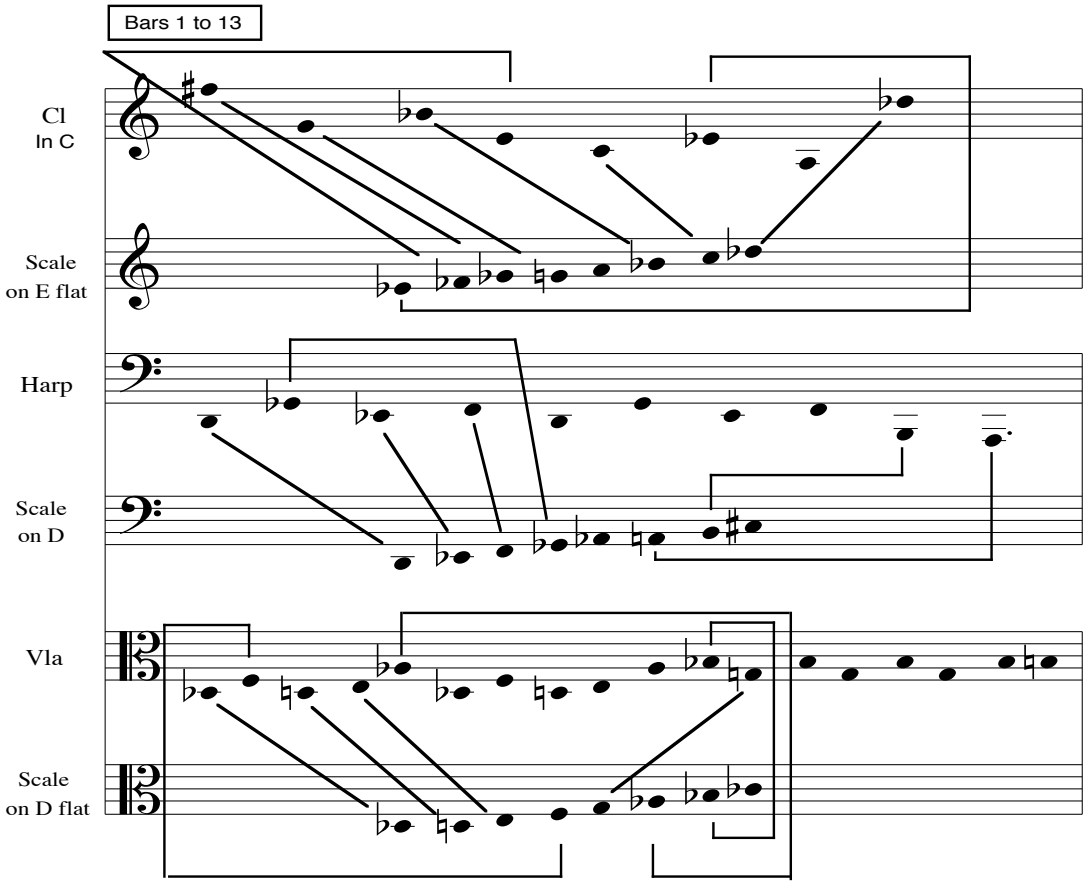

Figure 8.12. *Rêve de l'Orb:* parts develop from different transpositions of the octatonic scale.

Figure 8.12, shows each part above its respective scale; the pitches of each part have been taken out of context but their register and order has been preserved. In the case of the harp and viola, their respective tonics appear prominently at the start of their parts. The E flat tonic in the clarinet part does not appear immediately but is strongly emphasised in bar 10 of the score.

8.4 Cells

While the pitches are derived from the octatonic scale, melodic shapes are derived from the chaining of interval cells. The choice of this technique came about from a desire to embody in the music ideas such as contemplation, memory and reflection: the linking of cells in a chain is expressive of the way thoughts connect to one another in a cascade. The technique used here is a modified version of the 'cell method' described earlier. In the first movement interval cells were combined in a manner which allowed considerable variation and often produced unusual results. The modified method, used here, is more formal and limited as the cells are produced by the re-ordering of the notes of the octatonic scale. That the pitches of the scale are used only once severely limits the number of cells and the possible connections between adjacent cells, and the result is a more focused melodic line. Figure 8.13, shows the octatonic scale on D sharp (top stave), the scale arranged into three note chords (cells) and finally the melodic form of the clarinet line in which the pitches of the scale are used only once.

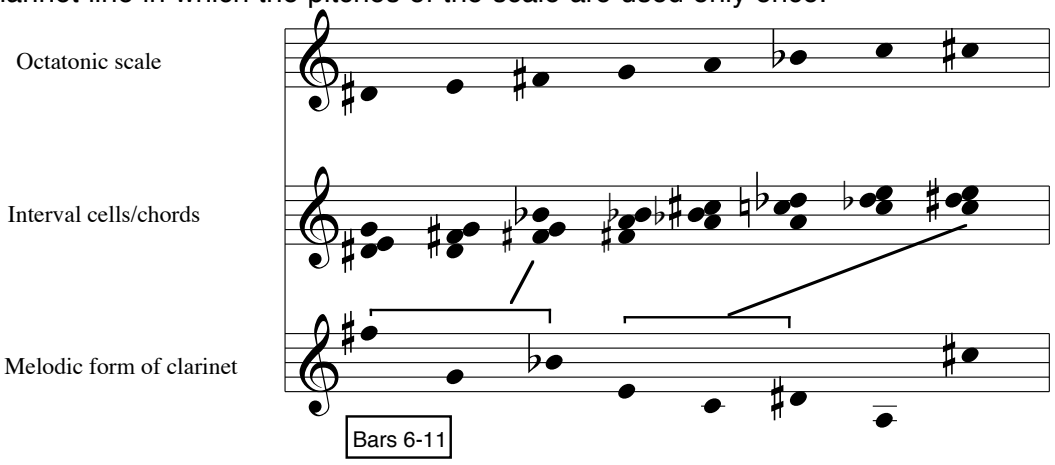

Figure 8.13. *Rêve de l'Orb:* clarinet part made from cells derived from the octatonic scale

8.5 *Chaleur*

8.5.1 Introduction

The third and final movement of *Rêve de l'Orb* involves the whole ensemble. The shimmering textures which dominate this movement were inspired by the fierce southern landscape, its steep hill sides, rocky paths and in particular the rippling heat waves which hover above road surfaces during the hottest part of the day. Towards the end of the movement, from bar

82 onwards, new material is introduced which evokes a dream-like atmosphere and is intended to convey something of the delirious state which can be induced by exposure to such intense heat.

8.5.2 Forms of motion

Various aspects of *Chaleur* can be discussed in terms of Schillinger's ideas. In *The Theory Of Melody* (Schillinger 1978), Schillinger describes basic forms of melodic motion[40]. Schillinger believed that forms of motion in the real world influenced the contours of a melody and that certain fundamental forms of motion, translated into music through the use of a graph, could be used directly to influence the behaviour of a melodic line. These basic types are derived from oscillatory motion of wave around an axis and are shown graphically with accompanying verbal descriptions of analogous forms. For example,

> **1**. **Repetition** (correspondences: aiming, rotary motion with infinitesimal amplitudes, affirmation of the axis level as a starting point). Musical form: repeated attacks of the same pitch discontinued by rests or following each other continuously.
> **2**. One **phase motion** (correspondences: preliminary contrary motion, initial impulse in archery [drawing of the bow], artillery, springboard diving, baseball pitching, tennis service, etc.). Musical form: a movement or a group of movements in the direction opposite to the succeeding leap.
> **3**. **Full periodic rotation** (one or more periods).
> Constant amplitude. (Correspondences: rotation around a stationary point, a top, somersaults- with diving and without- lasso, axis and orbit rotation of the planets, Dervish dances). Musical form: mordent, trill, tied tremolo, grupetto.
>
> (After Schillinger, 1978: 284-286)

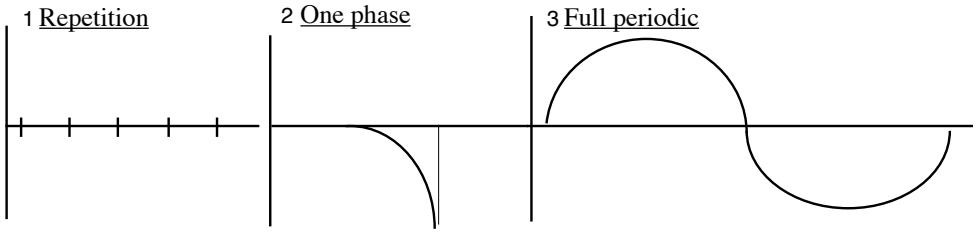

Figure 8.14. Forms of motion displayed graphically(after Schillinger 1978 page 284).

[40]See Chapter 2 section 2.5.

Through variations in amplitude and the introduction of *secondary axes* [41] Schillinger develops these basic types into an array of more complex forms. For example,

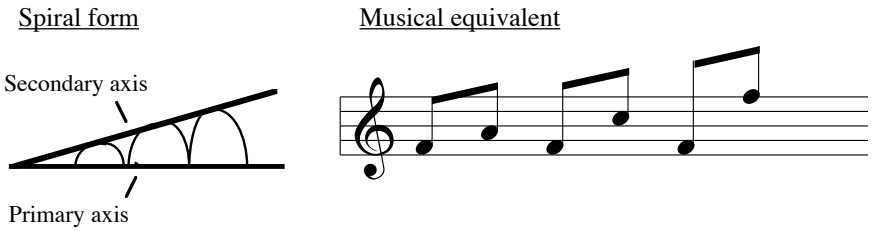

Figure 8.15. Spiral form (after Schillinger 1978 page 312).

Schillinger's reference to baseball pitching or the tennis service seem comic, imprecise and incongruous amidst the graphs and formulae of the surrounding text. However, in the opening bars of *Chaleur,* it is possible to see the influence of all these types of movement. For example, in bars 1 to 4, the cello plays a series of durations on the same pitch (type1) while the woodwind and the viola play trills (type 3). In fact the trills correspond more closely to the repetitive motion of type 1, that is, 'rotary motion with infinitesimal amplitude'. They are doubling the sustained pitches in the violins but are embellished with trills which in this case are really a defined vibrato. See for example the quarter-tone trills in the second violin at bar 10.

[41]See figure 2.18 and 2.19.

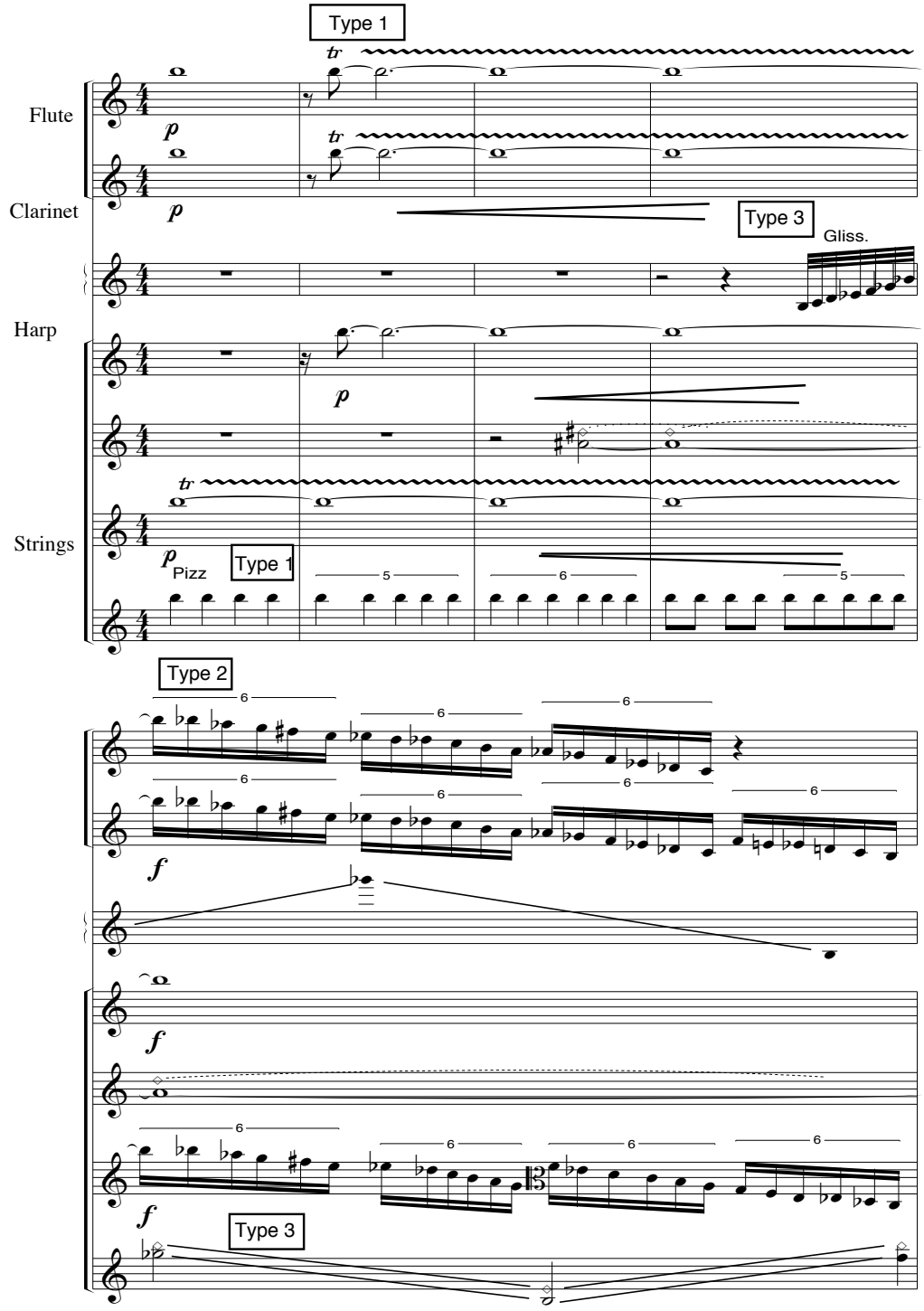

Figure 8.16. *Rêve de l'Orb: chaleur:* bars 1 to 5

Schillinger's suggested 'correspondences', such as 'aiming', or the 'initial impulse in archery', actually describe the effect of the opening bars rather well. The sustained notes, trills and repeated pitches in the cello create a feeling of poised tension (type 1), while the descending scales in bar 5, correspond to 'one phase motion' (type 2), which Schillinger compares to the drawing of the bow in archery. The third type of motion ('full periodic') is partially suggested by the arc movement of the cello and harp in bar 5. The contrary motion of these two instruments suggests the possibility of a full rotation. Schillinger's phrase, "affirmation of the axis level as a starting point" is also apt in this case as all the parts start by emphasising the pitch B, confirming it as an axis. The axis is confirmed several times in the course of the opening section the pattern of confirmation achieved by repetition and abandonment (one phase motion) of the axis over the first 50 bars is shown in Figure 8.17.

Repetition (confirmation)	**One phase (abandonment)**
Bars 1 to 4	Bars 5 to 7
Bars 8 to 19	Bars 20 to 21
Bars 22 to 50	Bars 50 to 54

Figure 8.17. Patterns of motion in bars 1 to 54 of *Chaleur*

8.5.3 Resistance and climax

The pattern of motion shown in Figure 8.17 creates an accumulation of tension which is released only after bar 54. A proper discharge of tension is denied until this point because there is always an immediate return to the 'initial' or 'aiming' stage. The effect is as if the bow was drawn but the arrow was never released. Each repetition of the 'aiming' phase is longer than the one before increasing our expectation of release and contributing to the accumulation of tension leading towards the climax at bar 51. This is a manifestation of the process described by Schillinger as increasing 'resistance' leading towards a climax.

8.5.4 Acceleration

Other processes contribute to the pattern of tension and release. The cello plays a rhythm which accelerates with each successive bar. For example,

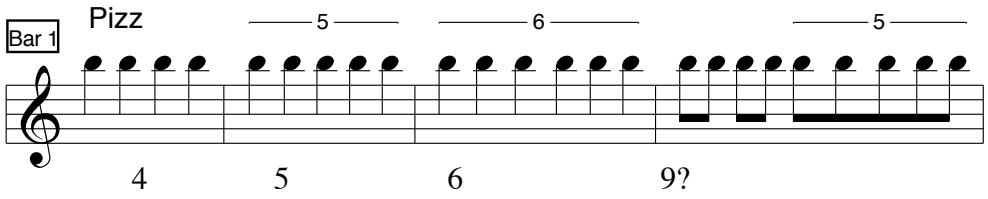

Figure 8.18.*Rêve de l'Orb:* acceleration in the cello part.

This acceleration proceeds almost according to a rhythm equivalent of the harmonic series until bar 4 when the rate of change increases. Growth series such as the harmonic series are important in Schillinger's theory both as concepts, relating music to natural phenomena, and as a technical device for the development of both rhythm and scale[42].

8.5.5 Bar groups

There are a number of bar group patterns which recur throughout the movement. These fall into two categories: contracting and expanding patterns and regular repeating groups. The latter suggest the unrealised tendency towards building large rhythmic structures derived from a master number and resulting in bar groups of square proportions, such as 4 bars of 4/4 beats or 7 bars of 7/8 beats. Metrical patterns, such as these, suggest a tendency towards the establishment of a *rhythm of bars*, a concept fundamental to Schillinger's *Theory of rhythm* (Schillinger 1978).

An example of an expanding bar group pattern can be seen starting at bar 73 (Figure 8.22). The harp arpeggios mark the start of each group of bars. Each group is one bar longer than the one before: an incrementation through the 'harmonic series'. The only distortion to this progression is the single bar of 6/4 in what is a predominantly 4/4 section.

[42]See Chapter 3, section 3.5.

An example of a contracting pattern, 5/4, 4/4, 3/4, can be seen at bar 20. This pattern recurs at ten bar intervals appearing at bar 30, bar 40 and bar 50. Once again the harmonic series determines the rate of contraction. Each occurrence of this pattern is separated from the next by seven bars in 4/4 metre. The whole sequence forms regular repeating groups of bars which establishes their own rhythm.

8.5.6 Interference rhythms

An example of a rhythm produced by *pulse interference*[43] can be seen in Figure 8.19.

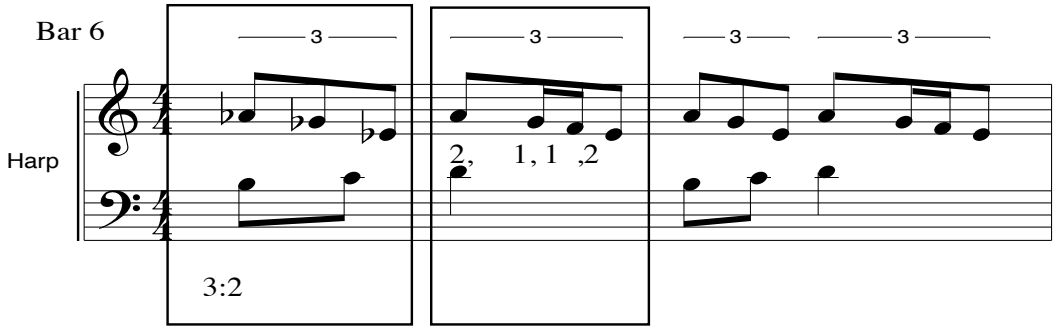

Figure 8.19. *Rêve de l'Orb:* the *resultant of interference* in the harp part.

The combination of triplet quavers and quavers (3:2) in the first beat is imitated directly in the upper part of the second beat. This pattern evolved without conscious knowledge of Schillinger's theories in which such rhythms are treated as fundamental to the process of composition.[44]

8.5.7 Symmetrical forms

Symmetrical forms in music are very important in Schillinger's work. The *Theory Of Rhythm* (Schillinger 1978) produces patterns almost all of which have symmetrical structures. Schillinger frequently notes the connection between symmetry in natural phenomena, such as the 'bi-fold' symmetry of the human body, and symmetrical forms occurring in music. The structure of *Chaleur* shows a tendency towards symmetry which however, is incomplete. The centre of the movement lies between two passages, bars 51 to 54 and

[43]See Chapter 2, section 2.2.

[44]A good example of the appearance of this type of rhythmic resultant can be seen in the finale of Schuman's *Carnival*, (Marche des Davidsbündler contre les Philistins) the right hand part of which is saturated with the rhythm (2,1,1,2).

bars 55 to 59, which are related through mirror symmetry. They represent the climax of the opening section and are relatively extended developments of the scale movement first seen in bar 5. The first passage (bars 51 to 54) consists of all parts descending away from their axis point, while the second passage (bars 55 to 59) shows the reverse: all the parts ascend towards the axis.

The following diagram shows the first half of the movement in a schematic form.

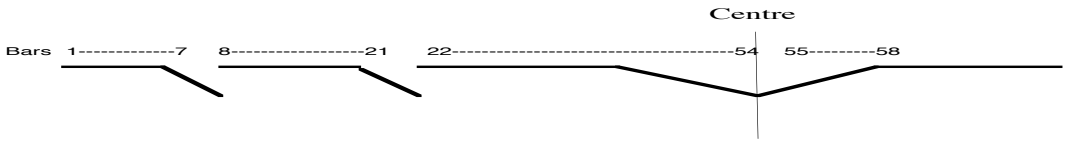

Figure 8.20. *Rêve de l'Orb:* diagram showing melodic movement in the first half of *Chaleur.*

The symmetrical structure suggested in Figure 8.20, is not fully realised in *Chaleur,* as the last half of the movement is not a retrograde of the first half but takes its own individual course. However, the potentially symmetrical form is alluded to at the end of the piece. Bars 106 to 113, are the retrograde form of the first seven bars of the movement (compare Figure 8.21, below, with Figure 8.16, above) in all but some small details.

