NUMBER SYMBOLISM IN MUSIC: THE HARMONY OF THE SPHERES AND GEORGE CRUMB'S *MAKROKOSMOS, VOLUME I*

BY

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DECLARATION

I hereby declare that this dissertation, submitted in partial fulfilment of the requirements for the degree of Master of Music at the University of Cape Town, has not been submitted by me previously for a degree at another university.

ABSTRACT

The Pythagoreans, for whom certain numbers held a mystical significance, stressed the connection between music and mathematics. Their concept of the universe was of an integrated, well-ordered system, which expressed the rules of music and mathematics on earthly and planetary levels. This philosophy was adapted by the early Christian church, and numbers that symbolise elements of the Christian faith can be found in medieval compositions.

Bach's use of symbolism in sacred works is a continuation of this tradition, but there are numbers of personal significance as well. The numbers ten and twenty-three in Berg's music refer specifically to Hanna Fuchs and himself, and have an important structural function.

Crumb's compositions are characterised by allusions, especially to music of the past; the symbolic qualities are visual, aural and numerical. *Makrokosmos, Volume I (Twelve Fantasy-Pieces after the Zodiac for Amplified Piano)* is the first in a cycle of four compositions inspired by the stars. Astrological and spiritual numbers—three, four, twelve, seven and five—appear to have determined the structural parameters of the pieces.

CONTENTS

PREFACE

Chapter 7, the analysis of *Makrokosmos, Volume I*, should be read with a copy of the score. (New York: C. F. Peters Corporation, 1972.)

For the sake of clarity, numbers which are symbolic in a particular context are written as numerals rather than words, unless they occur in direct quotations. Numerals within brackets are the prime forms of pitch-class sets.

Pitches are written as upper-case letters; sharpened or flattened pitches are hyphenated. Letters that are the initials of a person are distinguished by quotation marks.

Biblical references are taken from the *New International Version.*

George Crumb's visit to Cape Town this year was invaluable, informative and inspiring. The interview by Bongani Ndodana (23 May 1997) was transcribed by the author from the SABC broadcast. Other comments that are quoted or paraphrased are taken from notes made during the masterclasses on 21 and 22 May 1997.

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I must thank Daniel and Albie for introducing me to the music of George Crumb.

CHAPTER 1

MUSIC AND MATHEMATICS

> Music and dancing not only give great pleasure but have the honour of depending on Mathematics, for they consist in number and in measure. ... Therefore, whatever the old doctors may say, to employ oneself at all this is to be a Philosopher and a Mathematician.
> Charles Sorel, *Le nouveau parnasse*

All art forms are subject to the laws of science. Visual art relies on the reflection of light and the specific wavelengths of different colours; dance, on the anatomical possibilities of the human body, constrained by the law of gravity; music, on the acoustical properties of vibrations. Furthermore, art, architecture and, to a certain extent, music and dance, derive their proportions from mathematical ratios.

Whether or not rhythm is notated using a time signature (which is a ratio), it depends on durations which are relative to each other, and can be measured using mathematical ratios. Pitch and dynamics are measured by the numerical values of the frequency and amplitude, respectively, of wavelengths. Timbre determines the form of the wavelength, and is itself determined by the predominating overtones in the harmonic series of every pitch.

It is irrefutable that the elements of music obey natural laws; if the A above middle C is determined at 440 Hz, the only way to alter the pitch is to change the frequency. There may never be consensus on the question of whether mathematics was invented or discovered, but constants such as p, and the speed of light in a vacuum, indicate that there are certain absolutes in mathematics and science; the terminology used to describe these facts may have been invented, but the facts themselves are independent of human invention.

Music, like mathematics, is constructed from phenomena that exist, and are fundamentally invariable. Fabre d'Olivet paraphrased the Hermetic treatise *Asclepius, or The Perfect Sermon*, to describe music "as the Ancients defined it, the knowledge of the

order of all things, the science of the harmonic relationships of the Universe; it rests on immovable principals which nothing can alter."[1]

The division of academic studies into scientific and non-scientific disciplines is exemplified by the terms Bachelor of Science and Bachelor of Arts, which date from the seventeenth century. Medieval learning was divided similarly, but music was included with arithmetic, geometry and astronomy, in the quadrivium, while logic, rhetoric and grammar made up the trivium. This categorisation persisted, at least in some quarters, into the seventeenth century: Francois Blondel referred to music as a "beautiful part of mathematics" in *Cours d'Architecture*, from 1683.[2]

The connection between music and mathematics in Western thought is so ancient that history has to rely on myths for the details. The discovery of the intervallic ratios has survived as a legend of harmonious blacksmiths. Pythagoras (born ca. 570 BC) was supposedly intrigued by the different pitches he heard emanating from a brazier's workshop. By comparing the weights of different hammers, he discovered that the pitches produced when striking metal were directly proportional to the weight of the hammers. Tradition also credits Pythagoras with the invention of the monochord—an instrument with a taut gut string and a movable bridge—which he is said to have used to test his theory of intervals, by measuring the ratio between the lengths of string on either side of the bridge.[3]

The notion that music depends on mathematical ratios and on the science of acoustics is easily accepted. A more controversial suggestion is that the development of experimental science may have its origin in music. "Pythagoras's discovery of the arithmetical basis of the musical intervals was not just the beginning of music theory; it was

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[1]Fabre d'Olivet, *Music Explained as Science and Art: and considered in its analogical relations to Religious Mysteries, Ancient Mythology, and the History of the World*, trans. Joscelyn Godwin (Rochester, Vermont: Inner Traditions International, Ltd., 1987), 40.
[2]F. Yates, *The French Academics of the Sixteenth Century* (London, n.p., 1947), 287; quoted in Albert Cohen, "*Musique* in the *Dictionaire mathématique* (1691) of Jacques Ozanam", *The Music Review* 36, no. 2 (May 1975).
[3]Jamie James, *The Music of the Spheres: Music, Science, and the Natural Order of the Universe* (n.p., Grove Press, 1993; reprint, London: Little, Brown and Company, Abacus, 1994), 35-36.

the beginning of science. For the first time, man discovered that universal truths could be explained through systematic investigation and the use of symbols such as mathematics."[4]

There is a certain, possibly intentional, ambiguity in James's use of "symbols". Although nothing written by Pythagoras himself is extant, it is clear from writings by, and about, the Pythagoreans that numbers were not merely useful measuring devices, but that "*all* the things that are known have a number—for without this nothing could be thought of or known."[5]

Aristotle's criticism of the "so-called Pythagoreans", though scathing, gives an indication of the all-important position of mathematics in their philosophy.

> Since they thought they observed in numbers many similarities to the things that exist and come into being ... for example, that justice is such and such a modification of numbers, soul and mind such and such, opportunity something else, and so on for pretty well everything else (and they also saw that the modifications and ratios of harmonics depend on numbers): since, then, all other things appeared to have been modelled on numbers in their nature, while numbers seemed to be the first things in the whole of nature, they supposed that the elements of numbers were the elements of all things that exist, and that the whole heaven was harmony and number.[6]

Numerology is no longer considered a legitimate science, but in classical philosophy it was an integral part of mathematics. Similarly, astrology has become the esoteric branch of astronomy, but these two aspects of the cosmos were originally indivisible. (The terms really are synonymous, both denoting a scientific study of the stars.) The concept of dualism, intrinsic to Western philosophy, has been criticised and held responsible for this division in the approaches to gaining knowledge into either logical or intuitive. Yet dualism is fundamentally important in almost all ancient systems of higher thought, including Zoroastrianism and Taoism;[7] it is symbolised by the Yin and Yang of Chinese philosophy.

Pythagoreanism itself was based on dualism, in the form of a table of opposites, intended to "establish a rational and consistent relationship between the limited (man, finite

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[4]Ibid., 37.
[5]Philolaus *On the World*, transcribed in John Stobaeus *Anthology* I xxi 7-8; quoted in Jonathan Barnes, *Early Greek Philosophy* (London: Penguin Books, 1987), 217.
[6]Aristotle *Metaphysics* 985b23-986a26; quoted in Barnes, 208-209.
[7]James, 28.

time, and so forth) and the unlimited (the cosmos, eternity, etc.)".[8] The set of principles is arranged as co-ordinate pairs: limit – infinite, odd – even, one – quantity, right – left, male – female, resting – moving, straight – curved, light – darkness, good – bad, square – oblong.[9] That there are ten pairs is significant, as is the attempt of the Pythagoreans to express these basic concepts with numbers.

Many of the relationships are derived from mathematical properties, but these properties are not purely arithmetic: the philosophical and mystical attributes of numbers were considered innate, and were crucial in the development of Pythagorean mathematics and philosophy. This explains the apparent paradox of an all-inclusive conception of numbers within a dualistic view of reality. The Pythagorean type of dualism was, like the symbol of the Yin and Yang, a realisation of the intertwined, dual aspects of the whole, not the separation of these aspects.

The number one, for example, symbolises unity, two is the principle of dichotomy and three is the reconciliation of that division. In other words, the first three counting numbers represent: Thesis, Antithesis and Synthesis. Furthermore, with respect to geometry: a single point theoretically has no dimensions; a line is the distance between two points, and has one dimension only; three points create a plane surface, which has two dimensions; four points are required for a pyramid, the simplest three-dimensional figure.

This fundamental significance of 1, 2, 3 and 4 to geometry may not yet have been known when the discovery of musical ratios was made. The ratios of those particular intervals which are still designated as perfect—the octave, fifth and fourth—are, respectively, 1:2, 2:3 and 3:4. One school of thought holds: "Thus, the first four integers were established, and the Pythagoreans have never ceased to emphasise their importance."[10]

A conflicting opinion argues that the significance of these numbers had already been established, which would have added weight to the critical discovery of acoustical science.

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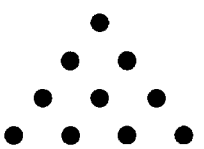
[8]Ibid.
[9]Aristotle *Metaphysics*; quoted in Barnes, 209.
[10]Annemarie Schimmel, *The Mystery of Numbers* (New York: Oxford University Press, 1993), 11.

One could accurately describe Pythagoras as "a primary thinker in philosophy, mathematics, music, and cosmology ... the whole point of what he taught is the interrelatednesss of all human knowledge."[11] Therefore it would be entirely appropriate for him to be remembered for the revelation that mathematics and music depend on the same numbers and are inextricably linked in this way.

In support of this second opinion is the symbol known as the *tetractys.* This is an equilateral triangle constructed by using the first four integers. According to Iamblichus, the Pythagoreans swore "by him who handed down to our generation the *tetractys*, source of the roots of ever-flowing nature."[12] It is likely that this fairly simple geometrical figure would have predated the experiments on musical ratios.