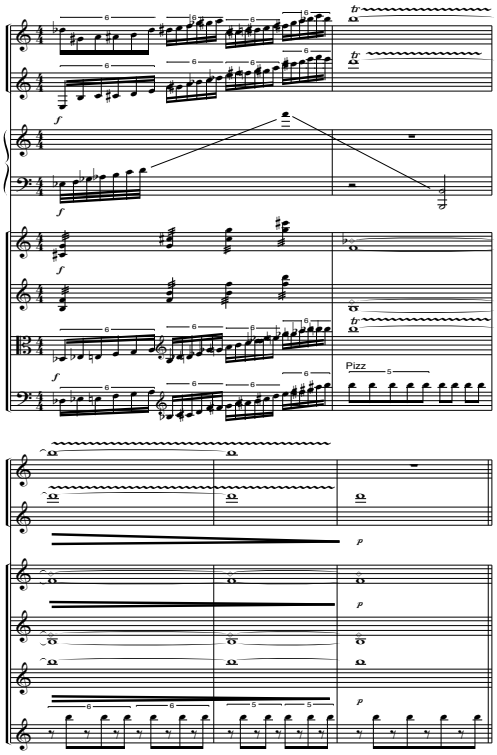

Figure 8.21. *Rêve de l'Orb:* bar 106 to 113 of*Chaleur:*

8.5.8 Links between movements

The abandonment of symmetry indirectly came about from a need to reintroduce musical material from previous movements. For example, at bar 73 of *Chaleur,* the momentum of the music is suddenly stopped by a passage of sustained tranquillity and stillness which is clearly reminiscent of the mood of the second movement.

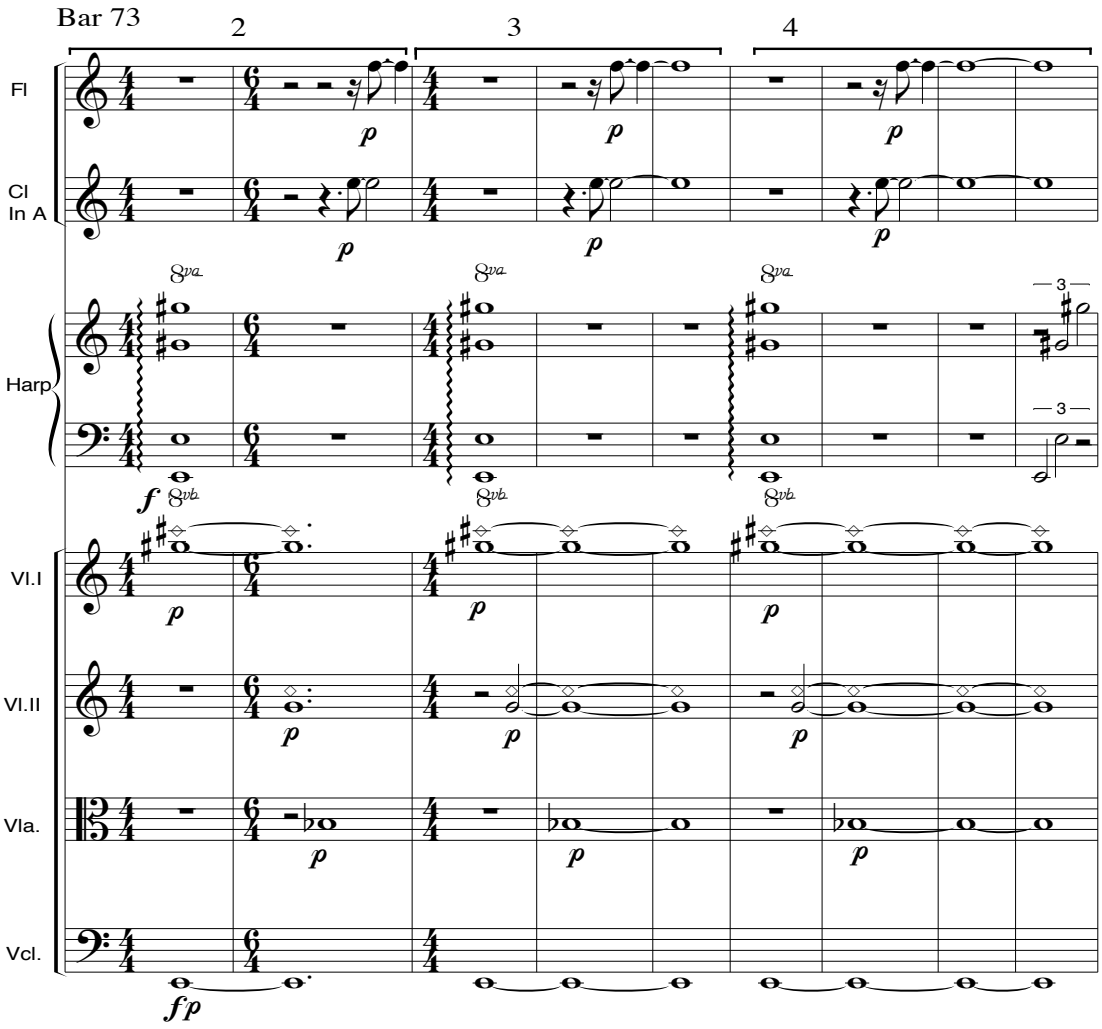

Figure 8.22. Resonance of the second movement.

Following this at bar 82, there is a short dream-like passage which suggests the character of the first movement. The relationship between the two movements is confirmed when at bar 91, the viola part similar to that of the first movement, is superimposed on the 'dream' music.

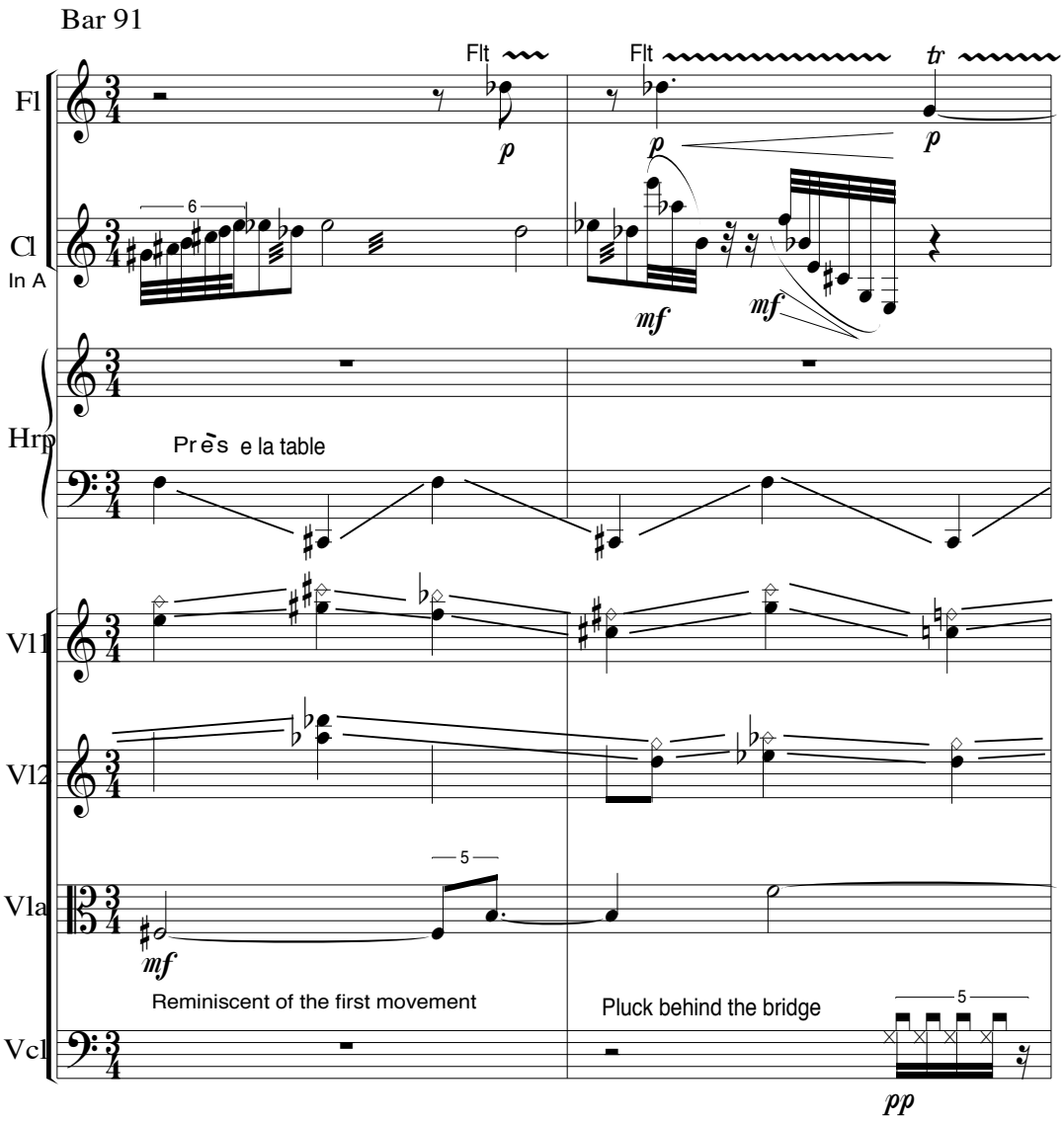

Figure 8.23. *Rêve de l'Orb* : resonance of the first movement.

8.6 Conclusions

Rêve de l'Orb is a composition inspired by nature and in particular the forms of movement in the natural world. I have attempted to translate

metaphorically into music the behaviour of birds and insects, the flow of water and qualities such as lightness, intensity and harsh brutality, all characteristics which I associate very strongly with the southern landscape.

I had not discovered Schillinger's work at the time of composing *Rêve de l'Orb,* but analysis shows the presence of forms which he advocates for the construction of music such as symmetry, pulse interference, growth series and melodic axes. It would be interesting to consider how I might have composed *Rêve de l'Orb,* using Schillinger's methods. There is no doubt that *Rêve de l'Orb* would demand an extremely sophisticated approach which only now, after several years of studying Schillinger's work, would I feel able to undertake. A complex rhythmic structure such as *Libellule* could be achieved by recourse to larger master time signatures such as 32, which would introduce very small durations and consequently flexible rhythms. It would also be necessary to have several simultaneous master time signatures in order to achieve the effect of musical 'tapestry'. Taking these as starting conditions, numerous variations, each of a different quality and character could be constructed. A process of *empirical* composition (refining the method of composition on the basis of the results of the last *experiment)* would ultimately lead to new musical ideas which would in turn lead to structural modifications. It seems likely to me that the application of such methods would not alter the essential underlying 'poetry' of the composition but the presence of a formal underlying skeleton provided by Schillinger's methods would enhance the music in a way that might be compared to the enhancement of an artists Figure by his or her knowledge of the underlting bone-structure.

The remaining chapters in this thesis discuss compositions which have all been strongly influenced by Schillinger's techniques and have been undertaken with a more or less empirical approach. The term *empirical composition* means that a decision to take a course of action or use a particular technique necessitated a process of speculative thought. Sometimes it was necessary to write and re-write large sections of music as part of the empirical process but on the whole experimentation took place in my head and on scraps of paper before I committed notes to paper.

Chapter 9 *Bayo's Way*

9.1 Origins

Bayo's Way, for tuba with live electronics and brass ensemble was composed in 1993 as a commission for the London Brass Ensemble. At the time of composition I had only recently discovered *The Schillinger System Of Musical Composition* (Schillinger 1978) and *Bayo's Way* is my first complete work influenced by Schillinger's techniques. The title is a dedication to Bayo Oshunbiyi, a Nigerian born poet and photographer whose personality and life-style inspired this work. Oshunbiyi lives with an intensity that is sometimes frightening and as he would say, "on the edge". He often spends the entire time between dusk and dawn in the serious appreciation of music. Oshunbiyi frequents all the best Jazz venues and knows many of the musicians who play there. At six in the morning, when the band has gone, elevated by the power of the music, he is still sparkling with enthusiasm for life and art. My composition attempts to capture some of the atmosphere, energy and almost continuous musical accompaniment of this nocturnal existence.

9.2 The extended tuba

The tuba has always fascinated me: it is capable of the lowest extremities of register, producing sounds of penetrating power or minuscule softness, is also a theatrical instrument capable of expressing different 'characters' from the violent and angry to the vulnerable and pathetic; its upper registers can produce expressive melodic phrases. In writing for the tuba player Oren Marshall, I had the possibility of extending these 'characters' into more extreme and distorted forms through the use of electronics. Over the last few years Marshall has extended the range of his instrument by developing a style involving the use of live electronic effects. *Bayo's Way,* was partly designed to be a vehicle to present the full potential of the tuba as a solo instrument and in particular Oren Marshall's extended techniques. Before composing, I spent several days acquainting myself with Marshall's use of the electronics and his individual playing style. He has designed a special mouthpiece for the tuba in which a tiny microphone has been implanted. The sound of his instrument is then passed through a series of effects units: *wah wah, flange, distortion, delay, harmoniser*. Each of these effects can be switched on or off by foot pedals and to some extent their various parameters (such as delay time or interval of harmonisation) can be controlled by the player during rests or at moments during the performance in which one hand can be freed from the instrument. The sound is finally passed to an amplifier and loud speaker unit designed specifically to reproduce bass frequencies

such as those of the electric bass guitar. This set-up makes it possible to alter the balance between acoustic and electroacoustic timbre: the electronics and amplification can be switched off by the performer or be made to dominate and overwhelm the normal acoustic sound of the instrument. Between these two extremes all kinds of subtle mixtures of acoustic and electroacoustic sound worlds can be achieved.[45]

9.3 The soloist and the bass line

Marshall is a virtuoso player who is equally expert in both improvised jazz and the most demanding, prescribed, notated music. His versatility inspired me to conceive of a number of roles that could be played out between soloist and ensemble. The most obvious of these roles is that of the provider of melody. (The melodic aspect of the tuba is exploited after bar 137 in the score). More unusual is the theatrical role of soloist as magician, capable of conjuring extraordinary sounds. This is an idea which recurs in my work, as in, for example, *Moon Shaman* (see Chapter 5). The soloist's 'magical' powers are most evident during the cadenza of *Bayo's Way*, in which he creates his own accompaniment. Using a sampler, the soloist captures a short portion of his performance which, held in electronic memory, can be played back as an infinite loop against which he improvises. At the end of the cadenza, the soloist 'magically' transforms his sound, using a flanging effect and distortion, so that it cannot be recognised as a tuba. At times the sound resembles the voices of dolphins or a distorted 'heavy metal' guitar.

The soloist exerts his will on the ensemble, controlling their actions. For example, at bar 105 in the score, the ensemble is instructed to imitate the soloist's last phrase. Perhaps the most important role for the soloist is what I describe as 'the keeper of the bass line', a role through which he provides the basic pulse and tempo of the music. Pulse is, of course, particularly important in terms of the performance of *Bayo's Way,* but is also the key to the composition as a whole because it is central to two important background considerations: Oren Marshall's personal playing style which has evolved from his study of African music and jazz and my interest in Schillinger's rhythmic theories. These interests originate from different fields of study but share a common ground, that of rhythm. Marshall's study of African music took him for several long periods to Ghana, where he played

[45]The live electronic system just described can be heard on the recording of *Bayo's Way* which accompanies this thesis.

and studied with various musicians[46]. This experience informed his personal style of playing which is strongly influenced by black American music such as funk. My own interest in this area has been enhanced through my study of Schillinger's *Theory of Rhythm* (Schillinger 1978), which has enabled me to incorporate some of the qualities of this type of music into my own style[47]. Examples of funk rhythm can be see particularly at the beginning and the end of *Bayo's Way*, for example, bars 1-49, or bars 178 to the end.

9.4 Form I: narrative, metaphor and trajectory

Bayo's way could be described as a miniature tuba concerto in one movement lasting approximately 12 minutes. The soloist is pitted against an ensemble of nine brass instruments: 4 trumpets, French horn, 4 trombones[48]. The sound of the solo tuba is almost always amplified and modified by electronics (described above) while the ensemble retain their acoustic sound. The overall scheme of the composition can be described as in 6 sections which are illustrated in the table below.

Bars	Description
1-80	Building tension. The tuba plays a virtuosic bass line accompanied by the ensemble. Overtones of Jazz and funk.
81-113	Climactic. An exuberant tuba solo punctuated by the ensemble acting as a chorus. Overtones of 'big band' style.
113-137	Transition to cadenza. Music becomes less tense. Ensemble plays alone.
138-176	Balance/relaxation. The tuba plays a melodic solo, the ensemble provides harmonic accompaniment.
177	Cadenza: gradual increase in tension leading back to Jazz/funk rhythm.
178-217	Finale: the tuba and ensemble are united in funky polyphonic texture.

Figure 9.1.*Bayo's Way* : six sections with bar numbers and descriptions.

The sectional structure shown in Figure 9.1 is the result of a dual approach: a series of dramatic images were ordered into a kind of narrative structure or trajectory and then realised in music mainly through the exploration of rhythm and proportion. Each part of my narrative is a point on an emotional journey and inspires a type of musical expression: as long as the trajectory is satisfactory it does not matter how discontinuous the sequence of narrative events become. A satisfactory trajectory comes about through the ordering

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[46]For example, The Ghanian Dance Ensemble, The West African Folkloric Troupe and The Pan African Orchestra.

[47]For a discussion of jazz and funk rhythm in terms of Schillinger's theory see Chapter 3, section 3.4.

[48]This is the standard London Brass instrumentation.

of images and narrative ideas according to their relative tension and relaxation. The process of ordering is facilitated, but not determined, by associating each idea with an image or mnemonic, such as '*Bayo walks out into the city'* or '*Playing for laughs'*. From these examples it can be seen that I associate musical ideas with types of physical movement as well as states of emotion. My personal tendency to relate image, movement and music was reinforced when I encountered Schillinger's ideas. He suggests that music could in part be described as a representation in sound of our physical experience (Schillinger 1978 page 1410 ff.)[49] and ascribes the following quotation to Aristotle.

> Rhythms and melodious sequences are movements quite as much as they are actions (Schillinger 1978 page 233).

The following table is a more detailed version of Figure 9.1. There are more sections illustrating the complete trajectory. They are displayed with their bar number, mnemonic tag, and a description of their formal function along the trajectory.

Bars	**Mnemonic**	**Trajectory**
1-48	Bayo walks out into the city.	Introduction/accumulation of tension.
49-64	Arrival at the club.	First climax.
65-80	Bayo aknowledges greetings.	Relaxation.
81-96	The performance	Sudden change, increased tension.
97-104	Playing for laughs.	Sudden unexpected change producing humour.
105-112	Band leader.	Sudden change provoking a sense of the absurd. Increased tension.
113- 136	Night into day.	Second climax and release.
137-176	Bayo 'chills-out'.	Maximum relaxation.
177	"On the edge".	Increasing tension.
178-217	New day.	Finale, climax.

Figure 9.2. *Bayo's Way :* the narrative trajectory .

The exact sequence of the narrative trajectory shown in Figure 9.2 was largely the result of instinct aided by use of mnemonic tags and some general principles concerning the means of creating tension and relaxation. Once again I found my own beliefs concerning musical tension were in keeping and enhanced by Schillinger's work. Musical tension and relaxation are related to the forms of motion of natural bodies[50]. Continuous movement plotted on a graph can be used to illustrate tension and relaxation. A sine

[49]See also Chapter 2 of this thesis, section 2.12.4.
[50]See Schillinger's *Theory Of Melody*, Schillinger 1978 page 283 and Chapter 2 of this thesis, section 2.5.

wave, with its regular and uniform motion is neutral with respect to tension and relaxation. Other wave forms suggest different degrees of tension as a consequence of how they change in time. Forms of motion can be viewed as those falling within the bounds of the expected and those which behave in unexpected ways, the latter are more likely to produce a response in the listener of amazement or wonder (Schillinger 1978 page 282). Parameters associated with changes in musical tension are, for example, changes of dynamic or changes of duration: rapid change in any parameter generally produces an increase in tension. In order to achieve a sense of climax over a relatively long period of time, it is necessary to pass through several lesser points of tension and relaxation. For example, during the first 48 bars of *Bayo's Way*, the soloist plays continuously while the density and intensity of accompaniment rises and falls, accumulating tension until the first climax is reached. During the process of composition, I gave this opening section a mnemonic label, '*Bayo walks out into the city*' which helped me to focus my imagination on the character and shape of the music. The entire composition is rigidly organised in 8 bar groups (to be explained later) and as a result, significant changes in the accompaniment occur at intervals of 8 bars. The following diagram is a general illustration of how tension varies throughout the composition as a whole.

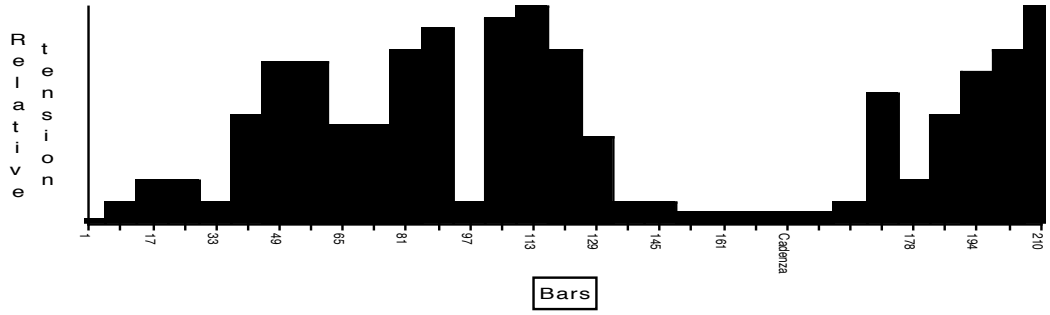

Figure 9.3. *Bayo's Way :* Variation of tension throughout the piece as a whole.

9.5 Form II

9.5.1 Rhythm

The most important aspect of the composition of *Bayo's Way,* was the fusion between the narrative trajectory (see section 9.4) and the rhythmic structure. This involved devising rhythmic structures which articulated the emotional intention of each section of the trajectory shown in Figure 9.2. I shall now

describe in detail the composition of rhythmic structure in relation to the opening section (bars 1 to 48) of the score.
Two Schillinger techniques were of particular importance.
1) Generating variants of a pattern through the rotation of its elements[51].
2) Squaring techniques[52].
Of these, the latter was by far the most important as theyenabled me to create numerous parts or what Schillinger calls 'counter themes' (Schillinger 1978 page 74) from a small amount of original material. Figure 9.4 shows the original rhythmic pattern from which the opening section evolves.

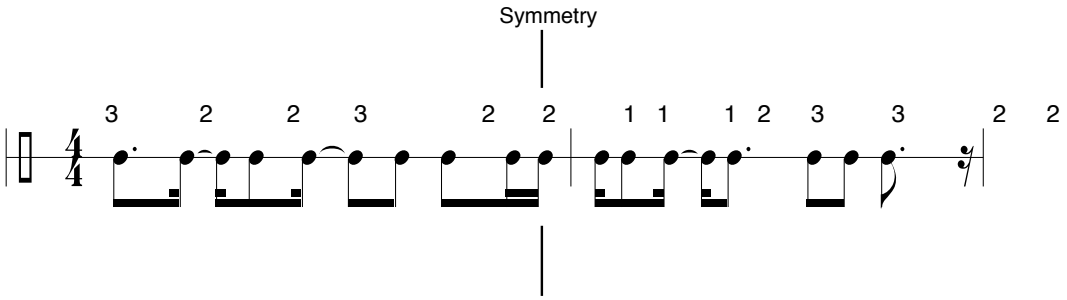

Figure 9.4. *Bayo's Way :* the original rhythmic pattern.

This pattern suddenly came into to my imagination and did not emerge slowly through deliberate crafting. It appealed to me for a number of reasons. It is symmetrical around its centre, suggesting economy and balance. I had become aware of the qualities of symmetry through my study of Schillinger's work (see Chapter 2, section 2.2) and these ideas had no doubt filtered into my imagination allowing them to manifest themselves, as it were, unconsciously. While the rhythm is symmetrical, it is also irregular in the sense that its total duration, 31 semi-quavers, cannot be accommodated in a simple bar scheme. This irregularity suggested to me that the pattern might yield a variety of interesting syncopations. In Figure 9.4, it can be seen that the pattern was conceived as having the semi-quaver as its fundamental unit of duration which ensures the rhythm is flexible enough to have a 'funky' quality (see Chapter 3 section 3.4). However, I felt that a true funk rhythm necessitated the use of 4/4 metre and so the pattern in Figure 9.4, was modified in order to lie neatly within bars of 4/4. This decision was also taken on practical grounds: an unconducted ensemble would play more accurately and effectively if the metre was relatively uncomplicated. My

[51]See Chapter 2 section 2.2.4.
[52]See Chapter 3 section 3.3.2

solution to the problem of barring was to repeat the pattern in Figure 9.4, four times and add four semi-quavers at the end. The following illustration shows the pattern as it appears in the score

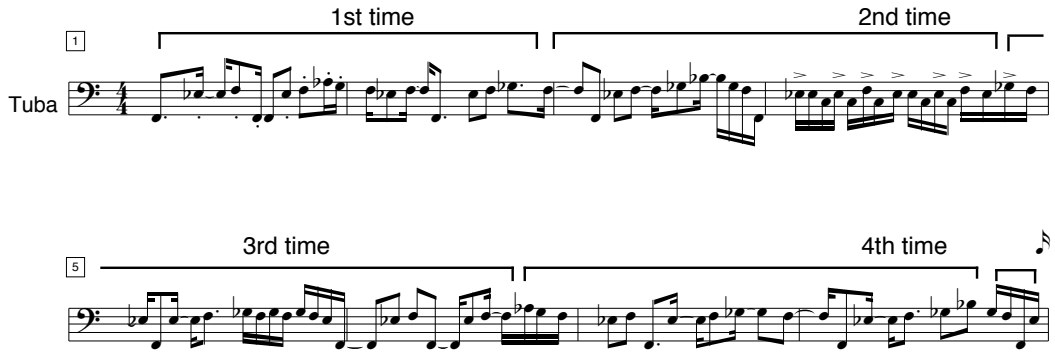

Figure 9.5. *Bayo's Way :* four repetitions of the basic pattern with four added semi-quavers.

Straightforward repetition was avoided by adopting techniques of variation as suggested by Schillinger. Figure 9.6 shows the original rhythmic pattern (top stave) and one of its variants (bottom stave).

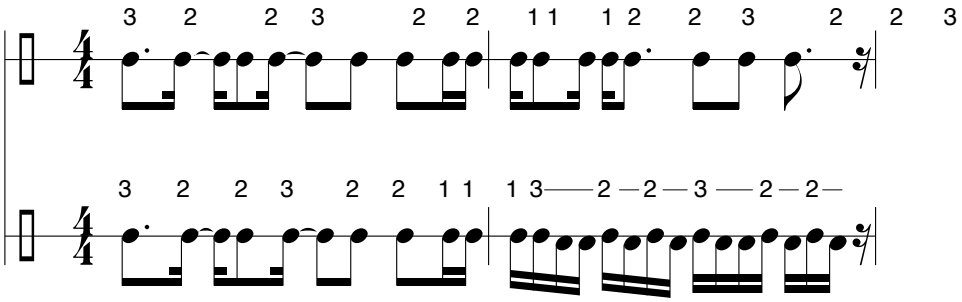

Figure 9.6. *Bayo's Way :* the original pattern (top stave) and a variation (bottom stave).

The second half of the variant (bottom stave of Figure 9.6) has been altered in two important respects.

1) The symmetry of the original has been modified by rotation:

(3,2,2,3,2,2,1,1,1,2,2,3,2,2,3) becomes (3,2,2,3,2,2,1,1,1,3,2,2,3,2,2).

In other words the second half of the variant is the retrograde of the same portion of the original form.

2) The durations of the altered portion have been split into single units (semi-quavers). This creates groups of semi-quavers indicated in Figure 9.6, by a displacement of the notehead on the lower stave line.

In the score these groups are further emphasised by accent markings. Apart from this relatively local variation rotation is also used on a larger scale[53]. The pattern shown in Figure 9.5, repeats every 8 bars for the first 48 bars of the piece, on each repetition the entire sequence of notes is rotated by one place. This causes the accents and stresses of the rhythm to shift to different parts of the bar so creating variation.

9.5.2 Using squares to create the accompaniment

Once the soloist's basic phrase had been established it was necessary to create accompanying parts. These were composed with the character or mnemonic of the opening section in mind: increasing tension as though 'storm clouds were gathering' (see Figure 9.2). I decided to generate accompanying parts using Schillinger's squaring techniques. The reader may remember that this technique involves squaring the master time signature and its sub-groups (see Chapter 3 section 3.3. ff.).

The matter of the master time signature in this composition requires some explanation. The original pattern (Figure 9.4) was based on semi-quaver units and for this reason it might seem obvious that the master time signature would be 16 (16 beats in the bar). However, I was satisfied with my extension of the basic pattern which had produced a phrase lasting 8 bars (see Figure 9.5).
The squaring technique requires that the number of beats in the bar and the number of bars in the bar group must be identical and for this reason I decided that the master time signature of the accompaniment should be 8, (quavers) rather than 16 (semi-quavers). Consequently the music simultaneously involves two types of durational unit: quaver units define the rhythm of the accompaniment while semi-quaver units define the rhythm of the tuba part. This state of affairs might be compared to a ruler marked with more than one gauge.

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[53]For a more detailed discussion of rotation, see Chapter 2 section 2.2.4.

The technique of evolving accompanying parts requires a source rhythmic pattern exactly one bar in length. After experimentation it proved most satisfactory to use a fragment of the basic pattern thereby linking the accompaniment to the solo line. The fragment (3,2,2,1) is derived from the first three elements of the basic pattern with one unit added at the end. (It is important to remember that while the basic pattern was originally conceived in semi-quavers, the fragments just described were treated as though they were based on quaver units). Applying the squaring formula to this fragment produced a new rhythm which perfectly accompanied the eight bar pattern shown in Figure 9.5.

$(3,2,2,1)^2 =$

$(3^2 +3\times2+3\times2+3\times1)+(2\times3+2^2+2\times2+2\times1)+(2\times3+2^2+2\times2+2\times1)+(1\times3+1\times2+1\times2+1^2)=$

(9,6,6,3)+(6,4,4,2)+(6,4,4,2)+(3,2,2,1)= 64 (8 bars of 8 beats).

The following shows how the accompaniment is combined with the original solo pattern in bars 9 to 16 of *Bayo's Way*. The rhythm has been distributed between the French horn and the trombone, an example of what Schillinger calls 'instrumental form': a rhythm is distributed between parts or 'places' and is thereby enriched through timbre contrast (see Chapter 2, section 2.2.1).

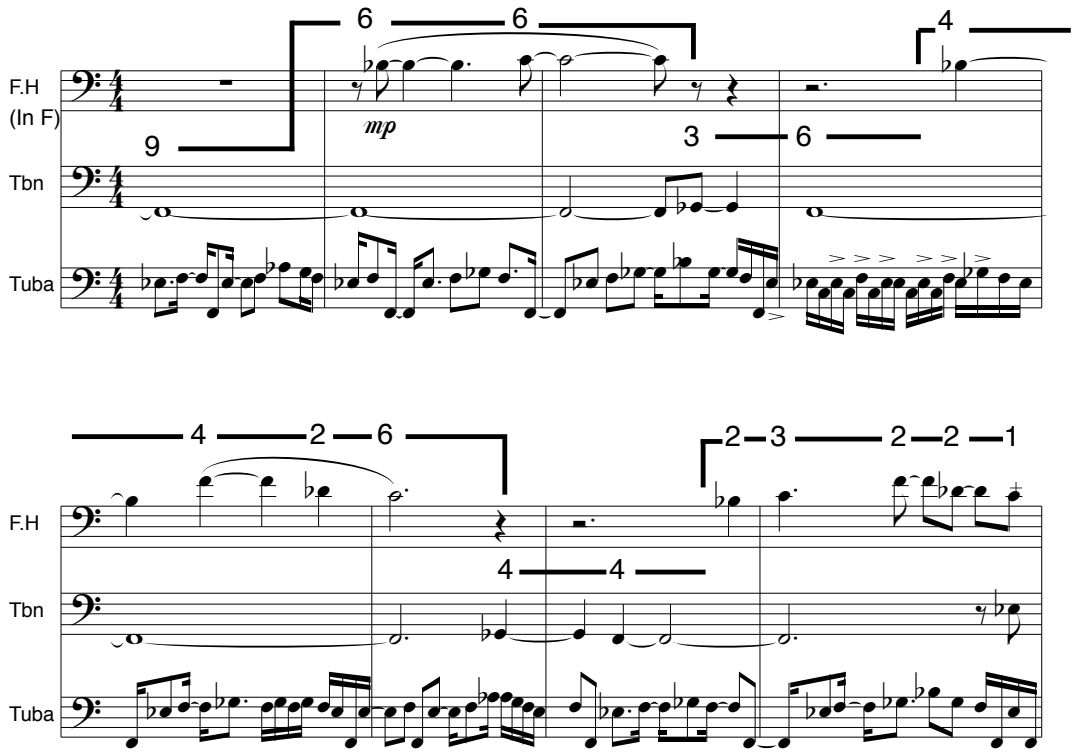

Figure 9.7. *Bayo's Way :* solo tuba and accompaniment, the latter generated by squaring.

The squaring technique described above can produce a very large number of parts. Of course not all the results produced will be suitable for use but the act of rejecting a particular pattern serves to sharpen one's instincts as to the essential qualities required of the material. There is of course always the possibility of modifying a phrase or pattern using techniques such as rotation or rhythmic ornamentation, in order to create more material. Schillinger suggests that the material produced by any technique should be used as efficiently as possible. Perhaps the most basic method of achieving efficiency is through the use of the retrograde form.

Figure 9.8, shows how the accompaniment (French horn) shown in Figure 9.7 is combined with its retrograde (trumpets) in bars 17 to 24 of *Bayo's Way.*

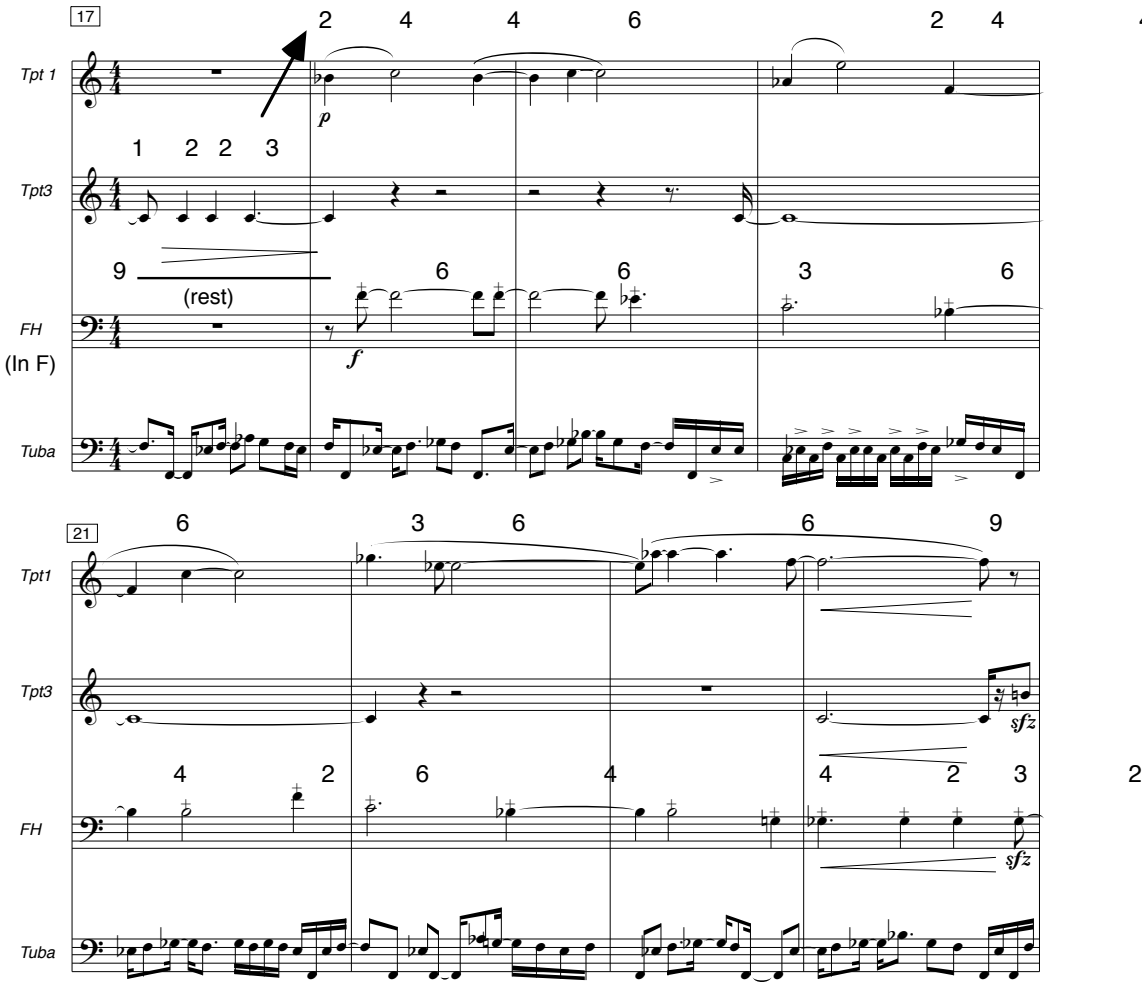

Figure 9.8. *Bayo's Way :* the accompaniment (French horn) and its retrograde (trumpets).

9.6 Pitch

9.6.1 Scale

Pitch was largely derived from the Aeolian scale in F. This scale was then modified, by omitting certain pitches, to give it a pentatonic and 'blues' like quality.

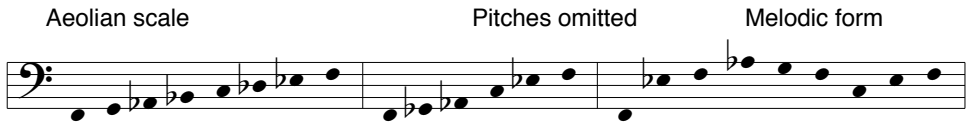

Figure 9.9. *Bayo's Way :* the basic scale of *Bayo's Way,* and its modifications.

Figure 9.9, shows the Aeolian scale (first bar) and two further stages of modification. By omitting certain pitches (bar 2) and rearranging them (bar 3), I created the bass line motif heard in the opening bars of *Bayo's Way* (see Figure 9.5).

9.6.2 Harmony

There are relatively few harmonic structures and progressions in this composition. The scale shown in Figure 9.9, dominates the harmonic dimension and chords usually result from the melodic or polyphonic movement of parts (see Figure 9.8). When harmonic structures occur they are used to fulfil a particular function. The chord shown below could be described as a major chord with a sharpened fourth and a major seventh.

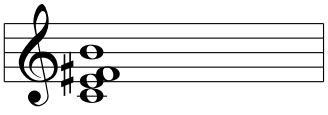

Figure 9.10. *Bayo's Way :* a harmonic structure used to evoke the spirit of Big Band music.

This chord has a quality which I associate strongly with jazz and in particular the 'Big Band' arrangements of Count Basie and Duke Ellington: I have used this harmony to evoke the spirit of that style.

The chord appears in *Bayo's Way*, in various transpositions and with various couplings, particularly between bars 81-96 (see Figure 9.2) where the ensemble punctuates the exuberant outbursts of the tuba.

A different kind of harmony occurs later in the score. Between bars 137 and 176, the tuba plays a solo accompanied by the following type of harmonic progression.

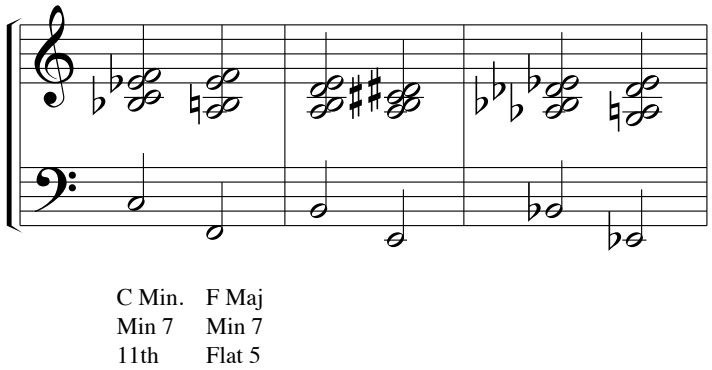

Figure 9.10.1. *Bayo's Way :* harmonic progression underlying bars 137 to 156.

Figure 9.10.1, is a reduction of the harmonic progression between bars 137 and 156 of *Bayo's Way.* The roots of the harmonies (lower stave) do not actually appear in the score as shown here but are included in the illustration for convenience. The harmonies form pairs: a minor chord with a minor seventh and an eleventh, followed, a fifth lower, by a dominant seventh chord with a flattened fifth. Each pair is a semi-tone lower than the last. In realising this progression in the accompanying parts I assigned different durations to combinations of chordal voices, so blurring the change from one chord to the next.

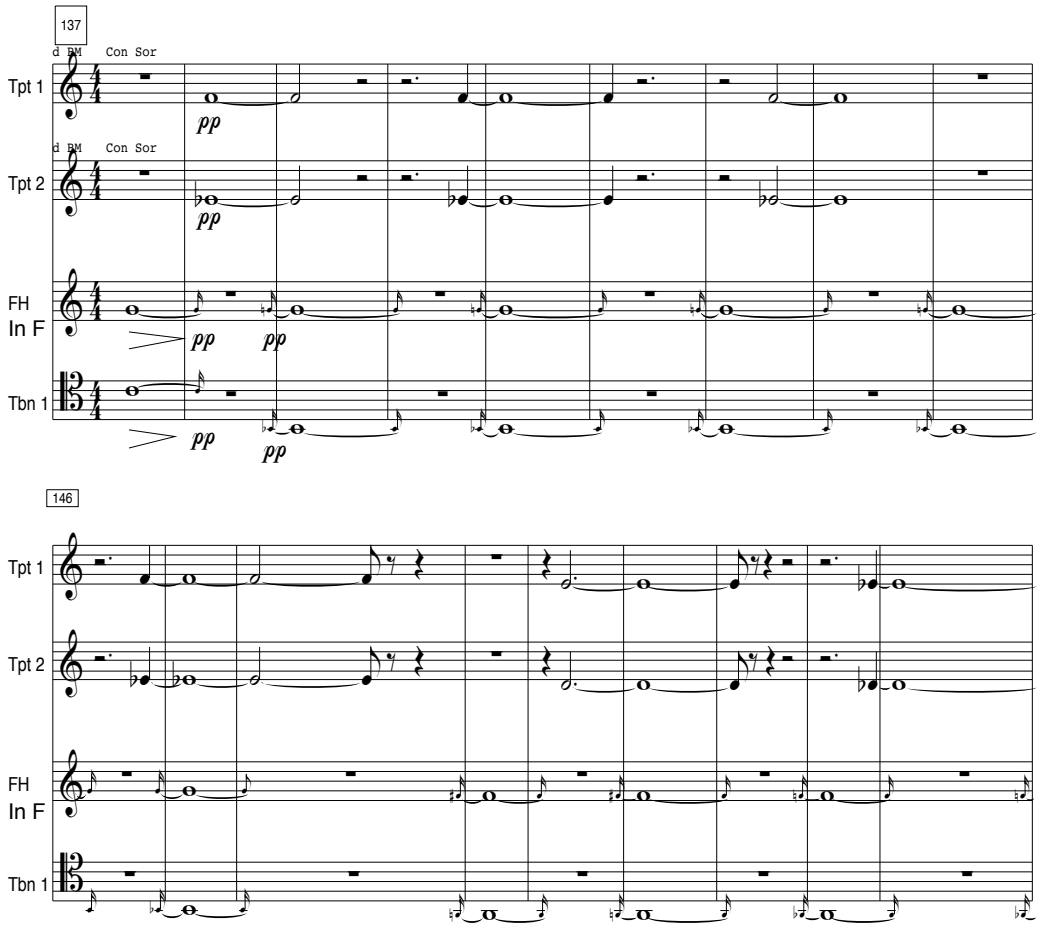

Figure 9.11. *Bayo's Way :* the realisation of the progression in Figure 9.10.1

Rhythmic displacement results in a quasi-polyphonic texture, and produces a series of suspensions (harmonically ambiguous moments) which helped to avoid the possibility of the music becoming a jazz stereotype.

Between bars 114 and 137, a different kind of harmonic structure is used to create contrast to the surrounding jazz influenced harmonies. The entire section is based on a single harmonic block derived from the octatonic scale(Figure 9.12)[54]. This proved particularly useful in neutralising the relatively strong tonal structures heard so far and helping to create a sense of transition.

[54]The harmonic structure shown in Figure 9.12, has also been used in other compositions presented in this thesis. For further discussion of its derivation see chapter 10, section 10.8.