The dichotomy "one – many" in the table of opposites is resolved by the *tetractys.* Out of unity came multiplicity, and that multiplicity again became unity in the number ten.[13] Ten thereby included in itself the whole nature of numbers, and acquired an almost religious veneration. The Pythagoreans believed that everything, cosmic and earthly, visible and hidden, relied on immutable laws, and any sign of disorder or deviation was a source of concern. They preferred to compromise on the evidence than on their principles.

Their astronomical knowledge was limited to the six planets closest to the sun, the sun itself, the moon, and the stars which they visualised as a fixed sphere. Since the number ten was understood to be perfect, and they found only nine celestial entities, they invented another, admitted it was invisible, and called it the counter-earth.[14] Aristotle considered this cheating, not without reason.

> Observation of the regular movements in the sky led to the concept of a beautifully ordered harmony of the spheres. The evolution of the world was paralleled by that of numbers: unity came into existence from the void and the limit; out of the One the

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[11]James, 23.
[12]Iamblichus *On the Pythagorean Way of Life* 162; quoted in Barnes, 213.
[13]Schimmel, 14.
[14]Aristotle *Metaphysics*; quoted in Barnes, 209.

> number appears, and out of the number comes the whole heaven, the entire universe.[15]

This apparently harmonious movement is not merely a figurative description of a well-ordered universe. The harmony, or music, of the spheres was the supposedly concordant sound of the various visible celestial bodies as they moved, obviously at great speed, through space. This was based on the observations of speeding objects on earth and the noises they produced, adapted to the premise that a universe in perfect mathematical and musical proportions would make harmonious sounds.

Aristotle, naturally, was sarcastic about this. "We do not hear this sound, they say that the cause lies in the fact that the noise is with us from the moment of our birth so that it cannot be distinguished by reference to a contrary silence .... Thus men are in the same case as blacksmiths whom habit makes impervious to the sound."[16] By this reasoning, it is hardly surprising that the braziers, who inspired Pythagoras, had never investigated the different pitches of heavy and light hammers themselves.

Other scientifically-inclined philosophers, such as Pliny the Elder (AD 23 or 24-79), also questioned the existence of this "sweet music of incredible beauty", and the rationalisation that the sound was so loud, it exceeded the capacity of the human ear.[17]

With the benefit of knowledge that includes a heliocentric solar system and, scientific laws that preclude the transmission of any sound through the vacuum of space, the fantasy of musical spheres seems ridiculous in the twentieth century. Yet, in spite of this common knowledge, it is rare to find a science fiction motion picture without sound effects accompanying the movement of a space ship, which should realistically be proceeding in absolute silence. A notable exception to this stupidity is *2001: a space odyssey*, in which the silence of space is a remarkable effect, enhanced by Kubrick's musical joke: using Strauss waltzes for the music of the space ships.

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[15]Schimmel, 11-13.
[16]Aristotle *On the Heavens* 290b12-29; quoted in Barnes, 211.
[17]Pliny the Elder *Natural History* II iii; trans. and quoted in Joscelyn Godwin, ed., *The Harmony of the Spheres: A Sourcebook of the Pythagorean Tradition in Music* (Rochester, Vermont: Inner Traditions International, Ltd., 1993), 8.

Nevertheless, it is surprising that some of the more mystical and irrational ideas of a secretive sect, the Pythagoreans, had more influence on subsequent Western philosophy than the well-reasoned alternatives proposed by their critic, Aristotle. This may be due to the intervening writings of Plato who, though he disagreed with many aspects of Pythagoreanism, firmly established the doctrines of cosmic harmony. Plato's most important thoughts on musical theory appear in the *Timaeus*, which "was the only Platonic dialogue that never sank into oblivion in the West."[18]

Timaeus, after relating the myth of the lost island of Atlantis, describes the creation of the world by the Demiurge (also called "Creator" or "Deity" in other translations). "When he was framing the universe, he put intelligence in soul, and soul in body ... the world came into being—a living creature endowed with soul and intelligence".[19]The description of the creation of the World-Soul is more complicated.

> From the being which is indivisible and unchangeable, and from that kind of being which is distributed among bodies, he compounded a third and intermediate kind of being.... When he had mingled them ... and out of three made one, he again divided this whole into as many portions as was fitting, each portion being a compound of the same, the different, and being.[20]

The analogy to the idea of Thesis, Antithesis and Synthesis is unmistakable, but even more significant are the ratios which the Demiurge chooses when separating off portions from the whole. He takes away a part of the whole, then another part twice the size of the first, a third and a fourth, respectively three and four times the size of the first. The fifth, sixth and seventh portions are nine, eight and twenty-seven times larger than the first.[21] (Arranged in the order 2, 4, 8 and 3, 9, 27, these are the first odd and even numbers, and the squares and cubes of each. One is excluded from these sequences, since it has no squares or cubes other than itself.)

The Demiurge continues by calculating the harmonic and melodic means of each of the double intervals (1, 2, 4, 8) and the triple intervals (1, 3, 9, 27). The formula for the arithmetic mean is simply $(x + y) \div 2$; that for the harmonic mean is $2xy \div (x + y)$.

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[18]Godwin, 4.
[19]Plato *Timaeus* 30; quoted in Ronald B. Levinson, ed., *A Plato Reader* (Boston: Houghton Mifflin Company, Riverside Editions, 1967), 456.
[20]Ibid., 459.
[21]Ibid.

Therefore, the harmonic mean is not equidistant from two numbers, its distance from each number is proportional to the number itself. For example, the harmonic mean of 1 and 3 is 1.5, which is greater than 1 by 0.5 ($^1/_2$ of 1), and less than 3 by 1.5 ($^1/_2$ of 3).

This type of mean is called harmonic because it corresponds to the ratios of any three successive members of the harmonic series. The first, second and third overtones are produced, respectively, by a half, a third and a quarter of the length of a vibrating string. By clearing the fractions, $^1/_2 : ^1/_3 : ^1/_4 : : 3 : 4 : 6.$, and the harmonic mean of 3 and 6 is 4.[22]

Furthermore, the harmonic and arithmetic means of any two musical notes an octave apart are the notes a perfect fourth and fifth above the lower octave. For the sake of clarity and whole numbers, taking two notes in the ratio 6:12, (i.e., 1:2) gives an arithmetic mean of 9 and a harmonic mean of 8.

Plato's *Timaeus* goes further than establishing the Harmony of the Spheres. The implication is that the sounds most naturally created on earth—octaves, fifths, fourths and also whole-tones—are present in the construction of the cosmos, were part of its creation. There is, according to this belief, a direct correlation between *musica mundana* and *musica instrumentalis*, between the sounds of the universe and the sound produced on any instrument.

There is a third type of music, also inaudible, known as *musica humana*:the resonance between the soul and body of every human being. Plato's description of the World Soul is an anthropomorphic view of the universe; since humans were understood to have a body, soul and intelligence, the world was assumed to have exactly the same attributes.

These Pythagorean and Platonic philosophies about the three-fold nature of music, and the presence of numbers in the fabric of the universe, survived into the Middle Ages, due to the influence of writers such as Nicomachus of Gerasa, who lived between AD 50 and 150, and whose *Enchiridion harmonices* (Textbook of Harmony) includes commentaries on Pythagoras's mythical discoveries and Plato's *Timaeus*. He also offers an explanation for the names of the seven tones of the scale, relating them to "the seven stars

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[22]Godwin, 404-405.

which traverse the sky and circle around the earth", and gives a poetic but fairly accurate description of the acoustical properties of wind and string instruments, concluding:

> We must consider here that "more" and "less" are dependent upon our own quantitative contribution, whether in blowing an aulos hard or soft, or in making the strings longer or shorter. It is evident that all this is numerically regulated, for it is agreed that quantity can properly be applied only to number.[23]

Another work by Nicomachus, his *Introductio arithmetica* (Introduction to Arithmetic), was later popularised by Boethius (circa AD 480-524), in *De institutione musica* (Principles of Music). Boethius is arguably the most important musical theorist of the Middle Ages, although there is little that is apparently original in his writings. He transmitted ancient Greek ideas by translating them into Latin and clarifying them with logical arguments; he is the first known author of the term "quadrivium" to describe the four mathematical disciplines; and the categories of *musica mundana*, *musica humana* and *musica instrumentalis* were first enumerated by him.[24]

> From this it follows that, of the four mathematical disciplines, the others are concerned with the pursuit of truth, but music is related not only to speculation but to morality as well.... From this may be discerned that truth of what Plato not idly said, that the soul of the universe is united by musical concord.[25]

Boethius's argument for the correlation between *musica mundana* and *musica humana* is based on the varying emotional responses to different modes, emphasising that music which is concordant resembles the ordered movements in the heavens, and resonates in the perfectly blended elements of the human body. He also states that music played on simpler instruments more closely preserves the beauty and harmony of the music of the universe.[26]

A contemporary of Boethius, Cassiodorus, wrote his *Institutiones* between 550 and 562. Like Boethius, he transcribed and commented on ancient wisdom, but it is particularly important for the subsequent development of music theory in Europe that he made no

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[23]Nicomachus of Gerasa *Enchiridion harmonices* III 10, IV 23; trans. and quoted in Godwin, 12.
[24]James, 74.
[25]Boethius *De institutione musica*, ed. Gottfried Friedlein (Leipzig, n.p., 1867); quoted in Oliver Strunk, *Source Readings in Music History: From Classical Antiquity through the Romantic Era* (New York: W. W. Norton & Company, Inc., 1950), 80.
[26]Ibid., 80-85.

distinction between Pythagorean, or pagan, philosophy and Christian morality. He also mentions the numerical basis of music:

> If we perform the commandments of the Creator and with pure minds obey the rules he has laid down, every word we speak, every pulsation of our veins, is related by musical rhythms to the powers of harmony.... The heavens and the earth, indeed all things in them which are directed by a higher power, share in this discipline of music, for Pythagoras attests that his universe was founded by and can be governed by music.... Musical science is the discipline which treats of numbers in their relation to those things which are found in sounds ...[27]

These sentiments were echoed almost exactly by Isidore of Seville, in his *Etymologiarum*, which includes a section on obtaining musical numbers, particularly the ratio of the harmonic mean, which are present in the revolution of the spheres and also in the human "microcosm".[28] Isidore became the archbishop of Seville in AD 599, and this treatise includes a chapter on the Divine Offices,[29] but his references to historical figures include such pagan deities as Mercury and Pan.

> Thus without music no discipline can be perfect, for there is nothing without it. For the very universe, it is said, is held together by a certain harmony of sounds, and the heavens themselves are made to revolve by the modulation of harmony.... every word we speak, every pulsation in our veins, is related by musical rhythms to the powers of harmony.[30]

The connection between music and mathematics, and the related concepts of symbolism in numbers and celestial music, were so persuasive that they were accepted by medieval Christians, despite their pagan origin. "Number symbolism, combined with astrological ideas, permeated medieval thought, and the church used it profusely."[31] Augustine of Hippo wrote the *City of God* to refute the "blasphemy" that the Christian religion was to blame for the sacking of Rome by the Goths in AD 410. He intended it as a counter-attack against "those who worship a multitude of false gods, whom we usually call pagans ...".[32]

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[27]Cassiodorus *Institutiones* 5.2, 4, ed. R. A. B. Mynors (Oxford: Clarendon Press, 1937); quoted in Strunk, 88.
[28]Isidore of Seville *Etymologiarium* 23, ed. W. M. Lindsay (Oxford: Clarendon Press, 1911); quoted in Strunk, 99-100.
[29]Strunk, 93.
[30]Isidore of Seville *Etymologiarium* 17; quoted in Strunk, 94.
[31]Schimmel, 19.
[32]Augustine *Retractions* 2; quoted in David Knowles, introduction to *Concerning the City of God against the Pagans*, trans. and ed. Henry Bettenson (Harmondsworth: Penguin Books Ltd., 1972), xvi.

Despite Augustine's limited knowledge of Greek philosophy, he often referred to the teaching of Plato or the Platonists,[33] and the *City of God* was arranged using a combination of symbolic numbers, although the symbolism is overtly biblical. The work consists of twenty-two books, corresponding to the twenty-two letters of the Hebrew alphabet, "divided into 2 times 5 refutations, which is an expression of the tenfold 'Thou shalt not ...' of the Law, and into 3 times 4 positive teachings, which correspond to both the 12 apostles and the Trinity as proclaimed in the 4 gospels: 3 X 4 = 12."[34]

[33]Knowles, xiii-xiv.
[34]Schimmel, 20.

CHAPTER 2

THE SYMBOLISM OF NUMBERS

> I always come upon the enigma of the *natural number*. I have a distinct feeling that number is a key to the mystery, since it is just as much discovered as it is invented. It is quantity as well as meaning.
> Carl Gustav Jung

The symbolism associated with 3, 4, 5, 7, 12 and 13—the numbers which are of structural importance in George Crumb's *Makrokosmos, Volume I*—has acquired distinctly Christian connotations. Yet number symbolism is not specific to any one religion or philosophy. The similarities between the symbolic aspects attributed to certain numbers by people of completely different cultures cannot be coincidental. Possible explanations are the assumptions that number symbolism is so ancient that it predates the dispersion of people across the globe, or, more plausibly, that the most fundamental aspects are not a conscious invention, but an unconscious response to numbers, common to all humans.

It is also arguable that numbers are not symbolic because of their religious connotations, but that various religions incorporated certain numbers because of their symbolic value. Although they may have come to symbolise something unique to one religion, these numbers have an independent significance, established before they were adopted to express a particular belief in a particular religious context. However, such is the influence of religion that symbolism is sometimes used as evidence of the authenticity of the belief, rather than *vice versa*. Even scientific observations have been used to confirm the religious significance of a number; "the great German astronomer Johannes Kepler asserted that there are not more and not less than three dimensions of space on account of the Trinity."[35]

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[35]M[arie]-L[ouise] von Franz, "Conclusion: Science and the unconscious", in *Man and his Symbols*, Carl G. Jung and others (n.p., J. G. Ferguson Publishing Company, 1964; reprint, Harmondsworth: Penguin Books Ltd., Arkana, 1990), 307.

The association of the number 3 with the Christian Trinity, for example, is widely accepted, yet the concept of the Trinity is not mentioned at all in the Bible. There are, however, precedents for a trinity of deities: Anu, Enlil and Ea in ancient Sumeria; Sin, Shamash and Ishtar in Babylonia; Isis, Osiris and Horus in Egypt; and Amon, Chonsu and Mut in Thebes. "The Etruscans too had a divine triad .... The *Edda* mentions an ancient Nordic triad in a visionary verse which declares, 'Odin gave mind, Hönur soul, Lodur light and color.' But even earlier, Germanic religion knew of Odin, Wili, and Weh ...".[36]

The importance of 3 cannot be unconnected with the physical world, which has 3 dimensions (length, depth or breadth, and height), contains matter which exists in 3 states (solid, liquid or gaseous), and functions temporally in 3 phases (past, present and future). Philosophically, the number represents a progression from the unity of one, through the divisiveness of two, to the reconciliation of 3. This can be expressed graphically, starting with a single point, drawing a line from this to another point, and joining both to a third point, making a closed or complete figure (a triangle).

This concept of completeness is important in the spiritual associations of 3, since it implies perfection. Adjectives are classified in degrees of comparison: positive, comparative, superlative. In a sense, 3 is also the first real plural, the lowest number which can denote "many" things. "In ancient Egypt 3 was, at some time, the upper limit of exact counting and at the same time an expression of indefinite multiplicity ...".[37] This became symbolic in a biblical context; 3 is used for periods of time, or for the number of people, concepts or objects, that are spiritually complete, even when this is unsupported or contradicted by the evidence.

"For as Jonah was three days and three nights in the belly of a huge fish, so the Son of Man will be three days and three nights in the heart of the earth."[38] Yet the crucifixion of Christ took place on the afternoon before the Sabbath, and the resurrection on the morning after the Sabbath; therefore, the time elapsed is definitely less than forty-eight hours. Schimmel writes that "it is no accident that there are 3 Magi who come to worship the child

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[36]Schimmel, 61.
[37]Ibid., 69.
[38]Matthew 12:40.

in Bethlehem",[39] but the number of Magi is not mentioned at all, only their "gifts of gold and of incense and of myrrh".[40] However, it is not accidental that they have become 3 in popular belief, but an indication that 3 symbolises completeness in the human psyche.

The power of 3 is not restricted to the side of good against evil. The instances of 3 characters or events in folk tales are too numerous to mention, but Shakespeare's Weird Sisters, also called Witches, are an excellent example of the demonic use of 3:

> When shall we three meet again?
> In thunder, lightning, or in rain?
> .....
> Thrice to thine, and thrice to mine,
> And thrice again, to make up nine.
> Peace! The spell's wound up.[41]

Act IV begins, "Thrice the brinded cat hath mew'd" and the Witches proceed with their spell. They each speak individually, but all 3 chant the same thing 3 times: "Double, double toil, and trouble; / Fire burn, and cauldron bubble",[42] and they conjure up 3 Apparitions to speak to Macbeth. Shakespeare gave the name Hecate to the mistress of their charms. "The Greek goddess Hekate appears under 3 different aspects: in the sky as Selena or Luna, the moon, on the earth as Diana, and in the netherworld as Hekate."[43]

As 3 is associated with the spiritual realm, so 4 is associated with the physical world. (This division is reflected in the trivium and quadrivium of medieval learning.) Jung emphasised the importance of 4, partly "because he felt that its ordering power was needed to counteract the chaotic development in Germany after 1933, to create a new, positive world order. In his view, the archetype of quaternity appeared to ban the archetype *Wodan*, which had incorporated demonic restlessness."[44]

In ancient Greek philosophy, the earth consisted of 4 elements—fire, earth, air and water—which are still used in astrology; earthly navigation is still governed by the 4 cardinal points of the compass, and these co-ordinates are also used to describe winds. The

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[39]Schimmel, 70.
[40]Matthew 2:11.
[41]William Shakespeare, *Macbeth*, in *William Shakespeare: The Complete Works*, ed. Peter Alexander (London and Glasgow: Collins, 1951), 999-1000.
[42]Ibid., 1016.
[43]Schimmel, 60.
[44]Ibid., 104.

biblical tradition of 4 begins with the Tetragrammaton, the letters "YHWH" which evolved into "Yahweh", but originally were not to be pronounced.

In Ezekiel's vision, 4 living creatures each have 4 faces (that of a man, a lion, an ox and an eagle), so that each looks in all 4 directions at the same time.[45] These animals were later attributed to the authors of the Gospels; Mark as the lion, Luke as the ox and John as the eagle; Matthew was represented as a man or an angel.[46] "Christian exegesis had an ideal symbol for the 4 directions in the form of Christ's cross, with its 4 arms that indicated, for them, the 4 directions in which the Gospel [or the 4 Gospels] should be preached ...".[47]

The symbol of the cross, obtained by connecting the 4 cardinal points, has become the inextricably linked with Christianity, but seems to have originated in ancient Egypt. The hieroglyph for immortality, *ankh*, is a modified cross with a loop at the top. "In this shape it was even found on early Christian tombstones, and the modern Coptic painter has represented Golgotha with an Egyptian cross as the symbol of Christ's resurrection."[48]

Another cruciform symbol is the *mandala*.[49] Although there are many variations of this image, the simplest and most common is a circle with an inscribed cross. This can be seen as an attempt to square the circle, but in analytical psychology it represents not only the Self, but also meaning and order. "The most widely current mandalas in Christian art are those of Christ surrounded by the four Evangelists. These go back to the ancient Egyptian representations of the god Horus and his four sons."[50]

Jung defined 4 types of human behaviour, sensation *versus* intuition and feeling *versus* thought, which are usually illustrated using a *mandala*. These character types are reminiscent of the 4 temperaments, or humours (sanguine, phlegmatic, melancholic and choleric), which were supposedly influenced by imbalances in the 4 bodily fluids (blood, phlegm, and yellow and black bile), which can, in turn, be seen as the human equivalents for the 4 earthly elements.

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[45]Ezekiel 1.
[46]Aniela Jaffé, "Symbolism in the visual arts", in *Man and his Symbols*, 238.
[47]Schimmel, 94.
[48]Ibid., 88.
[49]The word means "magic circle".
[50]Jaffé, 242.

While 4 humours could explain the constitution and behaviour of humans, a fifth and secret element, the essence of being human, was missing. "This *quinta essentia*, our *quintessence*, was considered to be the real element of life, and its production was the goal of medieval alchemists."[51] Thus, Hamlet's melancholy rhetorical question: "What a piece of work is a man! ... what is this quintessence of dust?"[52]

Although all mammals and birds, at least, are equipped with the same 5 senses as humans, 5 has usually been connected specifically with human life. This was depicted in Renaissance drawings (for example, those by Leonardo da Vinci) of a human figure standing inside a circle, with the limbs extended and arms slightly lowered; the extremities touch the circle at 5 points. Connecting these points forms a pentagram which, in practical magic, "is regarded as the sign of the microcosmos",[53] the human being epitomising the universe.