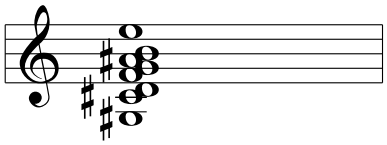

Figure 9.12. *Bayo's Way :* harmonic block derived from the octatonic scale.

The following illustration shows how this structure was realised in the score. As described earlier, rhythm has been applied to each voice in the harmony creating a whole variety of accents and emphasis on the different interval combinations of the harmonic structure.

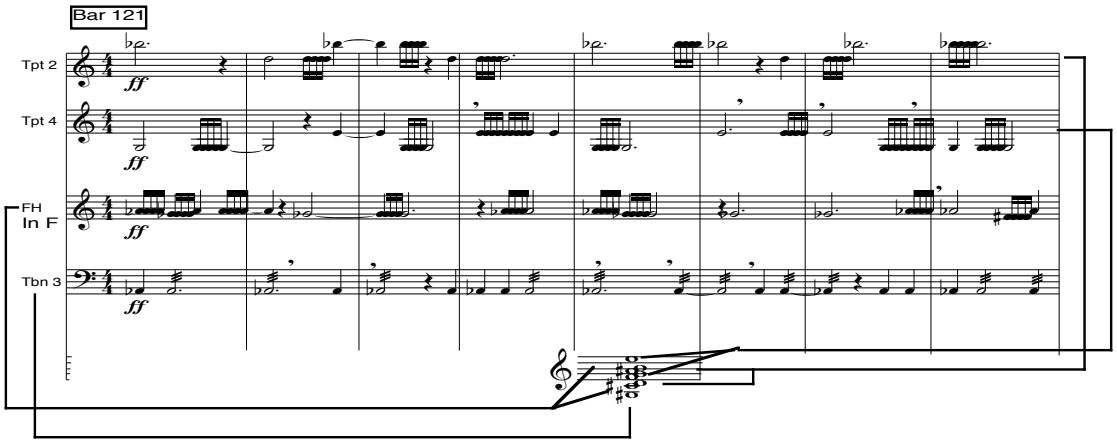

Figure 9.13. *Bayo's Way :* rhythmic realisation of the harmonic structure of Figure 9.12.

9.7. Conclusions

Bayo's Way marked the start of my new approach to composition. In all my previous works form and structure evolved from the imagination stimulated by the poetic background. For example, *Moon Shaman,* in which the setting of the bass clarinet solo, its continuous semi-quavers and sudden melodic leaps, were inspired by imaginary ritual, effort and hyperventilation. *Bayo's Way* was also born from ideas of imaginary narrative mnemonics and imagery. It is theatrical and draws upon my impressions of exuberant live performance. As the title suggests, *Bayo's Way,* is a celebration of the human spirit through the example of Bayo Oshonbiyi's life. Its detailed musical form is also influenced by Marshall's playing techniques and

references to jazz and funk. The difference between this composition and those completed earlier is that it is heavily influenced by Schillinger's rhythmic techniques which determine what might be called the architecture of the music, a quality I associate with predetermined proportions. Large sections of the composition are derived from the smallest fragments of original material. For example, the solo and accompanying parts of the first 48 bars are all derived from the first bar of the tuba solo. Schillinger often compared the development of a musical composition with the growth of natural forms[55] and the structures in *Bayo's Way* which result from squaring techniques could be described as crystalline as the largest and the smallest parts are essentially the same. Structures such as those evolved from squaring techniques contribute to overall coherence because a single rhythmic idea is expressed on every level, the rhythm of the composition as a whole is clearly felt and it is this more than any other factor that determines the architectural quality of the composition. The success of *Bayo's Way* [56]confirmed that the Schillinger techniques used in its composition were of proven practical value and encouraged me to explore his theories in greater depth.

[55]Schillinger 1948 page 222.

[56]*Bayo's Way* was received very well at its premiere in the Queen Elizabeth Hall in March 1994 and went on to receive over forty performances around the world. It was not always liked. in Germany, for instance, it caused much controversy between those who felt it abused the tuba and those who felt it represented an exciting development of the instrument.

Chapter 10 *Make Night Day*

10.1 Introduction

Make Night Day is a composition for violin, bass clarinet and tape, with a duration of 14 minutes. It was composed in 1993 as a commission from the Schreck Ensemble[57], and given its first performance in December 1994 at the Ijsbreker in Amsterdam. The instrumentation was given by the directors of the ensemble whose members included the bass clarinet player Hein Pijnenburg[58]. *Make Night Day* was my second composition made using techniques derived from *The Schillinger System Of Musical Composition* (Schillinger 1978). At the time of writing I was still most interested in absorbing and exploring ideas contained in Schillinger's *Theory Of Rhythm* (Schillinger 1978) and relatively less concerned with the practical application of other techniques, such as those dealing with pitch. In terms of technical development, *Make Night Day* represents an extension and exploration in the field of rhythm.

10.2 Title and origins

My initial inspiration for *Make Night Day*, came from a poem by Shelley entitled *Two Souls*[59]. The poem is set as a dialogue between two spirits who represent opposing forces, most obviously light and dark or perhaps good and evil. I believe the poem also describes something of the opposition or contradiction within the mind of the individual: the incomprehensible complexity of personality which may cause a person to have conflicting emotions or hold a particular point of view to be true at one time and false at another.

[57]An electroacoustic music ensemble based in Holland.
[58]For whom I also composed *Moon Shaman* and *Vision and Prayer.*
[59]I discovered this poem on reading Claire Tomalin's excellent biography of Shelley from which I have quoted the text. Tomalin 1980 page 111.

The poem is too long to reproduce in full but the first two verses will give the reader a clear idea of its nature.

First Spirit
O thou, who plumed with strong desire
Wouldst float above the earth, beware!
A shadow tracks thy flight of fire-
Night is coming!
Bright are the regions of the air,
And among the winds and beams
It were delight to wander there-
Night is coming!

Second Spirit
The deathless stars are bright above;
If I would cross the shade of night,
Within my heart is the lamp of love,
And that is day!
And the moon will smile with gentle light
On my golden plumes where'er they move;
The meteors will linger round my flight,
And make night day

In *Make Night Day*, the dualogue and the opposition between Shelley's spirits is given musical expression by the contrasting register, timbre and style of articulation of the violin and bass clarinet. However, it is important to point out that Shelley's poem was for me a starting point and as the composition developed it became more distant as a source for musical form and structure. For example, the sequence in which Shelley's spirits speak has nothing to do with the order of the solos in *Make Night Day* and in my musical realization I have often blurred the boundaries, so clear in the poem, between the 'two souls'. For example, the first solo of the violin is tense and strained and set in a context suggesting 'darkness' as a contrast to its character which represents light and intensity. The bass clarinet solo (bars 76 ff.) is both moody and dark but has a sensuous dance-like quality which is seductive and perhaps more positive than might be expected. The soloists are accompanied by a tape which surrounds and unites them with computer-manipulated sound. Its world is inspired by Shelley's poem particularly his imagery and suggestion of space ('Bright are the regions of the air') terrifying natural forces ('The red swift clouds of the hurricane') and celestial visions ('The deathless stars are bright above/ If I would cross the shade of night'). Before describing the sound of the tape part and the role of rhythm and pulse I will discuss in more detail the form of the composition and the role of the soloists.

10.3 Instrumental forms

Make Night Day is made up of five sections: sections 1,3 and 5 are dominated by the soloists, while sections 2 and 4 are connecting tape interludes. Each section explores a different aspect of the duet between the soloists and expresses their different qualities.

Bars	Form	Intention
Section 1: bars 1 to 75. ♩. 66	Violin solo. Bass clarinet accompaniment	Light: ascending, intense.
Section 2: (2.08")	Tape interlude.	Descending.
Section 3: bars 76 to 132. ♩= 50	Bass clarinet solo. Violin accompaniment.	dark: descending, slow, moody.
Section 4: bars 116 to 132	Duet in rhythmic unison	Equality/Unity
Section 4: (1.17")	Tape interlude.	Ascending.
Section 5: bars 135 to 196. ♩= 105	Finale: dualogue	Ascending: dynamic exchange.

Figure 10.1. *Make Night Day :* table illustrating sectional form.

The first section features the violin accompanied by the bass clarinet. The violin represents the spirit of light and its music is intended to sound bright and intense. This is achieved partly through rhythm and pitch (to be discussed later) and partly through the melodic contour, a series of ascending phrases and a general movement from low to high register over the course of the first section. There is also a general increase in the density of notes as the violin becomes more active and progressively louder. The bass clarinet at first remains very much in the background. It doubles with the tape accompaniment, playing a pulsing rhythmic Figure in its lower register. Both the tape part and the bass clarinet evoke a feeling of weight and fixedness which gives a sense of struggle to the ascending and increasingly active violin.

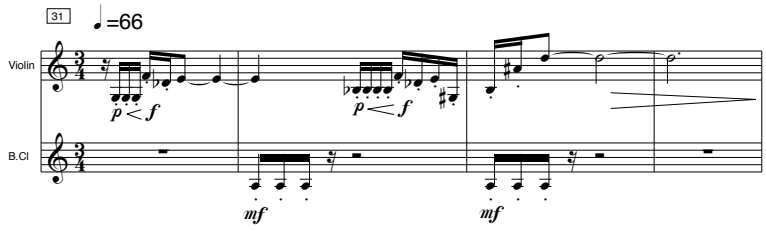

Figure 10.2. *Make Night Day*: bar 31 to 34.

At bar 51, the bass clarinet begins a strident theme in the bass register which serves to increase further the mounting tension.

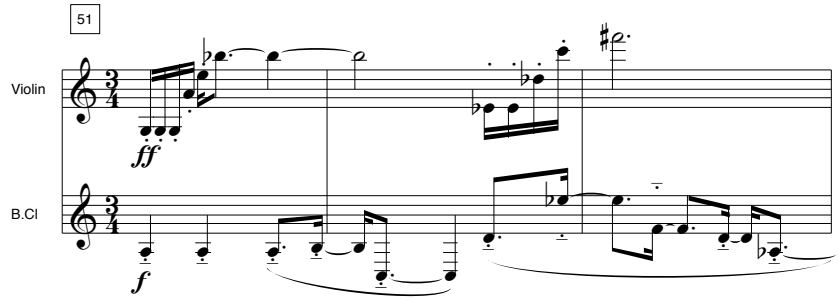

Figure 10.3. *Make Night Day:* bars 51 to 53.

At bar 75, both instruments are overwhelmed by the sounds on the tape, this might be described as a 'dissolve,' where one idea is neutralised and another is introduced.

In the second section, starting at bar 76, the bass clarinet dominates while the violin accompanies. The bass clarinet is in general associated with the coming darkness and plays a moody, sensuous solo in which sinuous phrases wind and meander in the lower registers. The violin takes on the three note motif, originally played by the bass clarinet in the opening section, as well as a languorous legato phrase consisting of a rising interval, most commonly a rising sixth. The solo phrases are set against a tape background of yawning rather languorous sound and repetitive rhythms which all together is meant to create a sense of space and weight.

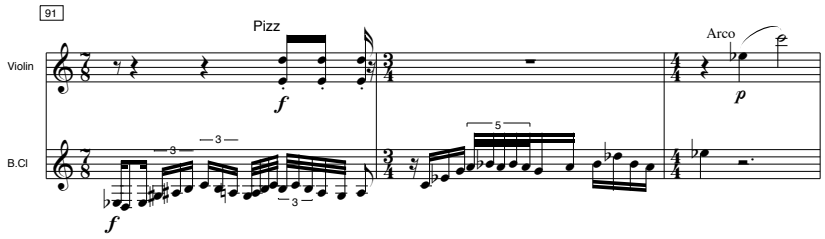

Figure 10.4. Make *Night Day* : bars 91 to 93.

At bar 116, the two soloists come together in rhythmic unison suggesting a harmonious equality.

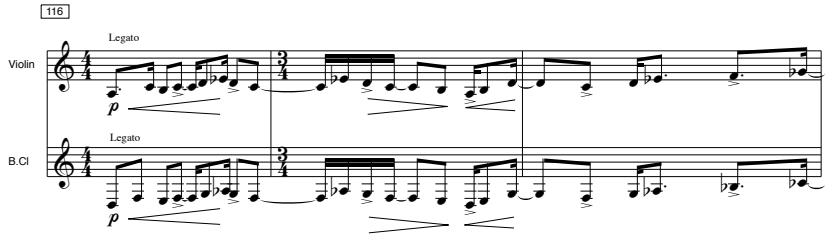

Figure 10.5. *Make Night Day:* bars 116 to 119.

A more dynamic and intense equality between the soloists is achieved in the finale (bar 135 ff.). The two soloists engage in a sequence of rapid exchanges which always ends in their separating in opposite directions. The bursts of 'cross-fire' are separated by miniature tape interludes of only a few bars in length. The intensity of the dialogue increases until the exchanges cannot be sustained and the piece ends, collapsing, as it were, in a kind of incandescent glow.

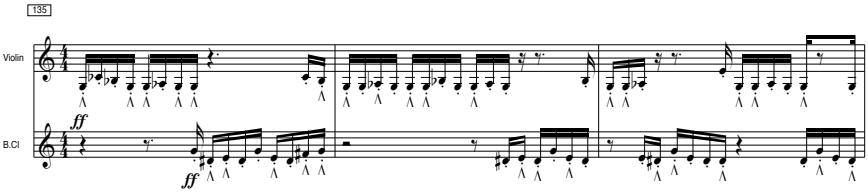

Figure 10.6. *Make Night Day*: bars 135 to 138.

10.4 The tape accompaniment

10.4.1 Introduction

Make Night Day is a composition which stems from duality and contrast both in its poetic background and its instrumentation: the violin and bass clarinet are unlikely partners occupying very different areas of the instrumental spectrum. The third element in the equation, the tape, also represents difference and contrast, being an electronic instrument free from many constraints and limitations which have shaped the expressive character of traditional instruments[60]. However, the difference between acoustic and

[60]I refer the reader to Chapter 4, section 4.2, for a further discussion of this matter.

electroacoustic media is also a unifying force, as the violin and bass clarinet, both mechanical acoustic instruments, share a common bond. These three elements fit into a scheme suggested by the poem: the violin and bass clarinet represent the two souls in dialogue, while the tape serves as their medium of communication, bringing together the two opposing forces by encompassing their sound within its own. The tape also has its own specific role: evoking the fantastical qualities suggested by Shelley's poem ("the meteors will linger round my flight"), and very importantly, in a practical sense, providing pulse as well as a rhythmic structure against which the soloists measure their performance.

10.4.2 Sound sources and their functions

My first step in creating the tape part was to make a large collection of recordings and samples of the violin and bass clarinet[61]. These recordings were then manipulated using a computer and selected to create a palette of sounds serving a variety of functions. A separate source of sounds are those created with an FM. synthesiser[62]. These are used very sparingly as, in my opinion, FM. sounds tend towards coldness, a quality which contrasts well with the earthiness of sampled sound but which can be obtrusive if overused. For example, at 1'27" in the first tape interlude a continuous throbbing texture generated from samples is decorated with a single FM sound: a high pitched, swelling, metallic ring. Sounds in general fall into three categories: *extension*, *gestural* and *percussive*.

10.4.3 Extensions

Sounds that are recognisably derived from an acoustic instrument or are compatible with the live acoustic sound of that instrument might be described as 'extensions'. These are usually sounds of fairly definite pitch which can be used melodically or harmonically to double a note played by the soloist. Extensions work well in creating 'auras' or 'resonance' surrounding the

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[61]Hein Pijnenburg visited the City University in 1991 and allowed a group of students to record his sound for sampling. In 1992 I invited the violinist John Francis to the university for a similar recording session. A few sounds were taken from earlier pieces such as *Moon Shaman* and *Riddle* and from other sources such as the Akai sound library; these latter were then modified using a computer. Michael Rosas Cobian kindly allowed me to use several of his original samples and programmes.

[62]The technical resources were as follows: Akai S1000 sampler, Yamaha TX 802 FM synthesiser, Sound Designer II and Alchemy Software.

sound of the acoustic instruments, helping the soloists blend with the accompaniment. For example, during bar 7, of *Make Night Day,* the violin holds the note G, releasing it on the second beat of bar 8. When the note stops a sample of distant, grainy, airy quality, derived originally from the violin, is heard to remain on the same pitch.

10.4.4 Gestural sounds

Gestural sounds are those which are not easily ascribed to traditional instrumental sources. They are often of indefinite pitch and tend to have very variable behaviour such as an extreme dynamic crescendo or a strong frequency modulation. It is often possible to ascribe to them a dramatic or narrative quality which suggests a context or a mood. Although I have used gestural sounds throughout the piece they are mainly reserved for the tape interludes. The two main tape interludes and the shorter ones in the finale of *Make Night Day* are dominated by sounds originally derived from violin bow taps which have been modified by looping and stretching to produce rhythmic patterns. They sound like highly exaggerated clockwork mechanisms which, as they unwind, form strange shifting rhythmic patterns. The moments dominated by the 'clocks' are transitions and are meant to evoke the sense of time passing. In this way they represent something of the urgency of Shelley's lines: 'A shadow tracks thy flight of fire / Night is coming'. Other gestural sounds are less evocative of time and place but are used to create a vibrant wash inspired by the poem's abstract and fantastical images. For example, the creaking sound used to begin the composition, or the wave-like sound heard at bar 4 (a sample of air passing through the body of the bass clarinet), are used to suggest Shelley's 'winds and beams' or 'äery fountains'.

10.4.5 Percussive sounds

Percussive sounds or sounds that suggest pulse are extremely important in *Make Night Day*. While composing, rhythmic co-ordination and proportion were my overriding considerations and I wanted to articulate clearly the most basic rhythmic structures of the piece. In addition, there was the practical consideration of how to synchronise the performers with the tape part without using a click track or a conductor; the solution was to use percussive sounds as cues giving the pulse and announcing each new section of the piece. Some sounds were both gestural and percussive, such

as the 'clocks' described above, which generated rhythm through looping. The patterns produced in this way were extremely exciting but relatively uncontrollable. Nevertheless, I decided to use them as free extensions of my predetermined pulse structures. Percussive sounds in this piece, therefore fall into two classes: those that can be placed in time with accuracy and used to articulate predetermined rhythmic schemes, and those sounds which can be *triggered* accurately but which thereafter produce relatively uncontrollable rhythms.

10.5 Rhythm

My study of Schillinger's *Theory Of Rhythm* (Schillinger 1978) inspired a number of ideas concerning the development of rhythm and proportion which I wanted to explore in *Make Night Day*. Once the form and character of the composition had been decided on (see Figure 10.1), I began to plan the detailed structure of the music with the intention that each section should have its own distinctive rhythmic character. I was originally attracted to this idea after reading Schillinger's discussion *The Evolution Of Rhythm Styles* (Schillinger 1978 page 84 ff)[63]. Schillinger believed that the rhythmic character of an individual composition or even a style of music, such as 'swing' (Schillinger 1978 page 85), was determined by a number which I refer to as the 'master time signature'. It is perfectly possible and frequently the case that music exhibits the influence of more than one rhythmic determinant or master time signature. A simple example of this is can be seen in a dance such as the Fox Trot or Charleston in which continuous quavers, contained in bars of 8/8, are accented by patterns of 3.

[63]The reader may remember that the master time signature is a number which determines rhythm inside the bars as well as the rhythm of the bar groups. For a detailed discussion of the master time signature, see Chapter 2, section 2.2.3, and Chapter 3, section 3.3.

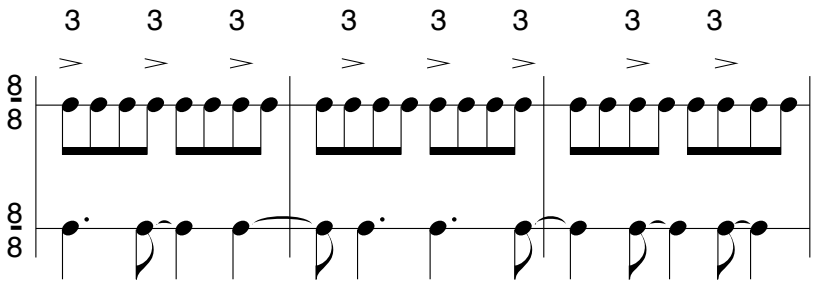

Figure 10.7. A 'Charleston' Rhythm, after Schillinger 1978, Figure 140 page 86.

In *Make Night Day,* I have explored the combination of master numbers[64], using them to create rhythmic patterns, bar groups, phrasing structures, and patterns of instrumental exchange. The rhythm of each section of the composition is derived from a different combination of master numbers or rhythmic generators.

The following table shows the master numbers that apply to each section.

Section	Master Number
Section I. Bars 1 to 75	3,4
Section II. Bars 76 to 132	3,4,7
Section III. Bars 135 to 196	3,4,7 and 5,8

Figure 10.8. *Make Night Day:* the sections of the composition and their master numbers.

Figure 10.8, illustrates how the influence of the master numbers develops during the course of the composition. I hope to show that as the combinations of master numbers evolve in complexity, so the music seems to develop rhythmically, shifting gear, as it were, and growing in dramatic tension. The numbers on the right hand side of Figure 10.14, belong to the following growth series: (1+3+4+7+11.....) and (1+2+3+5+8+13.....). In section 3, numbers from the two series are combined. These series are discussed in detail by Schillinger in his *Theory Of Rhythm,* (Schillinger 1978)[65]. He believed that they represented organic forms of growth and were therefore extremely useful for creating rhythmic structure and musical

[64]Master numbers means multiple master time signatures. I avoided using the term *master time signature* in this discussion because it refers to the specific technique of squaring (described in Chapter 3) and does not express the fact that there are multiple master time signatures.
[65]See also Chapter 3, section 3.5.1.

flow. My decision to make use of these growth series was not arbitrary but the result of contemplation of the motif shown in Figure 10.15. This occurred to me spontaneously, not as the result of deliberate crafting, and when I began to consider it more closely I realised that its simplicity and neutrality offered great potential for development.

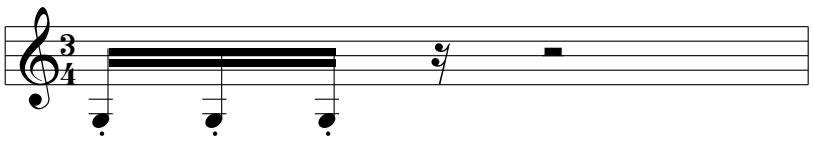

Figure 10.9. *Make Night Day:* the basic rhythmic material.