The points of a pentagram are seventy-two degrees apart on a circumscribed circle, and the old solar year "could be divided into 5 X 72 days, [but] was later transformed into a correct [or more correct] solar year of 365 days; to accomplish this, it was necessary to add 5 new days, which are called *epagomeneia*."[54]

"From early times 5 was considered a somewhat unusual, even rebellious, number, and the discovery by Hippasus of a fifth geometrical body, the pentagondodecahedron, which consists of 12 regular pentagons, embarrassed the Pythagoreans, who had concentrated on the 4."[55] Schimmel also mentions that pentagons can never be perfectly aligned together. Perhaps it was the rebellious nature of 5 that made it even more suitable as the number to represent human beings.

The number 7 is unusual in a mathematical sense; unlike the other numbers from two to twelve, the products of 7 form no recognisable patterns in the decimal system.[56]

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[51]Schimmel, 117-118.
[52]Shakespeare, *Hamlet, Prince of Denmark*, in *William Shakespeare: The Complete Works*, ed. Alexander, 1043.
[53]Schimmel, 116.
[54]Ibid., 108.
[55]Ibid., 106.
[56]For example, the digits in any product of 3 always produce a sum which is also a product of 3. The difference between the alternate digits, or between the sums of the alternate digits, of any product of 11 is either 11 or 0.

Despite the illustrious position of 7 in Jewish and Christian symbolism, it also has ancient negative connotations; "in the hot season in ancient Babylonia 7 signs of the zodiac were invisible and only 5 could be observed above the horizon. It was believed that the invisible 7 signs had gone into the realms of the evil principle, and for this reason, 7 could be considered a dangerous or evil number."[57]

The Judeo-Christian tradition of resting on a seventh, holy day is derived from the six days of creation and one of rest described at the beginning of Genesis. In the Babylonian lunar calendar, (introduced at the time of Hammurabi,) the seventh, fourteenth, twenty-first, and twenty-eighth days of each month were regarded as unlucky, during which certain activities were to be avoided.[58] This ambivalent nature of 7 has survived, at least in the German tradition, as "Die böse Sieben".[59]

In antiquity, there were 7 Wonders of the World, and the 7 stars of the Pleiades (also called the Seven Sisters) could be seen by the naked eye. "The ancient Babylonian *ziggurat*, the step pyramid, had 7 storeys, and the temple of the Sumerian king Gudea was called 'the house of the 7 parts of the world,' which likewise had 7 steps, to remind the visitor of the 7 spheres. The Tree of Life, too, was represented with 7 branches, each branch having 7 leaves, and it may well be that this was the model for the 7-branched candelabrum of Jewish ritual."[60] Seven Wise Men, seventh- or sixth-century Greeks, were said to posses great wisdom;[61] there are also the 7 pillars of wisdom: "Wisdom has built her house; she has hewn out its seven pillars."[62]

The enormous religious significance of 7 is evident in the book of Revelation.[63] It is written to the 7 churches and includes greetings from the 7 spirits (1:4); there are 7 stars representing 7 angels and 7 lampstands representing the churches (1:20); the lamb has 7 horns and 7 eyes (5:6), and opens the scroll with 7 seals (5:1); 7 angels sound 7 trumpets

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[57]Schimmel, 131.
[58]Ibid., 130.
[59]Walter Blankenburg and Willem Elders, "Zahlensymbolik", in *Die Musik in Geschichte und Gegenwart*, 1979 ed.
[60]Schimmel, 130.
[61]*Encyclopaedia Britannica*, 15th ed., s.v. "Seven Wise Men".
[62]Proverbs 9:1.
[63]The following parenthetical references are to the chapters and verses in Revelation.

(8:6); 7 thunders speak (10:4); there are 7 last plagues (15:1) and 7 bowls of God's wrath (16:1). In this vision, 7 has both positive and negative connotations, it denotes great power, but also destruction.

Seven is a psychologically complete number, since it is the sum of the spiritual 3 and the physical 4. The product of 3 and 4 is 12, which is likewise a complete number. "According to Augustine, since 12 consists of 3 X 4, it is the Apostles' duty to propagate the faith in the Trinity in the 4 parts of the world."[64] The names of the 12 apostles or disciples of Christ[65] appear on the 12 foundations of the wall around the New Jerusalem; the 12 gates to the city have the names of the 12 tribes of Israel,[66] who are the descendants of the 12 sons of Jacob.[67]

There is also the significance of the 12 signs of the Zodiac. In astrological terms, the sun is said to enter and leave each house of the Zodiac on specific days of the year (although the exact dates vary from year to year). The movement of the sun (from an earthly perspective) was traced throughout the year, and also during each day; it is a logical development that the subdivision of the year would be 12 months, and that of daily time, 12 hours.

In the Germanic tradition, the 12 days and nights that were intercalated to bring the lunar and the solar year together "live on in popular piety and superstition. They were often regarded as dangerous, or at least somewhat mysterious."[68] These 12 days can be seen as a combination of the 5 days of the *epagomeneia*, and the 7 days of the Roman Saturnalia, during which time all work was suspended, certain moral restriction were eased and slaves were free to say and do as they pleased.[69]

This was adapted into the Christian tradition as the 12 Days of Christmas, which end with Epiphany, or Twelfth Night. Hugo describes one particular "6th of January ... a double holiday, united since time immemorial—the Epiphany, or Feast of the Kings

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[64]Schimmel, 193.
[65]Matthew 10:1.
[66]Revelation 21:12-14.
[67]Genesis 49:28.
[68]Schimmel, 197.
[69]*Encyclopaedia Britannica*, 15th ed., s.v. "Saturn".

[Magi], and the *Fête des Fous*, or Feast of the Fools."[70] The festivities include the election of the "Fools' Pope or Lord of Misrule" who is dressed in a pasteboard tiara and mock robe.[71] The satirical elevation of the perfectly hideous, and apparently idiotic, Quasimodo to the position of a pope or a lord, corresponds to the temporary freedom given to slaves during the Saturnalia.

The notion that normal law and order were suspended during this time, especially at night, resulted in a remarkable synthesis of pagan and Christian superstition:

> One avoids washing laundry lest Wodan and his demonic horde carry it off or the accursed spirits that roam about on those dark nights endanger the home. The livestock receive special fodder, and the letters C + M + B, abbreviations for the names of the three Magi ... are written on doors and stables. Midnight likewise has a special character as the time when animals and spirits can talk, and the treasure hunter ... sees the guiding light as the clock strikes 12 times. But once this uncanny hour has passed, everything returns to its normal shape, and all the lovely figures turn into pumpkins.[72]

The superstitions surrounding 13 can be related directly to the closed system created by 12, which makes the thirteenth person an outsider, either a leader of the other 12, or one doomed to die. "Thus, Philip of Macedonia, who had his own effigy paraded along with those of the 12 gods, was assassinated soon after this event, while Odysseus escaped death at the hands of the Cyclops but his 12 companions were devoured."[73] The obvious example of this is the Last Supper of Christ and the 12 disciples; Christ is both the leader and the one preparing for death. However, the unlucky image of 13 is derived from Judas Iscariot, the thirteenth person at the meal, who betrayed Christ on the eve of a Friday.

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[70]Victor Hugo, *The Hunchback of Notre-Dame*, trans. J. Carroll Beckwith (n.p., 1899; reprint, London and Glasgow: Collins, 1953), 21.
[71]Ibid., 59.
[72]Schimmel, 199.
[73]Ibid., 205.

CHAPTER 3

J. S. BACH: RELIGIOUS SYMBOLISM AND *GEMATRIA*

> When we discuss numerical symbolism we must be careful to distinguish between numbers which are significant, those which are interesting and those which may be coincidental ... because Bach appeared to use numbers sometimes does not mean that he always did.
> John Bertalot

The presence of symbolic numbers in the music of Johann Sebastian Bach has been documented by analysts such as Friedrich Smend and Martin Jansen. Their assertions have subsequently been criticised as lacking in logic and factual basis, or even as directly opposed to historical facts. While there is little doubt that Bach consciously and deliberately used symbolic numbers in certain compositions, calculations such as those which show that the ratio of the numbers of bars of successive movements becomes a symbolic number when multiplied by one hundred are so far-fetched, that they reduce to absurdity the entire theory that compositions are based on symbolic numbers.

Bach has been recognised as a musical genius, a prolific and inspired composer, but was more famous during his own life as a performer and improviser. He was devoutly and, apparently, sincerely religious, and also highly intelligent. It is probable that "imposing restrictions upon his work ... acted as a spur to enable him to reach heights which he might not otherwise have attempted."[74]

Bach's reasons for using symbolism in secular compositions may be quite different from his intentions when including symbolic elements in sacred works. In a secular context, the symbolism is indicative of his fondness for intellectual games, which is also evident in pieces such as the canons of *The Musical Offering*; in the religious music, the symbolism is potentially more profound. In the words of Karl Geiringer:

> He considered his church music to be not so much a work of art as a part of the religious service, meant to teach the congregation, to elevate their souls, and to

[74]John Bertalot, "Number Symbolism in Bach—Part II", *Musical Opinion* 104 (September 1981): 441.

> strengthen their faith. The religious message embodied in each of his sacred works had therefore to be conveyed with the utmost clarity.[75]

In his liturgical music, Bach is thought to have incorporated numbers such as 3, 7 and 12,[76] which have important symbolic associations in the Judeo-Christian tradition, and also to have used numbers to identify specific biblical texts. For example, when setting a New Testament text that quotes from the Old, the number of bars, bass notes, etc., would indicate the Psalm in which the words originated. In these instances, the number *per se* is not symbolic in the strict sense, but it functions symbolically, by alluding to something which is not stated explicitly, thereby increasing the religious and philosophical significance of the text.

It is unlikely that it was possible to detect this type of symbolism during a church service, especially the number of the relevant psalm. Since members of the congregation would not have been looking at the score, the religious message embodied in a work was probably not conveyed to them at all. In an apparent contradiction of the statement quoted above, Geiringer compares Bach to the architects of medieval cathedrals "who devised multitudes of the most artistic statues placed high up on the edifice and invisible to most human eyes ... for the glory of God."[77]

It is possible that Bach's reverent attitude towards the composition of religious works—his attention to the details and to the greater structure, with the intention of creating something pleasing and acceptable to God—had an effect on those who heard the music. If many of the symbolic numbers in Bach's sacred music functioned only as sources of inspiration while he was composing, this music may nevertheless contain aspects of spiritualism it would not have acquired otherwise, and this spiritualism may, in turn, be conveyed to listeners, even if unconsciously.

This process would be comparable to hearing a vocal work without understanding the language in which it is sung, yet being able to appreciate the emotional qualities in the

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[75]Karl Geiringer, *Symbolism in the Music of Bach* (Washington, D.C.: The Library of Congress, 1955), 5.
[76]All three numbers are present in the "St Anne" Fugue, BWV 552, according to the analysis by John Bertalot, "Number Symbolism in Bach—Part I", *Musical Opinion* 104 (August 1981): 413.
[77]Geiringer, 10.

music, which is vastly different from a direct and complete comprehension. The probability that the symbolic numbers Bach used were not intended for the benefit of the general Lutheran public raises questions about their importance as a means of communication, but it does not affect the importance these numbers would have had for Bach as a composer, nor does it diminish the often profound religious beliefs encapsulated in them.

There is much evidence that symbolism, in general, was traditionally regarded as the preserve of the initiated, and was understood and appreciated by very few members of society. There is no evidence that Bach ever referred to his use of symbolism, but this is hardly surprising, considering that, in literature as well as in music, "numerical composition was an essentially arcane practice ...; the last thing we should expect to find is an unveiled authorial exposition."[78]

Not only did a sense of elitism continue to surround symbolism in the eighteenth century; it appears that the use of symbolism came to be regarded with suspicion, if not contempt, by many of Bach's contemporaries. Johann Mattheson is alleged to have poked fun at "'the number mongers who actually believe that secrets and images are hiding in figures'."[79] Matthesons's credentials may be somewhat clouded by his having fought a duel with Handel, after an argument during a performance of Mattheson's opera, *Cleopatra*.[80] Nevertheless, Terry describes him as "the foremost critic of the day," and quotes his laudatory opinion of Bach: "With Bach's treatise on 'The Art of Fugue' before him,... [he] claimed that Germany was 'the true home of Organ music and Fugue.'"[81]

Lorenz Christoph Mizler, who taught philosophy, mathematics and music in Leipzig, was the founder of the *Societät der musicalischen Wissenschaften*, of which Bach became a member, and the *Neu eröffnete Musikalische Bibliothek*, which became *Lorenz Mizler's Musikalische Bibliothek*. The last instalment of this periodical, issued in 1754,

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[78]Alister Fowler, *Spencer and the Numbers of Time* (London, n.p., 1964), 238; quoted in Randolph N. Currie, "A Neglected Guide to Bach's Use of Number Symbolism—Part I", *BACH, Riemenschneider Bach Institute* (1974): 23.
[79]Quoted in Peter Stadlen, "Berg's Cryptography", *Alban Berg Symposion, Vienna 1980,* Alban Berg Studien II (Vienna: Universal Edition, 1981), 173.
[80]*The Oxford Dictionary of Music*, s.v. "Mattheson, Johann".
[81]Charles Sanford Terry, introduction to *Johann Sebastian Bach: His life, art, and work* by Johann Nikolaus Forkel, trans. Charles Sanford Terry (London: Constable and Company Ltd., 1920; reprint, New York: Vienna House, 1974), xiii.

included an obituary of Bach, written by his son Philipp Emanuel, and former pupil Johann Friedrich Agricola. Mizler himself wrote the last four sentences of the obituary:[82]

> ... He joined the Society of Musical Sciences in the year 1747,... at the suggestion of *Hofrath* Mizler, whose good friend he was and to whom he had given instruction in clavier playing and composition .... Our lately departed Bach did not, it is true, occupy himself with deep theoretical speculations on music, but was all the stronger in the practice of the art. To the Society he furnished the chorale *Vom Himmel hoch da komm ich her* fully worked out .... He also presented to the Society the canon [triplex á 6 voc.] ....[83]

It is difficult to determine what Mizler meant by "deep theoretical speculations". Bach's speculations on the theoretical and practical possibilities of polyphonic music resulted in works such as *The Art of Fugue* and the *Goldberg Variations*. It is therefore probable that he was referring to Bach's use of extra-musical devices, for instance, number symbolism. If so, his statement is not necessarily proof that Bach did not make use of number symbolism; it may have been intended as a defence of Bach's reputation, if "the pursuit of sacred mythology had fallen into disrepute by the early 18th century".[84] It could also be an indication of the secretive nature of symbolism. "Even Mizler, whose mathematical interest is well known, seems never to have written a word about numerical composition."[85] However, the absence of evidence is not the evidence of absence.

In the case of Bach, there is at least one piece of evidence; the number "84" is written at the end of the *Patrem omnipotentem* in the autograph score of the Mass in B minor. It was discovered by Friedrich Smend, who "assures us that the figures are in Bach's handwriting."[86] There are 84 bars in the movement, and 84 is the product of 7 and 12, which are important holy numbers (both are combinations of the spiritual 3 and the physical 4), but this does not explain fully why Bach might have written the number in the score.

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[82]Hans T. David and Arthur Mendel, eds., *The Bach Reader: A Life of Johann Sebastian Bach in Letters and Documents* (New York: W. W. Norton & Company, Inc., 1945), 214-215.
[83]Lorenz Christoph Mizler, ["Nekrolog",] *Lorenz Mizler's Musikalische Bibliothek* IV (1754); trans. and quoted in David and Mendel, 224.
[84]Stadlen, 173.
[85]Currie, "Part I", 23.
[86]Ibid., 24.

The interpretation of the symbolism in this movement relies on the ancient, esoteric tradition of *gematria*, the practice of substituting numbers for the letters of the alphabet. It was originally applied to the Hebrew alphabet by the medieval Cabalists as a method of exegesis, employed to derive mystical insights into sacred writings, or to obtain new interpretations of the texts.[87] The natural order number alphabet which Bach is thought to have used is one of the simplest possible. Each letter corresponds to a consecutive number, beginning with A = 1; I = J = 9 and U = V = 20.

Bach was extremely fortunate in having a surname that could be spelled out completely using musical pitches (a bit of luck not granted to cryptography-inclined composers like Schumann or Schoenberg), and often used his name as a musical cipher.[88] The numerical value of "Bach" is 14, that of "J S Bach" is 41, and the letters in "Johann Sebastian Bach" add up to 158, and 1 + 5 + 8 = 14. Thus, 84 can also be seen as 14 X 6.

Six is the number of days taken for the creation as described in Genesis, which is appropriate considering the text: "Credo in unum Deum Patrem omnipotentem factorem coeli et terrae visibilium omnium et invisibilium". The 14 words contain 84 letters. Currie's extremely detailed analysis of the possibly symbolic constructs includes the observation that the numerical value of the letters in "Credo" is 43, and 41 + 43 = 84.[89] Geiringer counts 43 appearances of the word "Credo" in the entire Mass.[90]

The problem with supposedly significant numbers is that many of them can be said to represent completely different things in different contexts. For example, Pelikan interprets the 43 notes of Bach's setting "bis an den Tag" ("until that day") in *The Passion According to St Matthew* as a reference to the 43 days between Maundy Thursday and

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[87] *Encyclopaedia Britannica*, 15th ed., s.v. "gematria".
[88] Perhaps the most well known use of the "Bach motive" is as a countersubject in *The Art of Fugue*, near the end of the unfinished work.
[89] Currie, "Part I", 25-29.
[90] Geiringer, 14.

Ascension Day.[91] "There were frequently five or more possible interpretations of each number in traditional number symbolism."[92]

There are abundant examples of number symbolism in the *St Matthew Passion*. In no. 15, there are eleven entries of the phrase: "Herr, bin ich's?"; Bach omits a part for Judas Iscariot.[93] Similarly, "during the vigil on the Mount of Olives the tenor representing Peter sings 'I will watch with Jesus gladly' and the chorus adds the refrain 'so all our sins have gone to sleep' ten times to refer to the remaining ten disciples ..., Judas having left on his errand of betrayal."[94]

Unfortunately, analyses of the purported biblical references in Bach's music often are inaccurate. Bertalot's examples of numerical references to the Psalms in the *St Matthew Passion*[95] include several errors. He refers to Psalm 73:17-18, when the nineteenth verse is relevant to the text of the *Passion*. His reference to Psalm 44:7 should be 44:6, and to Psalm 31:6 should be 31:5. The most blatant error is Bertalot's emphasis "that there are *ten* bars in this arioso [no. 40], matching the verse number in the psalm!"[96] However, the verse he quotes from Psalm 39 is the ninth, not the tenth. Bertalot's observations, corrected where necessary, are summarised in table 1.

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[91]Jaroslav Pelikan, *Bach Among the Theologians* (Philadelphia: Fortress Press, 1986), 33. Pelikan cites Martin Jansen, "Bachs Zahlensymbolik, an seinem Passionen untersucht", *Bach-Jahrbuch* 34 (1937): 104. It is not clear to which notes the number 43 applies; the text from "bis an den Tag" to the end of the movement is set to 25 notes.
[92]Ruth Tatlow, *Bach and the Riddle of the Number Alphabet* (Cambridge: Cambridge University Press, 1991), 4; from Fritz Feldmann, "Numerorum mysteria", *Archiv für Musikwissenschaft* 14 (1957): 102-129.
[93]Bertalot, "Number Symbolism in Bach—Part III", *Musical Opinion* (December 1981): 87.
[94]Geiringer, 11.
[95]Bertalot, "Part III", 87-88.
[96]Ibid., 87.

Table 1.—Numerical references to Psalms in the music of Bach's *St Matthew Passion*

No.	Text (extract)	Symbolism	Psalm
17 (1st half)	*Nehmet, esset; das ist mein Leib*	34 bass notes	*Taste and see that the Lord is good,...* (34:8)
17 (2d half)	*das ist mein Blut des neuen Testaments*	116 bass notes	*I will lift up the cup of salvation ...* (116:13)
33b	*Eröffne den feurigen Abgrund, o Hölle, zertrümmre, verderbe, verschlinge, zerschelle*	73 bars	*How suddenly are they destroyed, completely swept away by terrors!* (73:19)
34	*denn wer das Schwert nimmt, der soll durchs Schwert umkommen.*	44 bass notes	*... my sword does not bring me victory;* (44:6)
37	*der ganze Rat suchten falsches Zeugnis wider Jesum*	22 bass notes/ 16 bars	*... a band of evil men has encircled me,...* (22:16)
40	*Mein Jesus schweigt zu falschen Lügen stille*	39 chords	*I was silent; I would not open my mouth,...* (39:9)
71a	*Mein Gott, mein Gott, warum hast du mich verlassen?*	22 bass notes	*My God, my God, why have you forsken me?* (22:1)
71b	*Jesus schriee abermal laut, und verschied.*	31 bass notes	*Into your hands I commit my spirit,...* (31:5)

Notes: The original German text has been substituted for Bertalot's quotations from the *Passion*, and his references to the Psalms have been replaced with translations from the *New International Version.* "No." refers to the numbering system in the *Passion*; Bertalot's sections "a" and "b" are from the change in metre and tempo in no. 33, and the change of key in no. 71.