In the course of the composition the pattern is repeated again and again in all the parts and registers, with different pitches and tempos (see Figure 10.19). I decided to incorporate its features into the detailed planning of the rhythmic structure of the piece as a whole. Contemplating the three attacks, lead me to speculate about rhythms produced by the number three. The first and most obvious manifestation of this line of thought is in the choice of metre (3/4) for the first section of the composition.

I adopted the same lateral approach in developing the basic rhythmic material into more developed rhythmic phrases. In *The Theory Of Rhythm* (Schillinger 1978), pulse interference, (the combination of pulses travelling at different rates[66]) is presented as the fundamental method of generating rhythm[67]. Beyond any purely technical aspects this method appealed to me because it seemed to have, in common with Shelley's poem, the aspect of opposition and duality: both rhythm and poem are the product of difference. I decided to use the original master number 3 as one of the pulses of interference and chose the other, 4, because it was an adjacent number in a common growth pattern (1+3+4+7..).*The Theory Of Rhythm* (Schillinger 1978), gives two techniques for generating the rhythmic patterns from a ratio. The difference between the two patterns is most evident in their duration: the duration of the first pattern is the product of the numbers in the ratio, while the duration of the second pattern is the *square* of the larger number. The common bond between the patterns is in the arrangement and type of numbers used. In the case of 4:3 the results are as shown in Figure 10.10:

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[66] For a full explanation see Chapter 2, section 2.2.

[67]The pulses are represented by number ratios, such as 5:4. The two numbers should not have a common divisor other than 1. The numbers in the original ratio signify the most natural grouping of the resulting pattern. For example, the resultant of 5:4 (4,1,3,2,2,3,1,4) will easily fall into groups of 5, and groups of 4.

Pattern 1 4:3 = (3,1,2,2,1,3)

Pattern 2 <u>4:3</u> = (3,1,2,1,1,1,1,2,1,3)

Figure 10.10. The two rhythmic patterns produced by the ratio 4:3.

The second pattern is an expanded version of the first. It contains numbers, which are arranged symmetrically around the centre. I refer to the shorter pattern as a ratio, (4:3) and the longer pattern as a ratio *underlined,* (<u>4:3</u>) .

The original three semi-quaver pattern (Figure 10.9), is easily derived from either of the above resultants by splitting the first term into single units:

3 → 1+1+1.

Both patterns are used in their entirety throughout section 1. For example, the violin part from bar 11, to 12, is derived from the rhythmic resultant <u>4:3</u> .

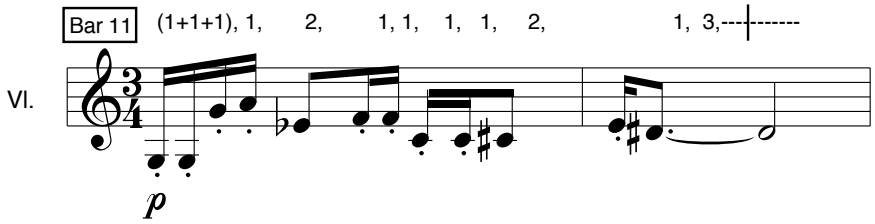


Figure 10.11. *Make Night Day* : the rhythm <u>4:3</u> worked into a phrase.

Further exploration lead me to apply Schillinger's squaring technique[68] in which a group of numbers is used to generate a large quantity of material by applying a formula: $(A+B)^2 = (A^2 + A \times B) + (B \times A + B^2)$. The number of elements in the result, is the square of the number of elements in the original and the sum of the elements in the original and the sum of those in the result are also related by the power of 2.

The result of squaring the rhythm of <u>4:3</u>, is shown below.

[68]For a full discussion of squaring see Chapter 3 section 3.3.2.

$(3,1,2,2,1,3)^2$ =

(9,3,6,6,3,9,)(3,1,2,2,1,3)(6,2,4,4,2,6,)(6,2,4,4,2,6,)(3,1,2,2,1,3)(9,3,6,6,3,9)

Figure 10.12. Rhythm produced by 'squaring'.

The original group has 6 members whose sum is 12. The squared result has 36 members whose sum is 144. Schillinger suggests that the result of this process be used as a 'counter theme', working in conjunction with the rhythm from which it evolved[69]. I decided to experiment with the rhythm in a different way: instead of translating the numbers directly into the durations of a phrase I used them to determine the points of *entry* of an event or phrase.

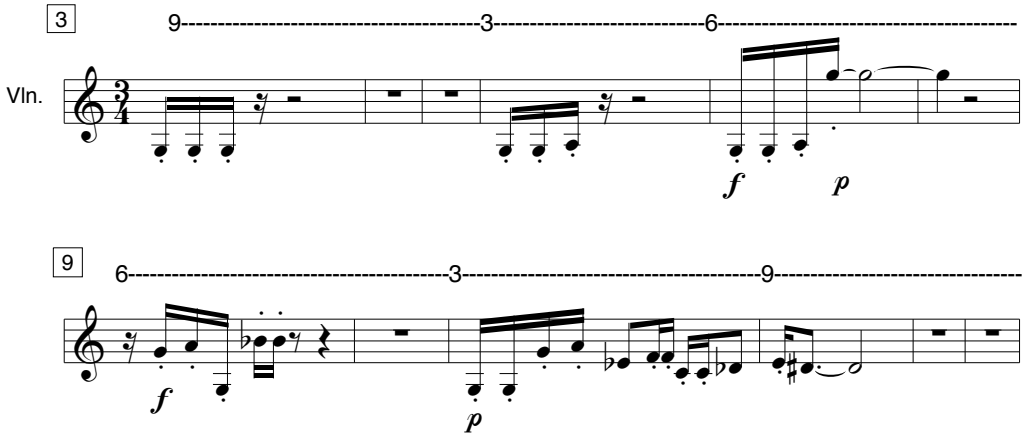


Figure 10.13. *Make Night Day* : rhythm derived from 'squaring' determines the violin entries.

In Figure 10.13, each number above the score represents a quantity of crotchet beats. Each element of the resultant rhythm (9,3,6,6,3,9) is used to 'trigger' the violin. The result is a series of phrases spanning 12 bars of 3/4 which became my standard length of bar group. It might seem most obvious to continue this process by applying the second group of the result in Figure 10.12. However, empirical exploration lead me to make a different decision: to exclude from the rhythm in Figure 10.12 all but two sequences, leaving (9,3,6,6,3,9,) and (6,2,4,4,2,6,), which I used to determine the points of entry of the violin throughout the first section of *Make Night Day*.

[69]See for example, Chapter 9, section 9.5.2

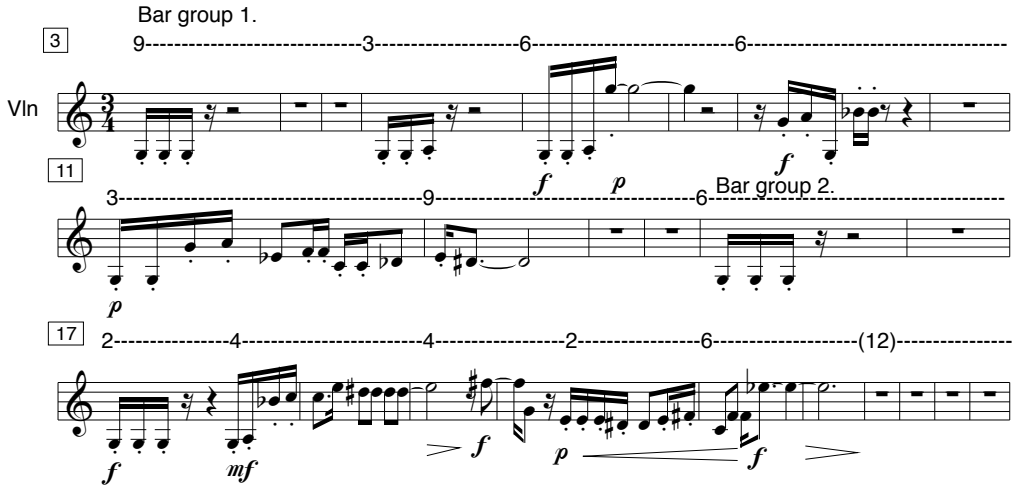


Figure 10.14. *Make Night Day* :a pair of rhythmic patterns controls the phrasing of the violin.

The pattern, (6,2,4,4,2,6,) is clearly too short to create a 12 bar group which accounts for the addition of 12 silent crotchet beats (see bar 22, of Figure 10.14). The use of two rhythms in sequence, one long and one short, is an idea discussed by Schillinger in *The Theory Of Rhythm* (Schillinger 1978 page 21) as a way of creating flow. He observes that the rhythms produced by a ratio, such as those shown in Figure 10.10, can be used in pairs to create expanding or contracting phrases. I have modified this idea choosing instead to use rhythms produced by squaring. The addition of an extra number at the end of the shorter pattern is an idea recommended by Schillinger as a way of making two unequal groups balanced. I chose to do this because at this stage in the composition I wanted to establish a degree of parity between the two instruments in order to later create tension through inequality. In this instance the rhythmic structure of *Make Night Day* does not strictly follow Schillinger's prescription. Instead I have used his ideas to produce structures but have chosen to use only those which suited my purposes.

10.6 Section II

10.6.1 Rhythmic identity

Each section of *Make Night Day* has its own rhythmic identity which helps support the emotional journey of the composition. The second section is

meant as a strong contrast to the first: it is slower in tempo and has a seductive dance-like quality, the result of the interaction between the master numbers, 3,4 and 7. The master number 7 is part of a growth series and is created by adding the first two numbers. Rhythms based on 7 are most distinctive in character[70] because they do not divide into even sub-groups and (being still relatively unusual in most styles of music) have something of a novel quality. After some thought I decided that 7 would be best used as a square determining the basic length of a section. I divided this length into a sequence of metre using wherever possible time signatures based on the other master numbers 3 and 4. For example,

$7^2 = 49 \times$

4/4	3/4	3/4	4/4	3/4	4/4	7/8.

Figure 10.15. *Make Night Day* :49 quavers grouped in bars of 3/4, 4/4 and 7/8.

The first two bars in Figure 10.15 (shaded) form a unit (4/4+3/4) which expresses the master number 7, the third and fourth bar are simply the retrograde of the first two. The sequence of metre in Figure 10.15, begins at bar 80 of *Make Night Day*, preceded by a four bar introduction (bars 76-79) illustrated by a shaded area in Figure 10.22.

3/4	4/4	4/4	3/4	4/4	3/4	3/4	4/4	4/4	3/4	7/8			
A						B							
A	**1**												

Figure 10.16. *Make Night Day* :Figure 10.15, with a four bar introduction (shaded area).

The sequence in Figure 10.16, was divided into two portions (A,B), which were then rotated to produce the following variation.

3/4	4/4	4/4	3/4	7/8	3/4	4/4	4/4	3/4	4/4	3/4			
B					A								
B	1												

Figure 10.17. *Make Night Day* : rotation of Figure 10.16

[70]"The 7/7 series is apparently of Eastern origin. In its trans-Asiatic travel it has crossed the Ural mountains and reached central Russia (Borodin, Rimsky-Korsakov)".Schillinger 1978 page 73.

The shaded area in Figure 10.17 illustrates how the four bar introduction has been shifted by rotation into the second half of the metric scheme. A method described by Schillinger as *permutations of the higher order* (Schillinger 1978 page 63) allowed me to create an extended sequence of metre derived from these initial variations. The sequences in Figure 10.15 and 10.16 themselves become A1 and B1, and are subject to rotation as illustrated in Figure 10.18.

Bars 76-81	Bars 82-86	Bars 87-91	Bars 92-97
A1	**B1**	**B1**	**A1**

Figure 10.18. *Make Night Day* :extension of larger groups through rotation.

This method helped me to create a continuously varied sequence of metre throughout the second section of the *Make Night Day.* The sequence of bars is an expression of the master numbers and has a distinctive rhythm which contributes to the languorous, rolling quality of this part of the composition.

10.6.2 Rhythm within the bars

Composing phrases within the bars was a process which began with the exploration of rhythms produced by the master numbers. The strong percussive pulses heard in the tape part were placed according to the rhythm 7:3 (331232133): each number in the rhythm represents a number of bars irrespective of the time signature.

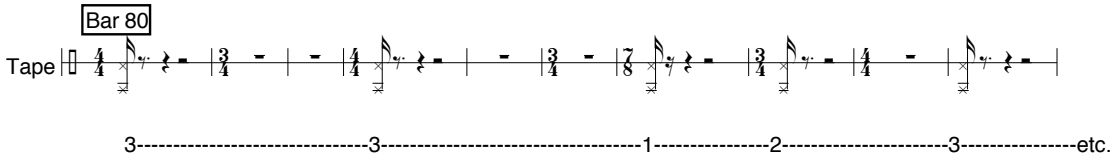


Figure 10.19. *Make Night Day* :7:3 determines groups of bars and percussive downbeats.

Figure 10.19 shows the first five elements of the rhythm 7:3 and how each determines the placement of a downbeat.

Other aspects of the composition, both the sounds in the tape part as well as the instrumental parts are controlled and co-ordinated by rhythms derived from the master numbers. For example, the entries of the bass clarinet and

the three note motif played by the violin are determined by applying squaring techniques to the numbers 3 and 4:

$(4+3)^2$ = (16+12) and $(3+4)^2$ = (9+12).

I combined the results of these squares as illustrated in Figure 10.20.

(16+12+9+12) and (5+9+12+16+7)

12

Figure 10.20. *Make Night Day* : two arrangements of the results of squaring.

Two arrangements of the square are shown in Figure 10.20. The first is simply the results of squaring, while the second is a variation of the first derived by dividing the number 12 into two portions and redistributing the results. This type of variation came about through musical not technical considerations and is a good example of how an apparently rigid procedure can be applied with flexibility. Figure 10.21, shows how the scheme in Figure 10.20 was realised in the score.

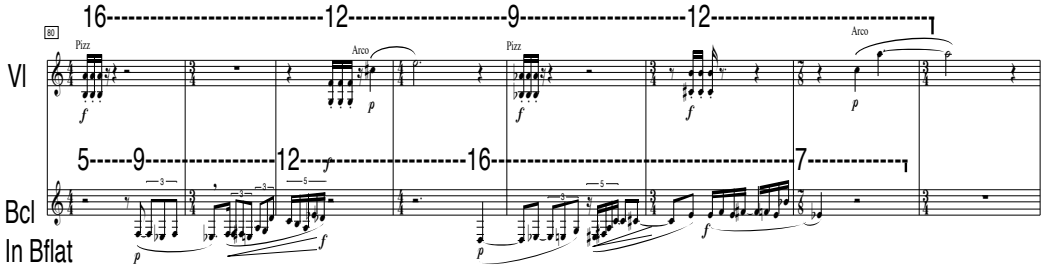


Figure 10.21. *Make Night Day* :the results of squaring realised as a score.

It can be seen in Figure 10.21, that the rhythms of the phrases played by the bass clarinet are freely composed but that the points at which they occur are controlled by the square rhythm. I treated this scheme with some flexibility, for example, the end of a phrase may overlap the start of the next entry point as in the third bar of the bass clarinet part in Figure 10.21.

10.7. Rhythm in the finale

The most important consideration in the Finale was how to create tension between the two soloists. In order to achieve this and suggest the idea of dualogue, the soloists play almost identical material based on regular semi-quavers which is 'bounced' between them in the manner of a fierce exchange.

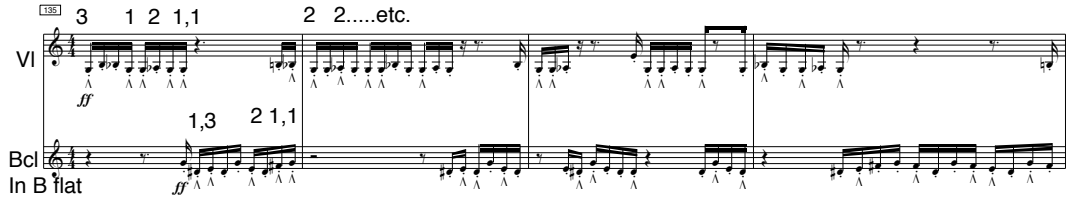


Figure 10.22. *Make Night Day:* cross-fire dualogue in the Finale.

The rhythm of the exchanges between the two instruments and the metrical structure of the Finale was influenced by the rhythm 8:5, (5,3,2,5,1,4,4,1,5,2,3,5). The two numbers in this ratio can be found in the Fibonacci series (1,2,3,5,8,13..) and add a new level of rhythmic complexity to the finale when combined with the already established master numbers 3,4 and 7. I believe that the tension and excitement of the Finale is partly the consequence of combining multiple master numbers belonging to different growth series.

I used the rhythm 8:5 to create a bar group in which to contain the exchanges between the soloists. The duration of 8:5 is the product of the two numbers ($8\times5=40$):40 quavers is easily barred as five bars of 4/4 (8/8) and is marked as 'first exchange' in Figure 10.23.

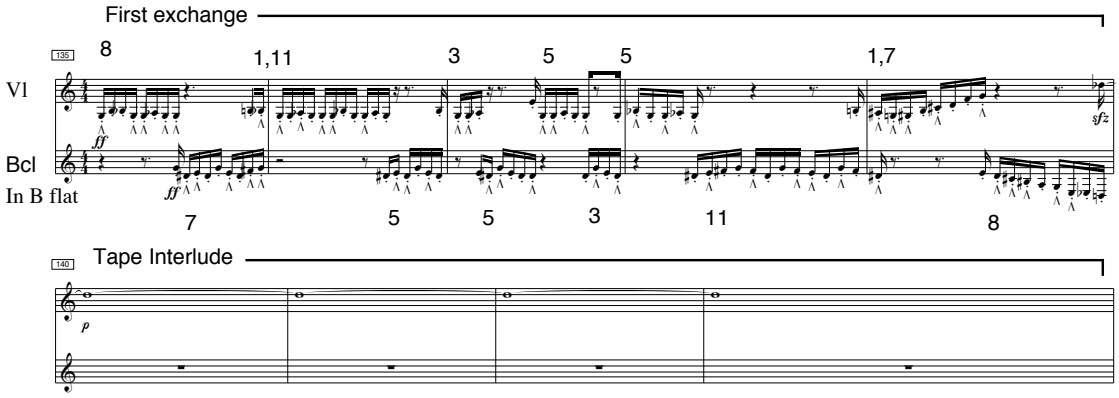


Figure 10.23. *Make Night Day:* first exchange and tape interlude in the Finale.

To control the rhythm of the exchanges I modified 8:5, first doubling its quantities in order to cope with the number of semi-quavers in the bar group and secondly fusing some adjacent numbers thereby reducing the number of elements in the rhythm and increasing the length of each instrumental exchange. The modification was made by trial and error but always preserving the symmetry of the original. For example,

(5,3,2,5,1,4,4,1,5,2,3,5)→(8,7,1,11,5,3,5/5,3,5,11,1,7,8).

40 80

Each number in the modified version represents a quantity of *semi-quavers* allotted to a soloist. Usually, but not always, consecutive numbers are assigned alternately to the soloists as illustrated in Figure 10.23.

The rhythm of the tape interjections is also based on the rhythm 8:5. There are four tape interludes in all, each is a bar shorter than the one before which creates a sense of tension through contraction. The entry of sounds in the tape part is based on the modified 8:5, as the interludes contract so I modified the rhythm by omitting elements on the basis of trial and error.

The following table describes the first three interludes.

First interlude: 4 bars of 4/4.	(7,1,11,5,5,11,1,7,8)	56𝅘𝅥𝅯 = 3.5 bars of 4/4
Second interlude: 3 bars of 4/4	(11,7,1,5,5,3,11)	48𝅘𝅥𝅯 = 3 bars of 4/4
Third interlude: 2 bars of 4/4	(11,7,1,5,5,3)	32𝅘𝅥𝅯 =2 bars of 4/4

Figure 10.24. *Make Night Day* :the proportions of the contracting tape interludes.

10.8 Pitch

The harmonic and melodic material in *Make Night Day,* is derived from the octatonic scale.

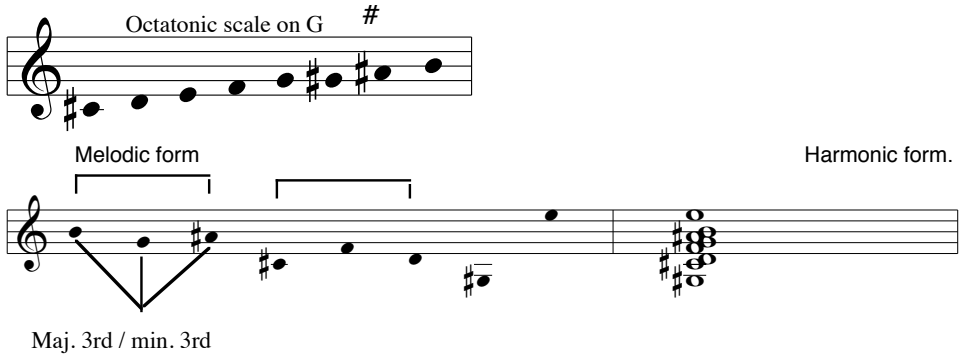


Figure 10.25. *Make Night Day* :the octatonic scale (top stave) rearranged (bottom stave).

The modified arrangement of the scale shown on the lower stave of Figure 10.25, came about through improvisation at the keyboard, and reveals a sequence of major and minor thirds. The configuration of pitches is crystalline in its symmetry and when sounded together or in rapid succession the structure has a bright and intense quality. The scale naturally falls into sub-groups of three-note cells which have a satisfying melodic potential. Their contour is circular and self-contained, constructed around the major and minor third.

The melodic arrangement of the scale has the quality of tonality in greater measure than the normal closed form of the octatonic scale. This may be because my arrangement reveals harmonic intervals, such as thirds, and that the last note of the sequence lies a perfect fifth higher than the first note,

thereby suggesting a dominant/tonic relationship. I explored a different type of tonality during the Finale of *Make Night Day*. This might be described as a kind of twelve tone tonality[71] achieved by introducing and repeating eleven out of the twelve possible notes of the chromatic scale. The twelfth pitch sounds particularly fresh and significant when it finally arrives and could be considered the tonal centre or goal of the chromatic scale. Starting at bar 180, of *Make Night Day,* I gradually interpolated alien (chromatic) notes between the pitches of the original scale (see Figure 10.7) thereby delaying the arrival of its final note C, which lies at the heart of the climax at bar 184. The whole sequence starting at bar 180 is based on scale form A, (see Figure 10.9) and its chromatic pitches. In Figure 10.26 the bass clarinet is notated in C, for convenience.