Bertalot credits Geiringer with the "revelations" concerning Psalms 39 and 116, although the specification of the tenth verse in Psalm 39 is his own.[97] Geiringer too has been mistaken about number symbolism:

> When in the *St. John Passion* Pilate hands Jesus to the Jews to be judged by them, they reply: "It is not lawful for us to put any man to death." Bach's theme has here *five* weird chromatically ascending notes on the word "töten" (kill), thus referring to the *fifth* commandment the Jews have just mentioned. This theme is repeated *ten* times so as to make it quite clear that the composer actually refers to one of the ten commandments.[98]

[97]Ibid.
[98]Geiringer, 12.

The Jews were not referring to the *sixth* of the Ten Commandments;[99] it was Roman law that prohibited them from executing anyone. "The Jews insisted, 'We have a law, and according to that law he must die, because he claimed to be the Son of God.'"[100] Under Jewish law, Christ had committed blasphemy, and "the Lord said to Moses:... 'anyone who blasphemes the name of the Lord must be put to death.'"[101]

The Gospel of Matthew was written specifically for Jewish converts to Christianity and, in order to prove that Jesus Christ was the Messiah prophesied in the Old Testament, the writer not only stressed the fulfilment of the prophesies, but also phrased his account so that it quotes, directly or indirectly, prophets such as Isaiah and Micah and the Psalms. Bach was, in a sense, copying the author of this gospel, quoting Psalms by using numbers in his music. The Gospel of John is not written in such comparative terms and there is little documentation of number symbolism in Bach's *Passion According to St John.* However, there has been some criticism of Bach's setting of the text:

> In the scene of Peter's interrogation by the onlookers in the courtyard there is further evidence of the difficulty which Bach experienced in maintaining a formal balance in this Passion. In an attempt to compensate for the lack of crowd utterances in this part of the work, the composer expands the chorus "Art thou not one of his disciples?" into a movement of seventeen bars, with forty-six repetitions of the words "Art thou not". The effect is forced and artificial; how simple and yet how brilliantly effective is the setting of the same section in the St Matthew Passion ..., in which four bars of music with practically no word-repetition suffice to paint the scene in the most vivid terms.[102]

This raises the possibility that Bach may have had a reason for using 17 bars and 46 repetitions. Psalm 17:3 reads: "Though you probe my heart and examine me at night, though you test me, you will find nothing; I have resolved that my mouth will not sin." Psalm 46 reveals nothing of significance, but if "Art thou not" is sung 46 times, the number of words (in German) is 138. Psalm 138 begins "I will praise you, O Lord, with all my heart; before the 'gods' I will sing your praise.... you made me bold and stouthearted." This extreme irony is surprising and it is difficult to imagine that Bach intended it. Thus, all "discoveries" of number symbolism in Bach's music should be regarded speculatively.

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[99]Exodus 20:13.
[100]John 19:7.
[101]Leviticus 24:13-16.
[102]Basil Smallman, *The Background of the Passion Music: J. S. Bach and his Predecessors* (London: SCM Press, 1957), 38-39.

The number of bars in the Mass in B Minor, for example, is 2345, to which Bertalot gives "'additional'" significance, while admitting that this number is reached by excluding the repeated *Osanna*.[103] Similarly, he calculates the total number of bars in the *Kyrie-Christe-Kyrie* ($270 = 3^3 \times 10$), but finds a proportional relationship between the number of bars in each section only "if the opening four bars of the first *Kyrie* are not counted, for they are musically separate from the rest of the movement ...".[104]

Currie, having expounded on the various instances of the number 84 in the *Patrem* of the Mass in B minor, gives examples of other works where this number may be found. In the organ chorale *Wenn wir in höchsten Nöthen sein*, BWV 641, "the completion of 41 notes in the top part coincides with a total of 43 in the accompanying parts for a total of 84".[105] Although this is the "forty-third completed chorale in the *Orgelbüchlein*",[106] the religious significance of 43 is based entirely on the numerical values of the letters in the word "Credo". Since the text for the chorale is in German, it is unlikely that 43 symbolises anything important in this context.[107]

Bach dictated the latter part of the chorale *Vor deinen Thron tret' ich hiermit*, BWV 668, "on his deathbed,... there are 14 notes in the first line of the solo melody and 41 notes in the complete solo part."[108] According to Currie, a passage of 84 notes, divided into 43 + 41 notes, occurs in connection with the second phrase of the *cantus firmus*, "part of an elaborate numerical scheme, the dimensions of which lie beyond the scope of this article."[109]

Concerning Bach's membership of the *Societät der musicalischen Wissenschaften*, Bertalot wrote, "he waited until he could be the 14th member and then wrote a 14-note canon for his entry exercise and had his portrait painted which shows 14 buttons on his

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[103]Bertalot, "Part II", 442.
[104]Ibid.
[105]Currie, "A Neglected Guide to Bach's Use of Number Symbolism—Part III", *BACH, Riemenschneider Bach Institute* (1974): 4.
[106]Ibid.
[107]Currie includes a section on the "Meanings Suggested By the Number '84'", emphasising the important factors of the number, but offers no explanation for 43 other than its relationship to "Credo".
[108]Bertalot, "Part II", 441.
[109]Currie, "Part III", 5.

coat."[110] The portrait shows Bach holding the *Canon triplex á 6 voc.*[111] but the canon itself contains 30 notes[112] and only one of the six voices has 14 notes in the solution.[113]

Tatlow has criticised the theory that Bach used *gematria* at all, particularly the natural-order number alphabet (which produces the numbers 14 and 41 from his name.) She states that the topic is "kept alive today by a few writers who continue to wrench ideas from their original context in Smend's theory ...".[114]

> Yet Smend provides no historical evidence to show that the natural-order number alphabet was ever used in conjunction with sacred numbers.... Smend neither gives an example of the existence in the eighteenth century or otherwise of the Latin or German natural-order alphabet, nor provides any evidence for Bach's knowledge of it. One must therefore query his examples and interpretation ...[115]

Tatlow gives thirty different systems of assigning numbers to the letters of the Latin alphabet.[116] She is convinced that, "had Bach used a number alphabet to embed theological meaning into his music ..., he would almost certainly have used the cabbalistic milesian number alphabet [1 ... 10; 20; 30 ... 100; 200 ...]. The natural-order number alphabet,... was used in the poetical paragram as a means of invention and had no pious or theological purpose."[117]

This implies that, though Bach may have used 14, and 41, to refer to himself, he did so only in a secular context. However, the nature of this symbolism in Bach's sacred music, assuming that the symbolism exists, is essentially personal. If he chose to include his signature, by way of *gematria*, in a religious work, it is more likely that this was a private expression of faith, not a public statement. As far as the apparent function of 14 is concerned, it is largely inconsequential whether it was used in a spiritual sense or not.

Bach's possible use of *gematria* for words in the text would also have been for himself, rather than for those who heard it. It is difficult to notice even the religiously

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[110]Bertalot, "Part III", 441.
[111]David and Mendel, 177, n. 72.
[112]Ibid., 77.
[113]Ibid., 404.
[114]Tatlow, 1.
[115]Ibid., 11.
[116]Ibid., 131-138.
[117]Ibid., 129.

symbolic numbers, which would more easily recognised, especially on hearing a work only once, which was the case with so much of Bach's music. As Stadlen writes:

> [Composers] could not possibly expect the listener to pick out whole number ratios hiding in the large quantities of notes ..., neither does a listener stand a chance of spotting the holy number represented by a five-note or a seven-note canon occurring at some point or other of a three part happening.[118]

There may have been a few contemporaries of Bach who did spot the holy numbers, especially among his pupils and friends who had access to his manuscripts. Several books on the subject of symbolism in music were published from the late sixteenth to the early eighteenth century, including *Isagoges musicae libri duo* (1591) by C. Schneegass, *Synopsis Musicae novae* (1612) by J. Lippius, and *Ut Mi Sol, Re Fa La, tota Musica et Harmonia Aeterna* (1716) by J. H. Buttstett. A Werckmeister's *Musicae mathematicae Hodegus curiosus* (1686) contains a section on "Allegorical Music", and the nineteenth chapter of his *Musicalischen Paradoxal-Discourse* (1707) deals with "The secret meaning of numbers." Johann Jacob Schmidt's *Biblischer Mathematicus* (1712) indicates that number symbolism retained its place in theological literature as well.[119]

However, there are relatively few examples of number symbolism in compositions from this period. (Although Mizler studied composition with Bach, "he was not much of a composer, being chiefly interested in theoretical and scientific matters."[120]) Whether this is because very few composers used number symbolism, or because Bach's work has been studied in such great detail and the symbolic devices of other composers have not yet been discovered, is not certain. One particular example is interesting; in J. Theile's setting of the *St Matthew Passion* (1673), the question "Herr, bin ichs?" is heard eleven times,[121] as it is in Bach's *St Matthew Passion.* This is a fairly simple use of number to illustrate the text, but it is possible that Bach borrowed the idea from Theile. Further studies of composers from this period may show that Bach's use of number symbolism was not at all unusual.

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[118]Stadlen, 172.
[119]Walter Blankenburg and Willem Elders, "Zahlensymbolik", in *Die Musik in Geschichte und Gegenwart,* 1979 ed.
[120]David and Mendel, 241.
[121]Ibid.

CHAPTER 4

ALBAN BERG: STRUCTURE AND SUPERSTITION

> In practice Berg's numerical schemes have the effect of acting as an abstract, objective means of determining musical proportions. It is clear from the annotations in the score of the *Lyric Suite* and from the 'Open Letter' on the Chamber Concerto, however, that the numbers upon which he based these schemes had, for Berg, a deeply subjective and almost mystical significance.
> Douglas Jarman

Alban Berg's use of a particularly personal form of number symbolism has been documented by scholars such as George Perle, whose initial work on "The Secret Programme of the Lyric Suite", published in the *International Alban Berg Society Newsletter* in 1977, has stimulated similar analyses of many other compositions. Although it is clear that Berg's significant numbers were 10 and 23, respectively referring to Hanna Fuchs and himself, his reason for choosing 10 as Hanna's number remains an unanswered question. The origin of his own "fateful relationship to the number 23"[122] may well have been his first asthma attack, which Reich dates as 23 July 1908, when Berg was 23. It is possible that he would have merely accepted "'the strange coincidences surrounding the number 23'"[123] had he not read Wilhelm Fliess's *Vom Leben und Tod* and taken Fliess's supposedly scientific evidence as proof of the importance of 23.