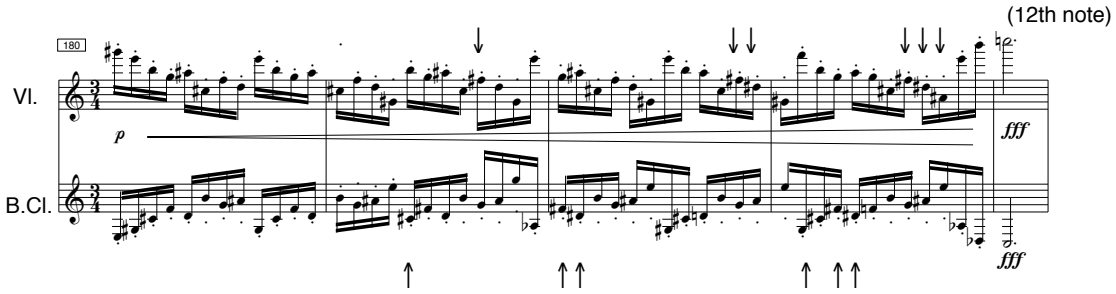


Figure 10.26. *Make Night Day* :scale form A, with interpolated chromatic notes indicated by arrows

As an aid to composition I constructed a chart of all twelve transpositions of the scale, shown below in Figure 10.27.

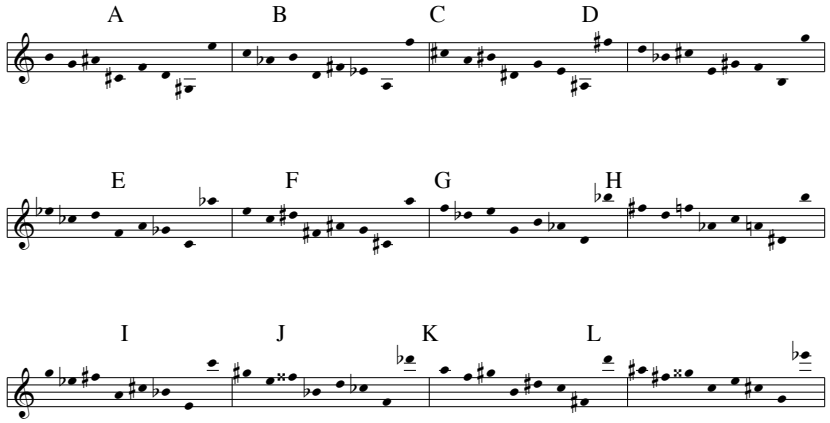


Figure 10.27. *Make Night Day* : twelve transpositions of the original scale.

[71]Not a reference to the book *Twelve Tone Tonality* by George Perle (Perle 1977).

Different transpositions of the scale are used to create the soloist's material. For example, the violin part of the first 21 bars is based on form F of Figure 10.27, only the F natural in bar 11 is a deviation from the scale.

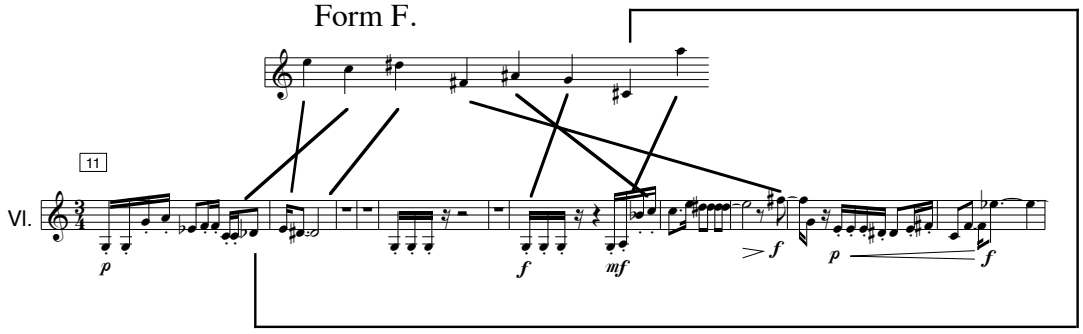


Figure 10.28. Form F, of Figure 10.9, is used to create the violin phrase starting at bar 11.

Between bars 37 and 38 of the violin part the melody is a directly derived from form D of Figure 10.27.

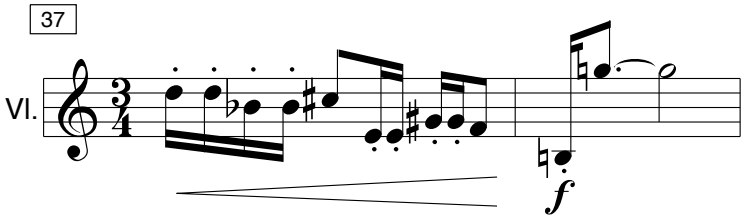
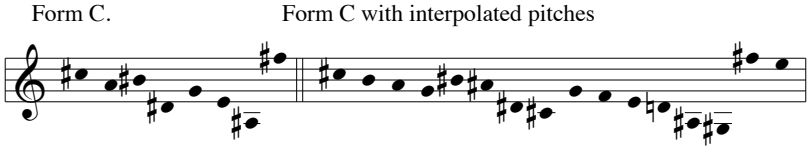


Figure 10.29. *Make Night Day* :form D (Figure 10.27), is evident in the violin part.

I found that interpolating intervals between the pitches of the original forms produced satisfying results. At bar 80 the bass clarinet solo is made by interpolating the interval of a major second between each note of form C.



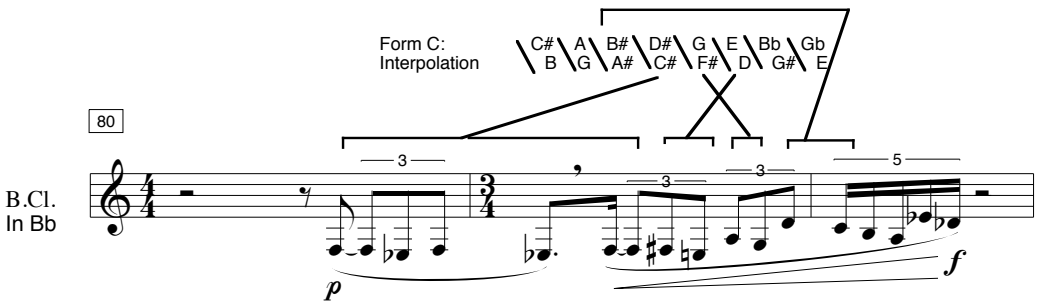


Figure 10.30. *Make Night Day* :the bass clarinet part based on Form C.

10.9. Conclusions

Make Night Day, represents a rather free exploration of the rhythmic techniques suggested by Schillinger which have been modified and combined in a way he never suggests in his writings. The application of a technique has always been in response to a musical need, shaped and inspired by the poetic material and musical instincts. This has sometimes meant embarking on a process of lateral thinking which cannot be described as rational and yet it has always lead to a sequence of procedures which have a solid technical base. From this experience I conclude that Schillinger's ideas are flexible enough to be applied, as it were, creatively. As the title of his books suggest, Schillinger's work is not so much a theory but a *system* designed to be a technical aid to the composer. Schillinger states that he wishes to help the composer to reach a clear decision, whatever that may be[72].

> My system does not circumscribe the composer's freedom, but merely points out the methodological way to arrive at a decision. Any decision which results in a harmonic relation is fully acceptable. We are opposed only to vagueness and haphazard speculation.(Schillinger 1978 Page 1356)

In the light of such a statement and my own experience I would suggest that a personal interpretation of his methods is in no way inappropriate.

[72]As mentioned in my introduction section 1.1.

Chapter 11 *Trilogy*

11.1 Introduction

Trilogy for orchestra was composed in 1995 and has a duration of approximately 12 minutes. As the title suggests it is in three parts: two outer sections, which are fast moving and scherzo-like and a middle section which is slower moving and features a melody with harmonic accompaniment. The opening section of *Trilogy* was intended to suggest intense growth and struggle, a journey leading to the calmer second movement. The idea of a journey fraught with difficulty is the stuff of myth or fairy tale: fighting one's way through a dense forest is symbolic of inner struggle[73]. The journey may lead to a better place, a clearing or place of safety but a haven in the centre of the forest or the eye of the storm is temporary and must eventually be abandoned and the struggle continued, the subject of the third section of the composition. Although the three parts of *Trilogy* can be explained by this story, the music is not inspired by metaphor or narrative to the same extent as some of my other compositions. By the time I came to compose *Trilogy* I had absorbed the majority of Schillinger's theories, enabling me to create a composition in which the poetic background and the intellectual dimension balanced and complimented one another.

11.2 Section I

11.2.1 Rhythmic structure

[73]See J.C. Cooper 1978 page 71.

The opening section of *Trilogy*, evolves from a melodic line the rhythm of which is strictly based on the following interference pattern[74]:

7:2 = (2,2,2 [37× 1] 2,2,2).

The total length of the rhythm is determined by the square of the larger number, 7^2 =49.

Figure 11.1 shows the rhythm as it appears in the score (1=𝅗𝅥).

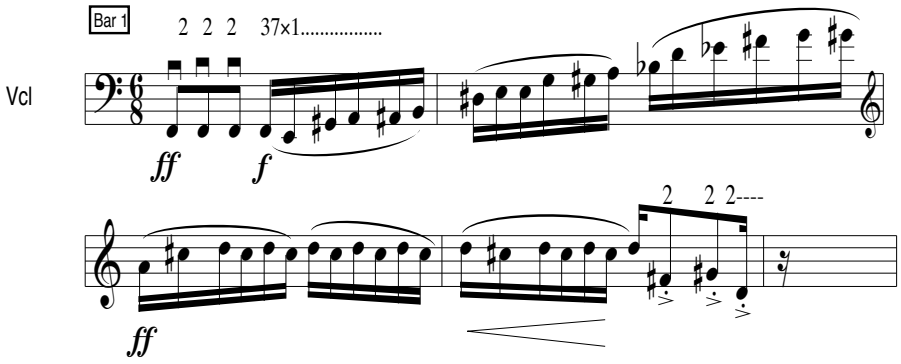


Figure 11.1. The rhythm 7:2. as it appears in the score.

Figure 11.1 shows one cycle of the rhythm 7:2 as it appears in bars 1 to 4 of the score. This rhythmic cycle is the main component building block of the opening section and its form is very clear: three attacks of quaver duration, followed by many more attacks of semi-quaver duration culminating in the return of the three quavers. I chose this rhythm because it evoked the feeling of a journey: the 37 semi-quavers lend themselves to runs and arpeggios which suggest the contours of a route, the regularity of the semi-quavers suggests neutrality and give the 6 quavers special significance as points of departure and arrival. Besides the characteristic just described, rhythms based on 7 appeal to me generally as they have an uneven quality due to

[74] See Chapter 3 section 3.2.

the fact that they do not naturally divide into balanced portions[75]. In addition, the number 7 is often associated with the folk music of Eastern Europe and has often appeared in the music of composers whose work I admire such as Stravinsky, Shostakovitch, Bartok and Janacek.

11.2.2 Counter themes

One potential advantage of using a rhythm such as 7:2 is that its duration is based on the square of the larger number in the ratio, which means that it can be used to create rhythmic structures derived from Schillinger's squaring techniques[76]. This method enables one to create accompanying rhythms or *counter themes* by squaring significant rhythmic patterns whose duration equals the master time signature. Although I used this technique on numerous occasions throughout the composition of *Trilogy,* in this case experimentation lead me to conclude that the original line was best left uncluttered by accompanying parts. I mention this here because it is an example of how Schillinger's methods and techniques are at the service of the music and can simply be discarded if they produce no beneficial result. My early sketches of the opening section of *Trilogy* contain several *counter themes* and the vestiges of one of these remains in the final score. For example, the rhythm of the piano part in bars 1 and 2 and bars 13 to 14 is based on the following square:

$(2+2+3)^2 = (4+4+6)+(6+4+4)+(6+9+6)$

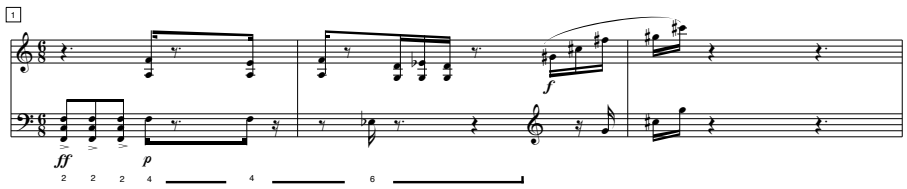
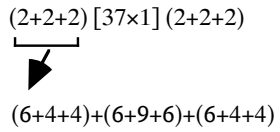


Figure 11.2. *Trilogy:* the piano part shows vestiges of the squaring technique.

[75] See chapter 3 section 3.3.1.
[76]See Chapter 3 section 3.3.2.

In Figure 11.2, the square rhythm is clearly very much in the background and is obscured by layers of adornment. The first three quavers (bar 1) are clearly the first three elements of the rhythm 7:2 but are also related to the squared rhythm because when taken as a group their sum (6) equals its first element.



The next three durations, 4, 4 and 6, shown in Figure 11.2, are most clearly articulated by the bass notes in the left hand of the piano part. After this the squared rhythm is abandoned and the original line (7:2) dominates the last part of bar two and the beginning of bar three.

11.2.3 Metre

Rhythms produced by the interference of pulses can be barred most naturally in meters indicated by the original ratio: the rhythm 7:2 falls into bars of 7 beats or bars of 2 beats. However, I chose to place the rhythm 7:2 in bars of 6/8 adding another level of rhythmic complexity to the music in order to further enhance the rolling, dance like quality of the original rhythm and increase the feeling of travelling motion.

11.2.4 Development of the line

After repeating the rhythm 7:2 several times I began to introduce variation. In keeping with my theme of growth and change I decided that on succeeding cycles portions of the rhythm should be silenced and then allowed gradually to be heard again; the intended effect was for the line to disintegrate or dematerialise and then reform itself. For example, at bar 13, the line is fragmented: groups of attacks are controlled by the Fibonacci series (1,2,3,5,8,13) and each group of attacks is separated by a semi-quaver rest.

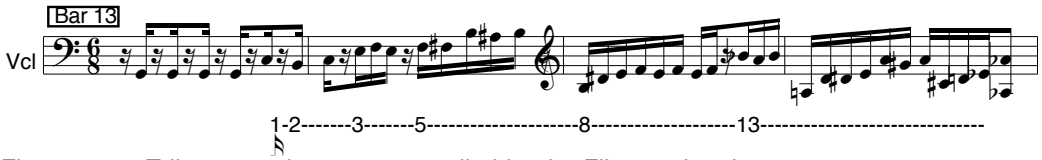


Figure 11.3. *Trilogy*: attack groups controlled by the Fibonacci series

At bar 21 for example, a sequence of silences is controlled by a portion of the Lucas series (11,7,4).

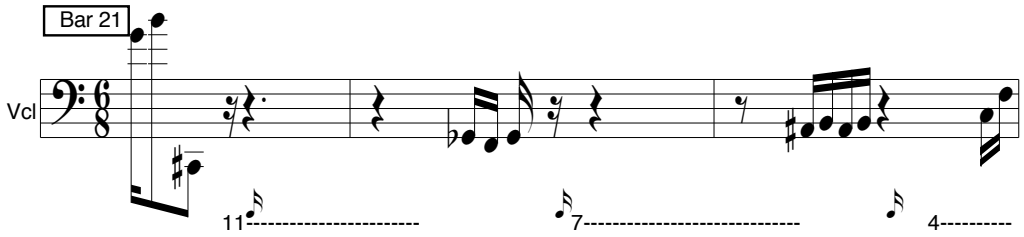


Figure 11.4. *Trilogy*: silences controlled by the Lucas series.

11.3. Pitch

The melodic structure of the line is built out of chains of four note cells, the interval structure of each cell is 4,2,5 (1= semi-tone)[77] (for example, Figure 11.5).

[77]Later on in the piece these cells also form vertical harmonic structures. The same structure appears in *Bayo's Way,* see chapter 9 section 9.6.2.

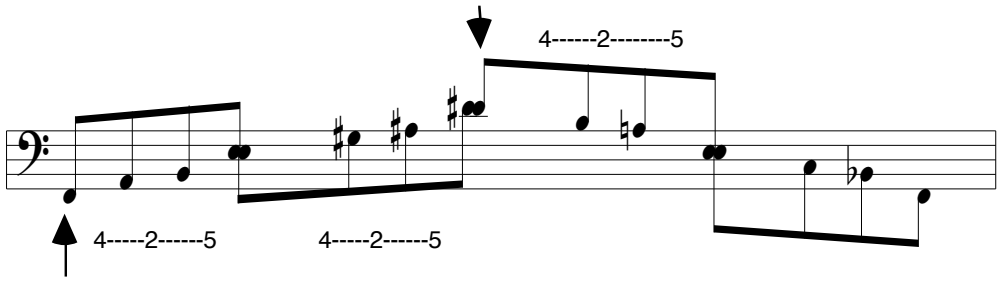


Figure 11.5. *Trilogy*: melodic line evolved from interlocking interval cells.

As can be seen from Figure 11.5 the cells lock together into chains, the last note of one cell doubling as the first note of the next. The interval structure is built from the bottom up or from the top down (shown by arrows) in order to articulate clearly the direction of the line.

The following example shows the arrangement of auxiliary notes within the cell.

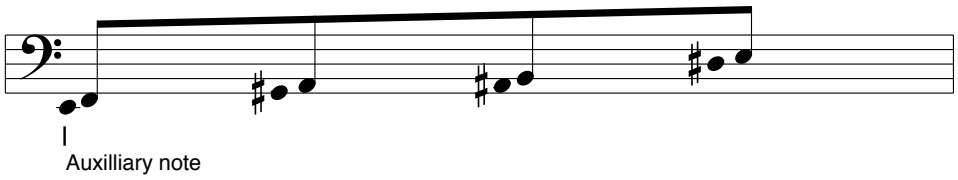


Figure 11.6. Auxiliary note arrangement in the melodic cell.

The arrangement shown in Figure 11.6 can be seen in the cello part of bar 1 in the score.

11.4. Adornment of the line: orchestration

The orchestration of the first section of *Trilogy* is based on a single line which has been adorned mainly by doubling and occasional harmonisations which have been distributed to different instrumental groups. For example, the strings play the original material reinforced by octave doubling, the woodwind provide colour and support for the strings, but their parts are subtly modified although they follow the same contour and compass as the original. In order to create doubling of this sort I selected a portion or phrase of the original line and then calculated the interval range over which the new

part would have to travel. For example, in bar 6, the first violin part falls by a distance of 18 semitones and the doubling was derived by sub-grouping this interval. For example,

18 = 9+9 = (1+8)+(1+7+1)

11.7. *Trilogy:* the original line (violin) and its doubling.

This method is derived from a technique described by Schillinger in *The Theory Of Pitch Scales* (Schillinger 1978) in which an interval can be made to generate scales by division into sub-groups. This is essentially the same technique as that used to create familial rhythms by sub-grouping the master time signature[78]. Although my method may be less rigorous than the formal procedure described by Schillinger it allows speed of writing while still guaranteeing against too much duplication of pitches and consequent neutrality which might easily occur if no method of control were adopted. Some local modifications were necessary on occasion as it was not always desirable that the doubling parts had exactly the same span as the original which would inevitably have lead to moments in which all parts produced prominent octaves or unisons.

11.5. Section II

11.5.1 Melody and harmony

The middle section of the *Trilogy* is intended to be a complete contrast to the two surrounding scherzo sections and represents a respite from the journey, a safe haven from the struggle. It is introduced by a tutti climax (bar 48) built

[78]See Chapter 2 section 2.2.3. and Chapter 3 section 3.3.1.

around the basic pitch cell (see section 11.3) now used as a harmonic structure.

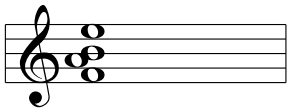


Figure 11.8. *Trilogy:* the basic pitch cell used as a harmonic structure.

In this composition harmony represents security and common action; I think of harmony as being like a bed of soil in which plants (melodies) grow. The climax starting at bar 48 is the first harmonic moment of the composition and represents a discharge of tension accumulated over the first 48 bars of linear music. From bar 53 onwards the harmonic and melodic system comes into its own. In the middle section of *Trilogy* melody exists both in the bass and the soprano registers, surrounding a central harmonic 'filling'.

The basses and celli play a pizzicato line formed from a pitch sequence derived from the basic cell.

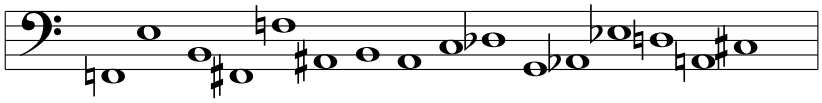


Figure 11.9. *Trilogy:* the original pitch sequence derived from the basic cell.

The line shown in Figure 11.9, is gradually elaborated by splitting the intervals between adjacent pitches. This process was inspired by Schillinger's method of generating scales (described in section 11.4 above). Figure 11.10, shows how the process occurs: the first interval (F to E) is 11 semi-tones and is split into two smaller intervals (3+8) as illustrated by the crotchet note head between the two principle notes; the second interval (E to B) is 5 semi-tones and also divides into two (4+1). This splitting process happens altogether five times, each time producing a longer cycle of pitches[79].

[79]I chose not to split some smaller intervals and of course it is not possible to split a semitone in this way.

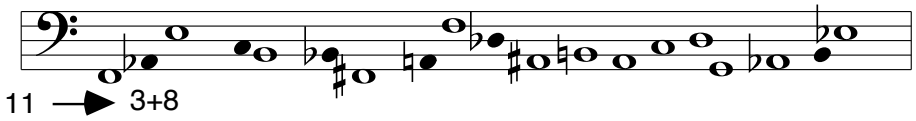


Figure 11.10. *Trilogy:* the elaboration of the original line shown in Figure 11.9.

The central harmonic 'filling', is a progression played as block harmonies by the upper strings that supports melodic writing in the wind. Like the bass line it is derived from intervals occurring in the original pitch sequence (Figure 11.9), but it is important to note that the two layers (bass line and harmony) are *independent*. They may originate from the same pool of pitches but the bass line does not provide the root tones for the harmonic progression. To create the harmonic progression I first developed four chords based on the original harmonic cell.

The interval structures for these chords are as follows:

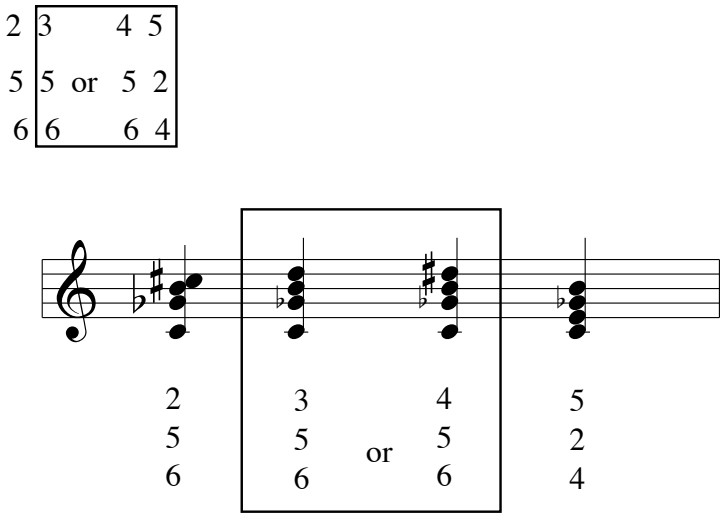


Figure 11.11: *Trilogy*: harmonic structures in section 2.

The two central structures surrounded by the box are used alternately as the four chords are repeated. The roots on which the chords are built form a

complete circle of fifths and therefore produce a progression of 12 chords. Rather than just repeating the sequence of chords shown in Figure 11.11, I decided to create a more sophisticated harmonic progression by applying a technique described by Schillinger in *The Variation Of Music By Means Of Geometrical Projection* (Schillinger 1978)[80] which involves mixing chords from the original progression its retrograde and inversion. In Figure 11.12, the original progression is shown on the top stave and the inversion (around the root) of each chord on a stave below. Single horizontal arrows above the stave designate the original progression and its retrograde while double horizontal arrows below the stave indicate the inversion and retrograde inversion.

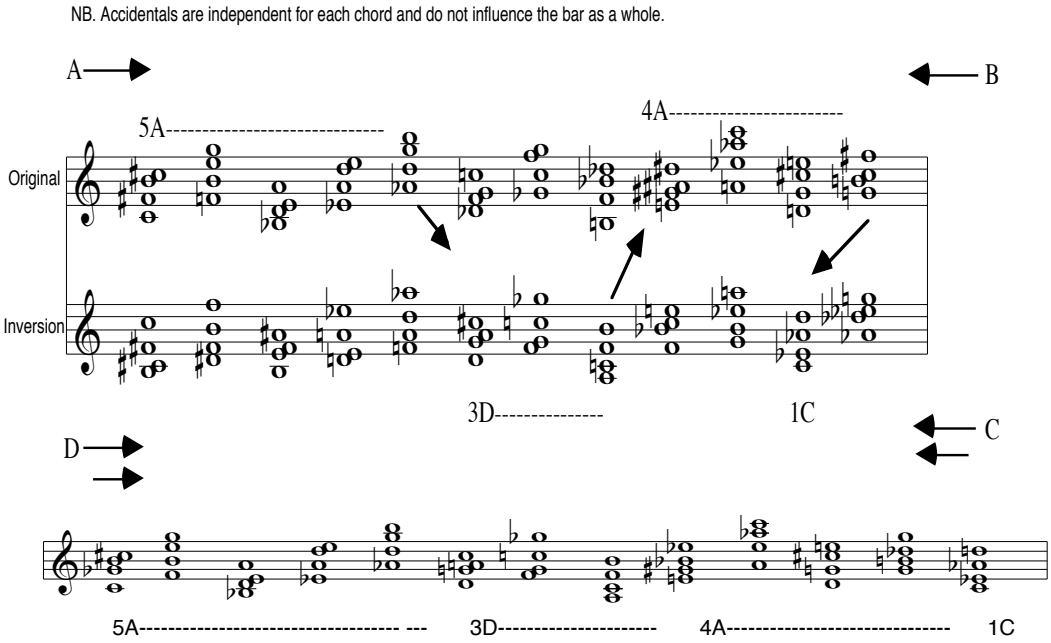


Figure 11.12: *Trilogy:* original (top stave), its inversion (second stave) and the result below.

Schillinger suggests that a chord progression made by mixing portions of its four possible forms (original, inversion, retrograde and retrograde inversion) has the quality of continuously fluctuating tension. This is because a chord undergoing inversion exhibits a change in quality: if originally major it becomes minor and vice versa. The chords in Figure 11.12, do not belong to a traditional major/minor system but nevertheless undergo an equivalent change of quality when inverted. The complete procedure involves tracing a path, as it were, backwards and forwards through the original progression and its inversion as shown by lines and arrows in Figure 11.12. The exact

[80]See also Chapter 2 section 2.4.

route and choice of direction is a matter for speculation and experimentation. Schillinger refers to the different variations as follows[81]:

the *original* is direction A (→),
the *retrograde of the original*, direction B (←),
the *inversion of the original*, direction D (⇒),
the *retrograde of the inversion* , direction C (⇐).

A number of chords from each variation are chosen and placed in a sequence. The exact number can be described as a scheme such as 5A,3D,4A,1C which is marked Figure 11.12 above[82].

11.5.2. Rhythm

The rhythmic structure of the middle section of *Trilogy* is an example of how a score may be co-ordinated through squaring techniques.[83] From bar 53 onwards the various parts of the score are all products of the master time signature 7. The sub-groups, squares of sub-groups, and rhythms of pulse interference[84], all combine to form an extended and rhythmically harmonious structure. The square of the master time signature determines the length of the basic structural unit. Typically this is realised in quavers:

7 bars of $\frac{7}{8}$ = $49\times e$

The different parts in the score based on the master time signature and its square are described below.

1. The timpani part is based on the resultant rhythm of 7:3 which has been modified by combining adjacent numbers.

7:3= (3,3,1,2,1,2,[25×1] 2,1,2,1,3,3)→(3,3,3,3,3,2,2,3,3,2,3,2,2,3,3,3,3,3)

---

[81]The letters A,B,C,D appear in this order because they represent the four quadrants of the graph. D is the inversion of A and C is the inversion of B.

A	B
D	C

[82]Schillinger suggests using rhythms made by the interference of pulses as the coefficients of recurrence for the directions A,B,C and D.
[83]See Chapter 3 section 3.3.2.
[84]See Chapter 3 section 3.3.2.

This modification was made in order to produce a more regular and stable rhythm suitable for the timpani. The choice of rhythm was influenced by the strong presence of the pulse 3, which produces a dance-like quality (Figure 11.13).

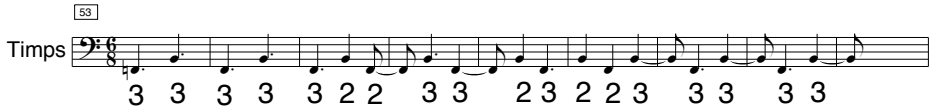


Figure 11.13. *Trilogy:* the timpani part based on 7:3

Each succeeding cycle of the timpani rhythm is derived by rotation of the pattern above.

2. The cello and bass parts are based on the rhythm 7:6
= (6,1,5,1,1,4,1,2,3,1,3,2,1,4,1,1,5,1,6) (Figure 11.14).

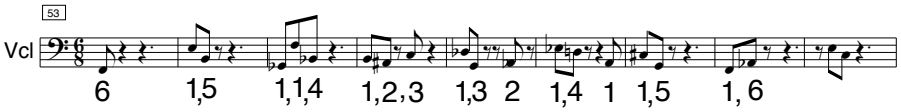


Figure 11.14. *Trilogy:* the bass and celli parts based on the rhythm 7:6

It can be seen from Figure 11.14 that the numbers determine only the duration between attack points and not necessarily the duration of the sound. I chose the rhythm 7:6 because it had a good deal of contrast between adjacent numbers and created a quality of lightness, animation and surprise.

3. The rhythm played by the gongs was determined by squaring a sub-group of the master time signature.

$7 \rightarrow (4+3) \rightarrow$

$(4+3)^2 = (16+12)+(12+9)$ (Figure 11.15).

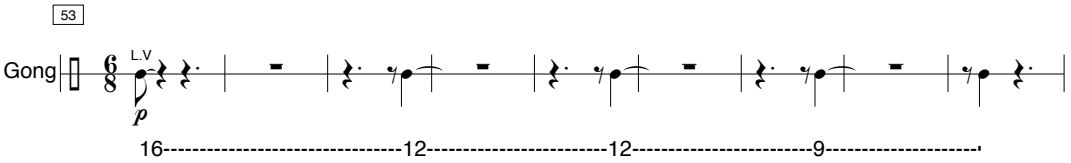


Figure 11.15. *Trilogy:* the gong plays a rhythm derived from squaring.

4. The tambourine, claves and piano take over from the gongs at bar 77 and are based on the rhythm 7:4 = (4,3,1,3,1,2,1,1,2 [13×1] 2,1,1,2,1,3,13,4). The three instruments share this rhythm which is distributed between them[85].

Tamb.	4		1		1		1		2			1		2		3		4
Clave		3		3		2		1			2		1		1		1	
Piano										13×1								

Figure 11.16. *Trilogy:* the distribution of the rhythm 7:4 between three instruments.

The arrangement in Figure 11.16, is realised in music notation in Figure 11.17 below. There is one tambourine attack at the very centre of the rhythm (fifth bar) which is not shown on the diagram above, it should be thought of as simply duplicating one of the piano attacks.

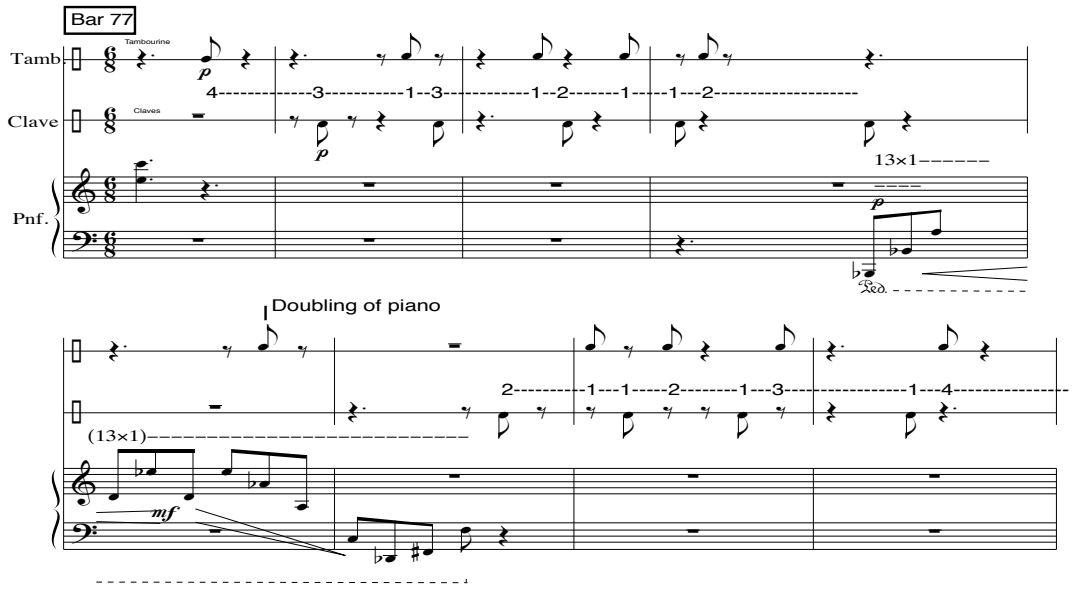


Figure 11.17. *Trilogy:* Figure 11.16 realised as a score.

5. I wanted to create a contrapuntal rhythmic relationship between the melody and harmony in which both were independent and yet perfectly co-ordinated. This was achieved using a technique described by Schillinger in *The Correlation Of Melody And Harmony* (Schillinger 1978)[86] in which two rhythms (e.g. 3:2 or 4:3)) are used to determine the following:

[85]See Chapter 2 section 2.2.2.
[86]See Chapter 2 section 2.7.

a) the number of melody notes per harmony,
b) The duration of melody notes and harmonies.
It was important that the rhythm of the melody and harmonic accompaniment be co-ordinated, not just with each other but also with all the parts of the score and, as before, this was achieved by using rhythms derived from the master time signature. The durations for each phrase of melody were determined by squaring sub-groups of the master time signature. This produced rhythms which spanned the basic rhythmic structure: 7 bars of $\frac{7}{8}$.
The following rhythm (Figure 11.18) is an example of just one melodic phrase.

$(3+1+2+1)^2 = (9+3+6+3)+(3+1+2+1)+(6+2+4+2)+(3+1+2+1)=49$

Figure 11.18. *Trilogy:* squaring a sub-group of the master time signature.

The choice of the sub-group is, of course, crucial to the character of the squared rhythm and this part of the process was a matter of trial and error. For example, I decided that the retrograde version of this rhythm was more suitable as it begins with relatively short durations and progresses to longer durations. This causes the melodic phrase to slow down towards its resolution and could be said to be in keeping with the theme of respite and rest (Figure 11.19).

$(3+1+2+1)+(6+2+4+2)+(3+1+2+1)+(9+3+6+3)$

Figure 11.19. *Trilogy:* the durations of a melodic phrase in retrograde.

The durations of the melodic phrases were themselves grouped by applying a second rhythm, for example, Figure 11.20.

$\underline{4:3} = (3,1,2,1,1,1,1,2,1,3).$

Figure 11.20. *Trilogy:* the rhythm determining attack groups.

The choice of the second rhythm was influenced by two factors: the flow of melody notes and harmonic changes and the need to ensure that all elements of the first rhythm were included in the process of grouping. This last requirement meant that the *number of elements* in the first rhythm (melodic durations) had to equal the *total duration* of the second rhythm (attack groups). In Figure 11.19, the number of elements in the rhythm of

melodic durations is 16 and the total duration of the rhythm controlling grouping (4:3) is also 16 (see Figure 11.20). When combined, the groups of melody notes determine the duration of each harmony.

Attack group	3	1	2	1	1	1	1	2	1	3
Melodic durations	3,1,2	1	6,2	4	2	3	1	2,1	9	3,6,3
Chord durations	6	1	8	4	2	3	1	3	9	12

Figure 11.21. *Trilogy:* melodic duration and attack groups determine chord duration.

In Figure 11.21, the first attack group contains three durations (3+1+2) the total duration of which determines the duration of the accompanying chord: 6. The second attack group contains one duration (1) which is accompanied by a harmony of the same duration. The third attack group contains two attacks (6+2) accompanied by a harmony equal to their total duration, 8. The extract shown in Figure 11.22, shows how the above scheme was realised in the score [87]

[87] During the fifth beat of the second bar in figure 11.22, the string accompaniment plays rapid semi-quaver runs, this is simply the product of ornamentation and is independent of the process being described.

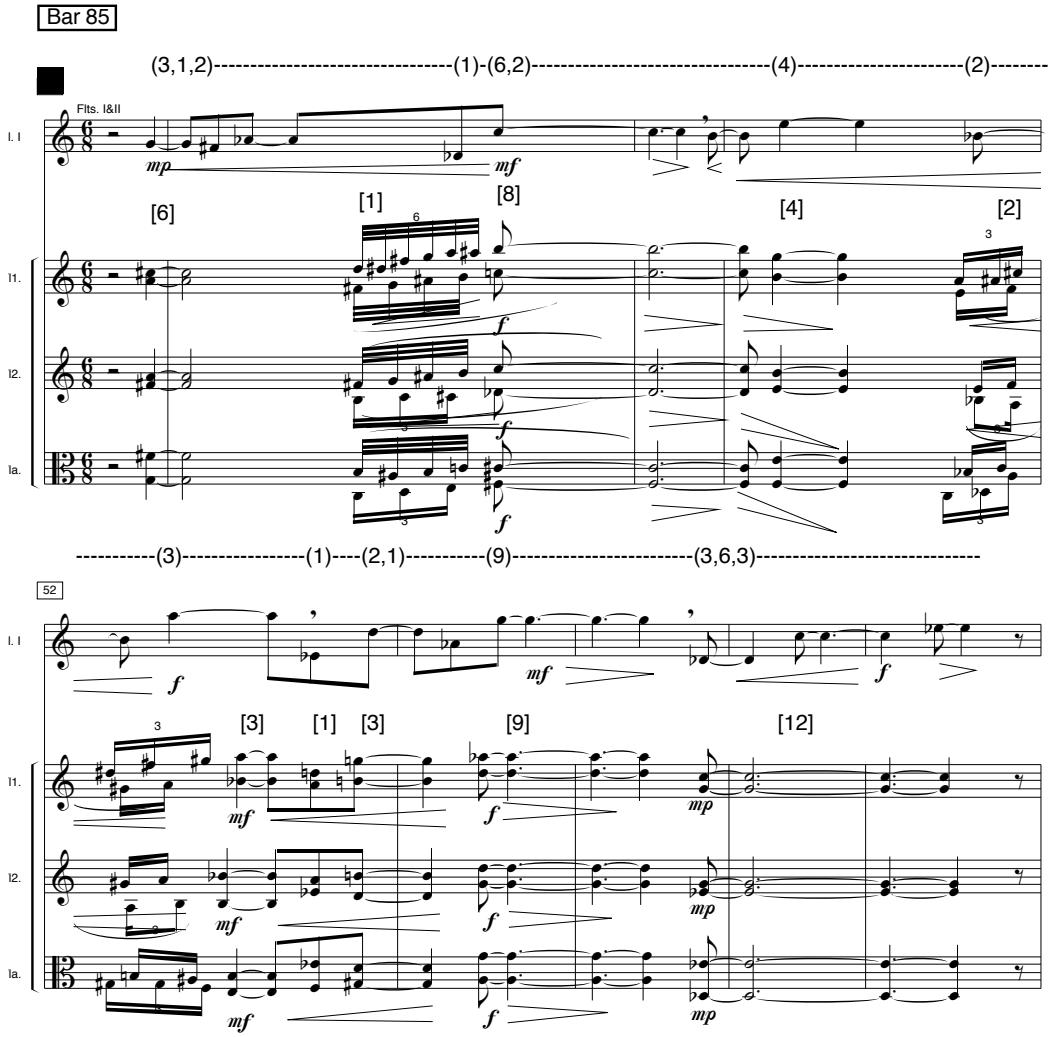


Figure 11.22. *Trilogy:* the realisation of the scheme shown in Figure 11.21.

11.6 Section III

11.6.1 Introduction

The last section of *Trilogy* is a return to the world of the opening but with modification and development to create a highly energetic conclusion to the piece as a whole. The return to the metaphorical journey is initially suggested by the pulsating tutti chord first heard at the climax of the opening section (compare bars 48 to 51 with bars 134 and 135). Following this the lower strings take up running semi-quaver motion suggestive of the opening

material which is a short transition (bars 136 to 143) leading to a prolonged scherzo-like passage in which the linear material is developed and explored eventually creating such an accumulation of energy that it collapses in on itself. Bars 182 to 190 represent the beginnings of the this implosion which leads to a moment of suspension (bar 191) and ultimately an explosive release of energy in the finale (bars 196 ff.).

11.6.2 Rhythm

The development of the material in section three is primarily a matter of rhythmic evolution and as with the opening section the master time signature 7 is of primary importance. Almost the whole of the third section (until the very end) is made up of continuous semi-quaver motion. My intention was to create increasing tension by imposing evolving patterns of accents on the semi-quaver motion. These patterns are derived from sub-groups of the master time signature:

$7 \Rightarrow (1+6) \Rightarrow (1+5+1) \Rightarrow (1+1+3+1+1)$

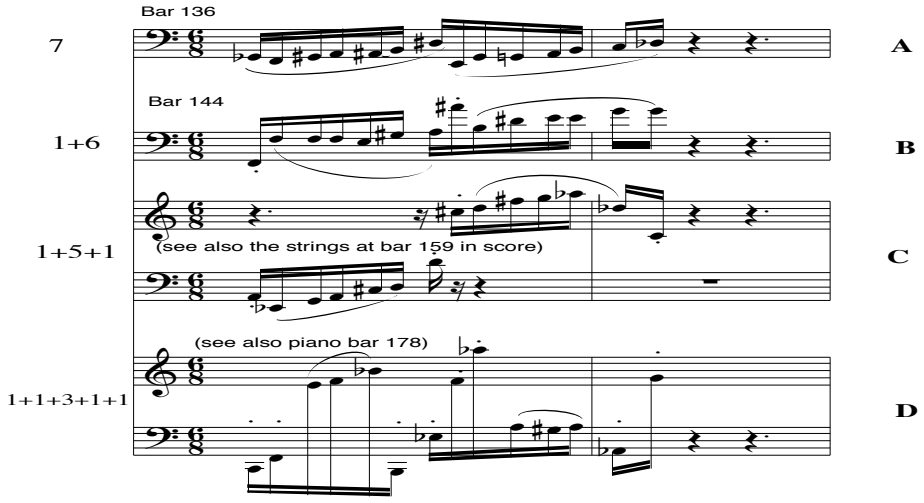


Figure 11.23. *Trilogy:* patterns of accents based on the master time signature.

Where in a pattern of accents single units (1) occur they are marked out for special emphasis not only by articulation and dynamic marking but also by octave placement and (in the final scoring) through orchestration and doubling. The method by which the above patterns were arranged was inspired by a Schillinger technique which he refers to as *progressive*

symmetry[88]. This technique allows a gradual change of emphasis from one element of a pattern to another.

For example, four elements **A B C D** can be arranged as follows:

A (A B) (A B C D) (C D) D

In this arrangement element **A** is at first dominant but by the end of the sequence its position has been taken by element **D**. I decided to use this scheme in order to determine the appearance of the patterns of accents and thereby control the progression of musical tension. Each of the different accent patterns in the Figure 11.23, were labelled **A B C D** and treated as elements in the *progressive symmetry.* As a consequence the music gradually changed from regular phrasing groups of seven semi-quavers (7) to the relatively more tense phrase groups (1,1,3,1,1,).
Each accent pattern contains 7 semi-quavers and is repeated seven times whenever it occurs in the *progressive symmetry:*

(7A,(7A,7B),(7A,7B,7C,7D)(7C,7D),7D)

This is in keeping with the principle of squaring and allows for the combination of other independent lines or *counter themes*. An example of this can be seen at bar 136 of the score where the groups of seven semi-quavers in the lower strings (pattern A) are combined with a flute solo. The flute solo, which fits perfectly with seven repetitions of pattern A, was created by squaring the sub-groups of the master time signature:

(3+3+1)⇒(9+9+3)(9+9+3)(3+3+1).