Berg began his composition studies relatively late in life (he was nineteen) and his only formal training was received from a paternalistic and domineering Schoenberg. It is logical that Berg would have sought Schoenberg's approval as far as composition was concerned, but the extant letters from Berg to Schoenberg reveal an almost pathetic desire to please, with grovelling admissions of guilt. Schoenberg's criticism encompasses Berg's

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[122]Willi Reich, *Alban Berg*, trans. Cornelius Cardew (London: Thames and Hudson, 1965; reprint, New York: Vienna House, 1974), 26.
[123]Douglas Jarman, "Alban Berg, Wilhelm Fliess, and the secret programme of the Violin Concerto", in *The Berg Companion*, ed. Douglas Jarman (n.p., Macmillan Press Ltd., 1989; reprint, Boston: Northeastern University Press, 1990), 183.

music, life-style and even his style of letter writing: "When you write to me, always underline the main points, particularly those I am to answer.... And something else: be more concise. You always write so many excuses ... your formalities take so much time. Break that habit!!"[124] Berg's reply to this began: "Forgive me, dear Herr Schönberg, if I deviate one more time from my resolve to be more concise.... So please excuse me, dear Herr Schönberg .... Second, I ask that you forgive me, dear Herr Schönberg ...".[125]

Schoenberg was unsympathetic to Berg's belief that 23 was his fateful number. Despite his own fatalistic attitude to the number thirteen, Schoenberg hypocritically told Berg to make himself independent of lucky and unlucky numbers. Berg accepted the criticism and expressed his intention of following the advice, but in a letter dated 20 June 1914, he wrote to Schoenberg about the apparently scientific evidence which, he thought, supported his superstitious concern about the number 23.

> In this connection, Herr Schoenberg, I must nevertheless tell you briefly about a book that I had never heard of before and that I came across by chance last summer, that seemed to confirm my old belief in the number 23. *Vom Leben und Tod* is by the well-known Berlin scholar Wilhelm Fliess and is based on biological experiments in which he shows that life and all phases in the lives of all living creatures run in periods and give rise to cycles which are always divisible by 28 and 23.[126]

Berg's "... I must nevertheless tell you ..." indicates the great importance he attached to the significance of 23. His writing about a subject of which Schoenberg disapproved is even more remarkable in the light of Schoenberg's letter from May of that year, which coincidentally contains the two relevant numbers: "I *must* tell you that today, the 28th (!!), your [bank] transfer still has not arrived. I'm extremely annoyed, for I realise how irresponsibly you treated the matter. Since you went to the bank too late on the 23rd, it would have been your duty to make up for it somehow.... now I know that I cannot depend on you."[127] Berg apologised profusely on 8 June, but apparently felt that justifying his number theory to Schoenberg was more important than acquiescing in order to atone for insulting his teacher.

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[124] *The Berg-Schoenberg Correspondence* , ed. Juliane Brand, Christopher Hailey and Donald Harris (New York: W. W. Norton & Company, 1987), 196.
[125] Ibid., 197.
[126] Alban Berg, quoted in Jarman, "Violin Concerto", 183.
[127] *The Berg-Schoenberg Correspondence*, 208-209.

Had Berg not been so anxious to please Schoenberg in everything, it is unlikely that he would have bothered to justify anything relating to numerological significance. He was certainly not alone in his beliefs. Developments at the turn of the century included not only radical changes in the visual and performing arts, but also unprecedented developments in science. Theories of evolution and psychology attempted to find definitive, scientific answers to questions about human nature, and encouraged other, quasi-scientific, schools of thought, such as astrology, as well as an interest in quasi-mystical religions, for example, Rosicrucianism and Madame Blavatsky's Theosophical Society. An offshoot of the former was the Hermetic Order of the Golden Dawn, established in the Isis-Urania Temple in London in 1888, with a Charter given by Anna Sprengel of Nuremberg, "allegedly a high-grade Rosicrucian."[128] Its members included Florence Farr, an actress who had been the mistress of G. B. Shaw, and the writers Aleister Crowley and W. B. Yeats.

The membership of these intellectuals indicates that the popularity of arcane societies such as this was not confined to the "large number of idle women who have the leisure to take a little occultism with their afternoon tea",[129] nor was it confined to England. Rudolf Steiner, an artist, scientist and expert on the works of Goethe, became acquainted with the Theosophical Society in 1902, and in 1912 founded the Anthroposophical Society, which emphasised spiritual perception, independent of the senses. He believed that one could participate more fully in the spiritual processes of the world through a dreamlike consciousness, by exercising the intellect to rise above material things.[130] Steiner was also for some time the leader of a Rosicrucian group near Hanover and wrote prolifically on "almost every aspect of occultism from the history of Atlantis to the nature and significance of the human blood."[131]

It was partly the overwhelming developments in science that led to these obsessions about things spiritual and esoteric; things essentially and exclusively human, but not

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[128]Francis King, *Modern Ritual Magic: The Rise of Western Occultism* (Bridport, Dorset: Prism Press, 1989), 42.
[129]Ibid., 103.
[130]*Encyclopaedia Britannica*, 15th ed., s.v. "Steiner, Rudolf".
[131]King, 205.

manufactured by humans, nor within their complete control or comprehension. The physical and social destruction of the First World War gave further impetus to the distrust of science and technology, and of the code of morals and ethics under which war had broken out. In Austria and Germany in the early twenties, "every extravagant idea that was not subject to regulation reaped a golden harvest: theosophy, occultism, spiritualism, somnambulism, anthroposophy, palm-reading, graphology, yoga and Paracelsism."[132]

The scientists themselves adopted unorthodox concepts. Jung's theory of synchronicity and his advocacy of the *I Ching* (he wrote the introduction to Richard Wilhelm's German translation) remain controversial. Both Jung and Freud were regarded with suspicion for their interpretation of dreams, and Freud "for many years shared Fliess's belief in the significance of the numbers 23 and 28. Only in the early 1920s did Freud begin to entertain doubts ...".[133]

Therefore, it is not surprising that Berg accepted Fliess's biological experiments. What is surprising is that Berg accepted Fliess's theory as proof of his idea that 23 was his own personal number, apparently without realising that, according to Fliess, it represented the entire male population, and therefore could have no particular significance for Berg himself. Perhaps, like Freud, he began to entertain doubts, which may be one reason for his later choice of 10, rather than 28, for Hanna.

Aside from the obvious fact that there are 10 letters in "Hanna Fuchs", adding the numbers corresponding to those letters—according to the system Bach is thought to have used—gives a total of 91, and 9 + 1 = 10. The initials would add up to 14, which would convert to 5, a number Green considered to be the "alter ego" of 23 (2 + 3).[134] It is possible that 5, like 230, was intended as a substitute for both 10 and 23. There are also 5 different musical notes that can be named from the letters in "Hanna Fuchs".

Since Berg seems to have used the numerological practice of generating substitute numbers by addition, he may have decided on 10 by adding the 2 and 8 in Fliess's female

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[132]Stefan Zweig, *The World of Yesterday: An autobiography by Stefan Zweig* (London: Cassel and Company Ltd., 1943), 229.
[133]Jarman, "Violin Concerto", 184.
[134]Douglas M. Green, "Berg's De Profundis: The Finale of the *Lyric Suite*", *International Alban Berg Society Newsletter* 5 (June 1977): 18.

number. However, if he was also familiar with this particular number alphabet, he would have known that 8 and 2 represent the letters "H" and "B"—his wife's initials—which would have been another reason why he did *not* use Fliess's number 28 for Hanna.

Alternatively, Hanna may have chosen this number herself, based on strange coincidences in her life connected with 10, or it may have symbolised for Berg the perfection attributed to it by the Pythagoreans. A completely different possibility is suggested by Stadlen's observations of the metronome marks in the second, third and fourth scenes of Act III of *Wozzeck*, which are all divisible by 10. "I'm only glad that Hanna did not live to hear me say so, for it almost looks as if she had a predecessor as regards the leasehold of Number Ten."[135] (Berg and Hanna Fuchs first met in May 1925.)

In a letter to Frida Semler (an American friend of Berg's family) from 1907, Berg wrote: "'... I am declaring firmly and certainly the great importance of sensuality for everything spiritual. Only through the understanding of sensuality ... [and] fundamental insight into the "depths of mankind" (shouldn't it rather be called the "heights of mankind?") can one arrive at a real idea of the human psyche ...'".[136] His emphasis on both the spiritual and sensual sides of the human psyche, and the implication that understanding the psyche is of great importance, makes his adoption of serialism appear out of character, since it involves the subjugation of spiritualism and sensuality to artificial laws.

Because of his devotion to Schoenberg, using Schoenberg's method of composition was necessary, but Berg continually found ways to express himself despite the restrictions. The pocket score of the *Lyric Suite* has an analytical introduction by Erwin Stein which mentions the quote from *Tristan und Isolde* in the sixth movement, paradoxically made possible within the limits of tone rows. Berg presented Hanna with an annotated copy of the score, in which he pointed out most of the symbolic references in the music. He also underlined the words "Die Freiheit gelassen hat" in the introduction, and wrote:

> It [the 12-tone system] has also, my Hanna, allowed me other freedoms! For example, that of secretly inserting our initials, H.F. and A.B., into this music, and of relating every movement and every section of every movement to our numbers, 10 and 23. I have written these, and much that has other meanings, into this score for you (for whom, and only for whom—in spite of the official dedication on the

[135]Stadlen, 176.
[136]Green, 16.

> following page—every note of this work was written). May it be a small monument to a great love.[137]

Apart from the necessity of including personal, emotive elements in the 12-tone system, there was the necessity of finding structural parameters to replace those that relied on the tonal system. Numbers provided one of Berg's solutions to this problem; he also made use of arch forms and mirror-reflections. Retrograde and inversion are both standard procedure with respect to 12-tone rows, but there may be a symbolic aspect to these as well.