[88]See Chapter 2 section 2.12.3 and also Chapter 5 section 5.7.3.

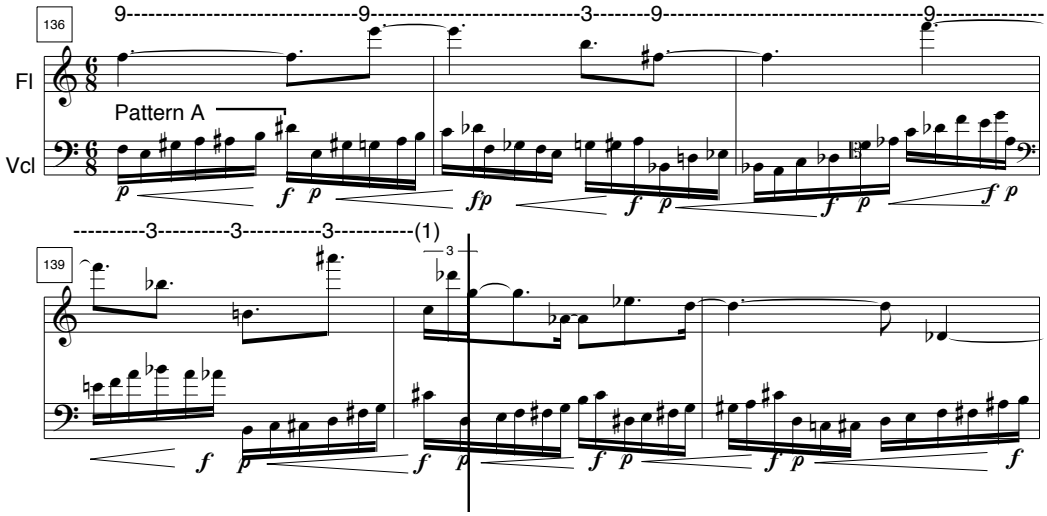


Figure 11.24. *Trilogy*: pattern A and its *counter theme* produced by squaring.

11.6.3 Metre

The interference between the 6/8 metre and rhythms derived from the master time signature (7) was a constant feature of the first section of *Trilogy* and occurs again during the last section of the composition as can be seen in Figure 11.24. However, as the rhythms of section three evolve they become too complex to be notated easily in bars of 6/8 and more importantly the process of rhythmic evolution overwhelms any audible influence that the 6/8 metre might exert. For these reasons I decided that from bar 154 to 181 the metre would be determined by accent, such as the patterns in Figure 11.23, or the weight of orchestration.

11.6.4 Rhythm and orchestration

Between bars 136 and 182, tension increases as ever more complex patterns of accents are imposed on the continuous semi-quaver line. At bar 182, I felt that a new tension-making device was needed in order to continue the drive towards a final climax. I decided that the orchestra itself might provide the effect I was searching for: to overwhelm the ear through sudden changes in textural density and variation of timbre. Schillinger described a method for the control of these qualities in his *General Theory Of Harmony* (Schillinger 1978)[89]. He identified two kinds of textural density: the density of timbre, a matter of instrumentation, and the density of texture which concerns changes in the harmonic or melodic texture of the music. Both of these

[89]See Chapter 2 section 2.10.1.

qualities can be controlled by rhythmic techniques such as those described in Schillinger's *Theory Of Rhythm* (Schillinger 1978). I decided to explore the former quality (instrumental density) as the texture of the music at this point in the composition was completely dominated by linear semi-quaver motion. I divided the orchestra into several groups shown in the table below (Figure 11.25).

Low strings: bass, cello, viola + contra bassoon and piano.
High strings: violins I and II
Low Brass: trombones and tuba
High brass: trumpets.
Wood-wind I: flutes, clarinets and horns.
Wood-wind II: oboes and bassoons.

Figure 11.25. *Trilogy*: scheme of instrumentation for bar 182 ff.

Occasionally other combinations occur due to local considerations of tone colour but essentially the orchestra is divided along family lines. The percussion other than the piano plays an independent role helping to provide pulse and so is not included in this scheme.

The different orchestral groups shown in Figure 11.25, were treated as *places of attack* [90] (that is, treated as a single part), and a sequence of *attack groups* (a group of durations applied to a part) was derived by sub-grouping the master time signature (7). In this case numbers representing attack groups (such as 4,3) define the quantity of semi-quaver attacks played by an instrumental group *before* the next group enters. The attack group does *not* specify when an instrumental group stops playing, only when the next group starts and therefore, the overlapping of instrumental groups often occurs intentionally. Figure 11.26, shows part of my sketch for the attack groups, arrows indicate that a group continues to play.

Instrumental groups	Attack groups						
High Strings			1	→	→	2	→
Wind+Horns		3	→	→	2	→	→
Low Strings	4	→	→	→	→	→	→
High Brass							
Low Brass				2→	→	→	2

Figure 11.26. *Trilogy:* a scheme showing attack groups and instrumental groups.

[90]See Chapter 2 section 2.2.2.

In Figure 11.26, the attack groups are applied to the instrumental groups in a vertical direction with rotation: when the highest instrumental group has entered, the process begins again starting with the lowest instrumental group. For example, following High Strings is the entry of Low Brass. In order to introduce more variation to the scheme I introduced a rule that after every four movements through adjacent places a new starting place was chosen freely. Figure 11.26, corresponds to bar 182 of the score which is shown below reduced to its main constituents in order to better reveal the pattern of orchestration.

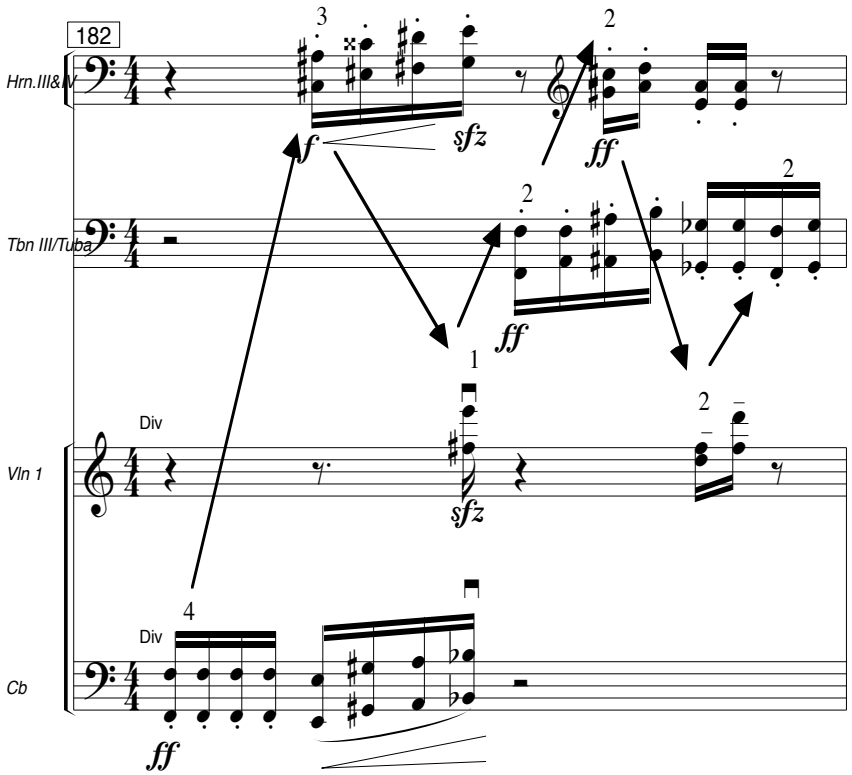


Figure 11.27. *Trilogy*: the realisation of the scheme shown in Figure 11.26.

11.7. Rhythm in the finale

The Finale beginning at bar 196 is a release of all the previously accumulated tension. This is achieved in two ways: firstly by the abandonment of the rigid semi-quaver motion in favour of flowing melodic phrases which expand and contract rhythmically suggesting a wave-like motion and secondly by switching to a new master time signature (8) which possesses a quality of greater stability and regularity in contrast to the

previous master time signature 7. This change at the very end of the composition represents an evolution or transcendence from struggle to certainty.

The technique for creating wave-like phrases originates in Schillinger's *Theory Of Rhythm*[91] in which he explores the possibility of combining the two alternative but related rhythms produced by pulse interference[92].
The two rhythms can be combined in sequence but as they are not equal in length they form a pair which tends towards expansion or contraction. For example, the rhythms produced by 4:3 (3,1,2,2,1,3) and 4;3 (3,1,2,1,1,1,1,2,1,3) combine to form two types of phrase:

Expanding: (3,1,2,2,1,3)+(3,1,2,1,1,1,1,2,1,3)

Contracting: (3,1,2,1,1,1,1,2,1,3)+(3,1,2,2,1,3)

The melodic phrases in the finale of *Trilogy* were developed with this technique in mind but do not make use of interference rhythms as Schillinger suggests. Instead each phrase is made up of three rhythms which are related by the identity of their numbers 1,3 and 5 and which have a total duration equal to the square of the master time signature:

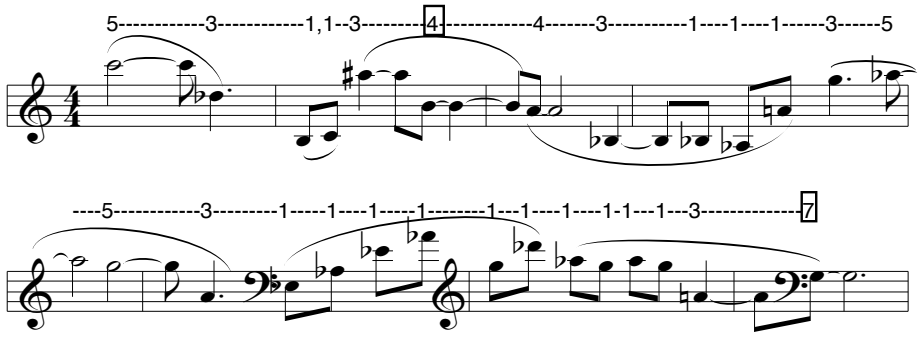
$8^2 = 64 \times$ ♪.

Each of the three phrases is symmetrical around its centre and each is longer than the previous one due to the insertion of single units around the axis of symmetry.

(5,3,1,1,3,5)⇒(5,3,1,1,1,3,5)⇒(5,3,1,1,1,1,1,1,1,1,1,1,3,5)

A slight modification, an un-balancing of the regularity of the scheme, produced the variation which can be seen in the score example below.

[91]See Schillinger 1978 page 21. See chapter 3 section 3.2.
[92]That is, different rhythms produced by the same ratio.



Numbers represent durations where 1= ♪

Boxed numbers have been modified from the original scheme.

Figure 11.28. *Trilogy:* expanding and contracting melodic phrases of the finale.

Each of the three rhythmic sequences maintains the essence of the previous one (5,3) but also includes new material (1,1,1,...). The growing number of single units creates a sense of increasing neutrality as one unit cannot be rhythmically distinguished from the next. This process of increasing neutrality represents the dissipation of energy, the 'wave fronts', as it were, gradually spread out and die away.

In order to create the excitement in keeping with the metaphor of the rushing 'wave', I decorated the line as shown in Figure 11.29. The most obvious example of decoration can be seen in the upper string parts from bars 196 onwards. These highly ornamented parts are derived from the technique of sub-grouping the intervals of the original line to create runs or passing notes between the primary pitches.

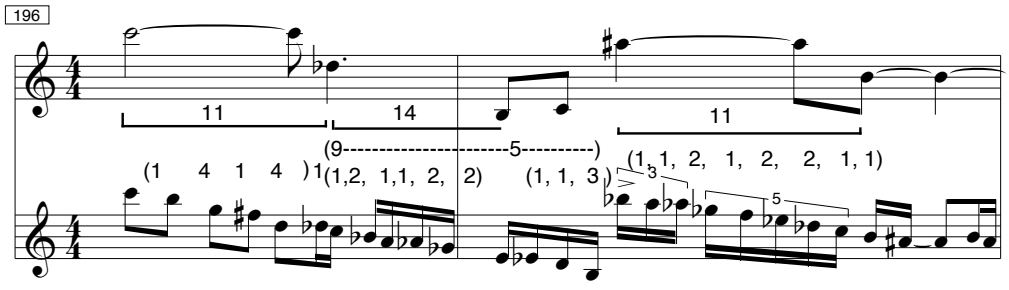


Figure 11.29. The melodic phrase (top stave) and its ornamented version below.

11.8 Conclusions

In *Trilogy* I have combined both aspects of the compositional mind: the spontaneous imaginative and the deliberate intellectual. As the last composition to be composed for this thesis and the third to be composed using techniques derived from Schillinger's work it is the most ambitious in scale but the most economical in technique. The usual sources of inspiration influence this work but the poetic background, so overtly present in earlier compositions, has been absorbed and digested making it possible to draw on the world of symbol, narrative and metaphor without explicitly describing them first. *Trilogy* is also more refined in terms of its technical organisation. In earlier compositions, such as *Make Night Day,* I explored abundant technical possibilities within a single section of music. *Trilogy* by contrast, makes use of relatively few technical devices: its form is a simple ABA and most of the music evolves from a single line; squaring techniques, of which I am so fond, are sparingly used. This economy of means is, I believe, not a reaction against Schillinger's ideas but an instinctive realisation that a body of such range and power as the orchestra requires a musical structure of appropriate definition and clarity.

Chapter 12 Conclusions

This thesis charts the course of my development as a composer between the years 1990 and 1995. It is a record of a period in which I began to investigate fundamental processes in composition and to develop my musical language. The discussions of my compositions and their origins which form the majority of the chapters of this thesis have contributed to the process of defining myself as an artist. There are influences on my musical imagination which have become more clear as I have written this text. These are ideas that inspired the aesthetic and poetic background of my composition and belong to the realm of the imagination: but this is a very general description and as a conclusion to this thesis I feel it would be appropriate to discuss these influences in more detail.

Nature is a theme which underlies several compositions presented in this thesis. *Moon Shaman, Make Night Day* and *Riddle,* all include references to the natural world represented by sounds on the tape which mimic wind, water, breath or animal cries; in the case of *Riddle,* the storm is the subject of the composition. *Rêve de l'Orb*, is a composition inspired by the river and the life which surrounds it.

This last composition suggests another theme central to much of my work, that of dream states, magic and meditation. This in some ways is in contrast to the theme of nature which concerns the outer world as opposed to an inward journey; but ultimately the two ideas are connected and not separate at all.

> In all their delvings into the nature of reality, Western thinkers, until recently, dismissed dreams as the last place to look....The great analogy for which the Upanishads are renowned is that of the waker-dreamer- deep sleeper. This beginningless, endless Universe is the dream of Brahman. We are the dreaming Figures in that world which is constantly in the process of being dreamt up. (Brown 1988 page xxiii)

Nature within and without, dreams and natural forms are the source of the symbolism and metaphor which inspires much painting, poetry and of course music. As a musician I naturally look to other art forms to see how they reveal and express the issues concerning man, life and the universe. For this reason my compositions have a poetic (*Riddle, Make Night Day*), narrative (*Moon Shaman, Trilogy*), theatrical (*Bayo's Way*) or visual element (*Vision and Prayer*).

In strictly musical terms there are certain features which seem to recur in almost every work. It will be apparent that I am fascinated with bass instruments. Possibly their power and depth attracts me, perhaps I am naturally inclined to favour instruments that are traditionally not given prominent solo roles. This may be a legacy of my own days as a bassoonist. There is also the recurrent appearance of passages based on regular semi-quaver motion. This type of texture expresses something of the obsessive and energetic nature of contemporary life, as do musical forms such as jazz and funk of which I am extremely fond. In my electroacoustic composition I have developed a particular group of sounds which have particular meaning and which I use in several compositions. For example, *Moon Shaman* and *Riddle*, have many sounds in common.

Various musical styles and particular composers have influenced my work. These are so numerous that a list would be inappropriate here. It is more useful to list certain types of music such as early 20th Century French music, in particular that of Ravel and Debussy, which I value for its lyricism and colour. Music with a strong rhythmic character has always been important to me, this includes jazz of all kinds, early 20th Century Russian music, such as that composed by Prokofiev and Stravinsky, American composers such as Ives and Carter, the music of Bela Bartok and the British composer Harrison Birtwistle. However, early on in my studies I became unhappy with the idea of modelling my work on that of another composer. It seemed to me to be more important to understand what it was in general that attracted me to a style of music or to a particular composer's work. The type of information

produced by the analysis of music is on the whole not the type of knowledge required for composing; analysis is rather a means for interpreting and discussing a work of art. Revealing some of the techniques involved in a particular composition does not necessarily lead to the discovery of one's own compositional methods. This is, I think, well illustrated by the work of Harrison Birthwistle whose music is rhythmically complex and fascinating. However, Birtwistle is not known for his willingness to discuss the systems at work in his music and so far I do not believe that any analysis of his work has revealed how he actually composes.

I started composing by capturing and examining improvisations believing that my spontaneous imagination would reveal a structural scheme. A major shift in my approach was triggered by my acquaintance with the work of Joseph Schillinger whose ideas provided me with some most useful structural models. The work of Joseph Schillinger has significance in this area because it is not derived primarily from the analysis of music: indeed it is at its weakest when discussing the work of other composers. Instead it is designed as a series of tools, techniques, one might even say recipes, for the building of musical structures which can be modified or adorned to the composer's personal taste. Its general principles are based on concepts derived from the study of natural forms and pattern making and not a particular style or school of music. This makes it infinitely adaptable and non-dogmatic. And yet by itself it is not enough to compose music. Through teaching the system to a wide variety of students of all ages and abilities I have come to the conclusion that the student fails to compose with the techniques offered by Schillinger only when he or she has no idea or source of inspiration. When there is nothing to express, no reason for writing music, composition is simply a technical matter, an intellectual exercise from which little satisfaction is derived. In chapter three in his *Poetics of Music,* Stravinsky, identifies the creative need.

> The very act of putting my work on paper, of, as we say, kneading the dough, is for me inseparable from the pleasure of creation. So far as I am concerned, I cannot separate the spiritual effort from the psychological and physical effort; they confront me on the same level and do not represent a hierarchy. (Stravinsky 1947).

The combination of aesthetic intention and technical procedure into a single process seems to me to be the central problem faced by the composer. The

painter Cecil Collins beautifully described this as "the eye of the heart" (Anderson 1988 page 109) where the eye represents our intellect and the heart our soul and imagination. During the course of composing the works presented in this thesis I believe that I have achieved a balance between these two states and that my work has become more focused as a result. For example in the final work, *Trilogy,* there is notably less tension between the spontaneous imaginative and the deliberate intellectual in the process of composition. The basic aim of my research was to unite these two sources of creativity, and in doing this I have defined my artistic process.

Finding a group of techniques which will effectively realise the imaginative idea is a matter of careful consideration for each individual case but once the correct approach is found, the use of Schillingerian techniques will most likely have certain desirable consequences. The most important of these is not symmetry or even efficiency but *relatedness of structure.* Schillinger's rhythmic techniques generally produce results which although varied, originate from a common source. The proportions of the source material are evident at every level and in this sense the structure might be described as hierarchical. Hierarchical structures are very powerful, often stable and contribute to the clarity of the intention. As a consequence of my use of Schillinger's techniques it has been necessary to describe his work in some detail and I have attempted to interpret and explain his ideas. I believe I have shown that Schillinger's work is of great value to the composer despite being obscured by layers of eccentricity of pseudo-science. It is my intention in the future to produce a thorough interpretation of his theories which can be understood and used by even relatively young musicians. I believe that Schillinger should be seen as part of a long and honourable tradition starting with Pythagoras and including Plato, Boethius and Zarlino. These writers were natural philosophers who adopted what they believed to be a scientific attitude to music and all discuss music in terms of harmonic proportion and number (James 1993). Schillinger believed that music was a response to the world and the laws which govern its behaviour. To this end his ideas concerning the nature of music come not just from his musicianship but from his knowledge of subjects such as physics, biology and psychology. It does not matter greatly that Schillinger was less knowledgeable in these areas than he thought. Rather, he was able to make a connection between basic principles of these subjects and the construction of musical forms. This is what makes Schillinger's work different from most other theories of music (which may recognise natural phenomena such as the harmonic series) but

which are essentially derived from the author's knowledge of the repertoire and history of music. Schillinger's work is both unusual and attractive because it attempts to discuss all areas of music and embrace all styles. From my own point of view as a composer and a teacher this is most welcome as much writing about the craft of composition fails to tackle with enough rigour the precise nature of the process or does so only in a limited way. Schillinger is different in that his work is more like a cook book from which I was able to compose successfully. At first this was a somewhat formal affair but I am now sufficiently fluent in the systems I use that the process in no way inhibits my aural imagination. The process is self-perpetuating: imagination provokes the structural mind which in turn fuels the imagination. My musical development will no doubt continue and cannot be predicted. However, the use of Schillinger's ideas in compositions which have had successful public performances and the enthusiasm of my students, suggests that Schillinger's work deserves to rise from the relative oblivion to which it has been consigned.

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D'Arcy Thompson, in particular *Growth and Form.*

Appendix I: details of accompanying recording

PG	Time	Performances	Duration	Personnel	Recording
1	0'12"	*Moon Shaman*	10'36"	Bass clarinet: Tim Lines	City University 10/96
2	11'.00"	*Riddle*	5'.00"	Voice: Loré Lixenberg	City University 10/96
3	16'12"	*Bayo's Way*	12'48"	Tuba: Oren Marshal Band: London Brass	Qeen Elizabeth Hall 3/94
4	29'08"	*Make Night Day*	13'08"	Bass clarinet:Tim Lines Violin: Anne Wood	City University 10/96

PG	Time	Tape accompaniment	Duration
5	43'31"	*Moon Shaman*	9'25"
6	53'17"	*Riddle*	5'00"
7	58'27"	*Make Night Day*	14'10"