> There was inherent in him a spiritual escapism which at times craved for suspension of the present and for the magical reversal of time. Berg's deep-seated fear of the evanescence of life found a kind of safety valve in the return of the end of a musical structure to its very source by, as it were, musical black magic, by the use of mirror-reflection, inversion and retrograde motion.[138]

Dalen suggests that Berg's interest in palindromic and retrograde structures "may even have been sparked by contemporary developments in film and radio, which had made the 'play-back' technically possible",[139] but she cites Jarman's argument as the most persuasive, that "'the circular, palindromic and other symmetrical designs which play so large a role in Berg's music are not simply technical conceits but, like his use of ciphers and number symbolism, are objective intellectual restraints which hide a deeply subjective significance'."[140]

Symmetry and symbolism in Berg's music, objective constraints with subjective significance, have an historical association in the music of Renaissance composers who used intellectual, non-musical concepts to impart both structure and meaning to their music. Stadlen paraphrases Jarman's opinion on Berg's predilection for using retrogrades, palindromes, isorhythmic techniques and numerology; they "correspond to those practised by composers of the late Middle Ages and early Renaissance ... the similarities represent a

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[137]George Perle, "The Secret Programme of the *Lyric Suite*", *International Alban Berg Society Newsletter* 5 (June 1977): 7.
[138]H. F. Redlich, *Alban Berg: The Man and his Music* (London: John Calder Ltd., 1957), 113.
[139]Brenda Dalen, "'Freundschaft, Liebe, und Welt': the secret programme of the Chamber Concerto", in *The Berg Companion*, ed. Jarman, 146.
[140]Douglas Jarman, *The Music of Alban Berg* (London: Faber and Faber, 1979), 241; quoted in Dalen, 147.

striking example of the way in which composers of the pre- and post-tonal periods, facing similar structural problems, turn to similar devices as a way of solving them.[141]

It is impossible to tell how widespread the knowledge of numerology was in the sixteenth century, or to know if composers used personally significant numbers as well as those, for example three and seven, which we recognise as being generally significant. The main difference between Berg and earlier composers, especially Bach, is that he seems to have used *only* those numbers that he had chosen to symbolise himself, or his own relationship to other people. His use of three in the Chamber Concerto, for example, has nothing to do with the Christian Trinity; it refers specifically to the three composers of the Second Viennese School. However, Berg's writing "... all good things that I wish for you come in threes ..."[142] corresponds to the ancient belief in the spiritual importance of 3.

Another important difference between pre- and post-tonal music is obviously that of chronology. Renaissance composers could not have known anything about the future development of the tonal system and the formal structures that it implied; furthermore, Renaissance music, if not vocal, was usually derived from vocal musical forms and adapted its structure from the text, whether explicit or latent. Berg was composing in genres that had originated in the tonal period—the solo concerto, the string quartet, and opera. These had specific, fairly lengthy, formal procedures, based on tonality, and Berg had to find substitutes for common-practise structures that had endured for approximately 250 years.

> Berg's intentions in using such number symbolism often seem quite different from those of other artists and composers who have indulged in such conceits.... in the music of the Renaissance and Middle Ages the symbolic arithmology employed had a meaning and made reference to a body of knowledge that, if not generally well known, was at least familiar to the cognoscenti. The numbers employed in Berg's music, on the other hand, have no such generally understood significance ...they represent something that is purely personal.[143]

This is not entirely true. As far as Berg's personally symbolic numbers are concerned, his use of 10 was definitely intended as a hidden declaration of his love for a woman with whom his affair was a secret. However, he made no secret of his identification with the number 23. Fliess's supposedly scientific evidence about 23 and 28 would have

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[141]Stadlen, 171.
[142]*The Berg-Schoenberg Correspondence*, 335.
[143]Jarman, "Violin Concerto", 181.

given at least a partial understanding of its significance to Berg's contemporaries who had read, or read about, *Vom Leben und Tod*, and also those who were interested in Freud's psychoanalysis, or any of the numerous esoteric societies that were fashionable in Europe in the first decades of this century.

If this body of knowledge were considered the concern of only the cognoscenti of Berg's time, it is still arguable that some aspects of numerology were more generally known. *The Black Cat*, published in 1921, includes a lengthy paragraph in which the haunted protagonist, prompted by what "appear[ed] to be a series of mere coincidences", correctly predicts his fate: "He had taken the numerical value of the letters C, A, T, in the alphabet, 3, 1, and 20 respectively, and by adding them together had arrived at the total 24. He then proceeded to note the many ways in which this number had played its part in the events of his life. He was born on the 24th of the month ... the memoranda conclude with the ominous question, 'Will it all end on the 24th?' "[144]

The author of this ghost story, W. J. Wintle, was an English novelist who often contributed to popular magazines. (It is interesting that he uses the simplest number alphabet, A = 1 ... Z = 26, unlike the system Bach supposedly used, which assigned equal values to I and J, and to U and V.) Since this particular character dabbles in Egyptian antiquities, the numerology is not surprising, but the inclusion of symbolic arithmology in a popular publication implies a general interest in the subject.

As far as the use of three in the Chamber Concerto is concerned, Berg not only called attention to the symbolism, which might otherwise have remained unnoticed, but also ensured that the significance of three would be "generally understood". The Concerto for Piano and Violin with 13 Wind Instruments was dedicated: "Arnold Schönberg zum fünfzigsten Geburtstag", and was preceded by an "Open Letter" to Schoenberg, published in *Pult und Taktstock* in February, 1925. Herein he listed the "trinity of events" (Berg's underlining)[145] that he was commemorating: Schoenberg's fiftieth birthday, his own

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[144]W. J. Wintle, "The Black Cat", in *Chillers for Christmas*, ed. Richard Dalby (London: Michael O'Mara Books Ltd., 1989), 160-161.
[145]*The Berg-Schoenberg Correspondence*, 335.

fortieth birthday (the completion of the work actually post-dated both these occasions) and the twentieth anniversary of the friendship between Berg, Schoenberg and Webern.

Berg writes that the three introductory motives, "which play an important role in the melodic development of the piece, contain the letters of your name as well as Anton Webern's and mine, so far as musical notation permits".[146] He then points out the "trinity of available instrumental genres (keyboard, string, and wind instruments) ... the chamber orchestra of fifteen, a sacred number for this type of scoring ever since your Opus 9",[147] failing to account for the conductor, a position he later includes as one of the soloists.[148] He was admittedly flippant when writing: "I'm sure that—to the extent I make this public knowledge—my reputation as a mathematician will rise in squared proportion to the demise of my reputation as a composer."[149] (He probably was more concerned about Schoenberg's opinion of this trinity-pervaded composition than his public reputation; he may also have noticed that counting three soloists made the number of musicians sixteen.) He continues:

> But seriously: If in this analysis I discussed almost entirely matters relating to the trinity, that is: first, because they are the very events that would be overlooked by everyone (in favour of musical events). Second, because it is much easier for an author to speak of such structural matters than of the inner processes ...[150]

This letter is extremely valuable as a guideline for any numerological analysis of Berg's music, because in it he indicates where his musical decisions were influenced by numbers: the instrumentation; the number of movements, rhythmic forms and harmonic aspects; the nature of themes and how many times they are repeated; the number of bars in sections, movements and in the entire work. Although he mentions the intended duration of movements, he omits any comments on the metronome markings. In the score itself, Berg indicates the entire duration as "ca. 39 Min.", which is the number of soloists multiplied by the number of wind instruments; thirteen is also Schoenberg's fateful number. Moreover, Berg apparently wanted everyone to notice the formal construction, implying that symbolic numbers had an important position in his compositional psyche.

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[146]Ibid., 334.
[147]Ibid., 335.
[148]Ibid., 337.
[149]Ibid.
[150]Ibid.

However, it is the second reason he gives for the numerical bias that has proved most important in subsequent analyses of Berg's music. "Pre-tonal numerology is shown up by recent research to transcend the preoccupation with a surrogate for the tonal cohesive that was still to come ... some as yet insufficiently considered aspect of Berg's make-up needs to be understood in the light of these ancient preoccupations ...".[151] It has been discovered that behind the publicly-explained structures of works such as this, the *Lyric Suite*, the Violin Concerto, and even *Wozzeck* and *Lulu*, Berg concealed secret programmes that have revealed some of the inner processes about which Berg was unable, or unwilling, to speak.

Apart from the structural importance of three, "the figure 5, too, controls some features by way of salute to the dedicatee's 50th birthday",[152] although Berg does not refer to five in the Open Letter, not even to the obvious fact that 3 X 5 = 15, which is the number of instrumentalists and also the duration, in minutes, of the *Adagio* movement. As for the metronome marks, it cannot be coincidental that there are fifty of them, which would be another birthday homage.

> They are all divisible by 3 except for 2 figures; these ... may well be due to the erroneous belief that 3 will go into 112.... Berg's desire to enforce symbolic divisibility is further proved by the occurrence, in the list of the *Chamber Concerto's Rondo Ritmico*, of no fewer than 10 marks of 90, a figure that does not feature on the Maelzel scale.[153]

It is in the palindromic *Adagio* movement that Barbara Dalen discovered the secret programme of the Chamber Concerto. "In fact, the secret programme for the Adagio is inextricably bound up in this palindromic design".[154] Berg sketched a programmatic outline of the Concerto, in which he subtitled the three movements: *Freundschaft*, *Liebe*, and *Welt*. "Under the words 'Liebe' and 'Adagio' ... he has written the letters 'Ma'."[155]

Another sketch, on an envelope, indicates the turning point of the palindrome graphically with the words: "... dazu Math Thema Ahde edhA".[156] Dalen's examination

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[151]Stadlen, 171.
[152]Ibid., 175.
[153]Ibid., 176.
[154]Dalen, 146.
[155]Ibid., 145.
[156]Ibid., 153.

of the earliest draft of the turning point revealed the name "Ma-thil-d-e" under the pitches of the "Math thema".[157] This theme consists of those letters in "Mathilde" for which there are musical equivalents; these four pitches are contained within Schoenberg's musical cipher and are thus disguised in the Concerto.

Dalen offers conclusive proof that Berg was referring to Schoenberg's first wife, who had died on her twenty-second wedding anniversary, in 1923. She traces a partial scenario of Mathildes's struggle against fatal illness in the palindromic structure of this movement.

> The climax ("Höhepunkt") of the Adagio, reached in bar 314, incorporates the penultimate statement of the "Math Thema" within the first half of the movement. ... [This] and its retrograde counterpart (bars 404-7)—the fourth and seventh statements respectively—occur 47 bars on either side of the turning-point. Mathilde ... died shortly after her 46th birthday, or at the beginning of her 47th year.[158]

Another aspect of the *Adagio* is the label "Melisande" which, in the formal sketches, is attached to the second theme; each statement of this theme, throughout the movement, is "coupled with a statement of the 'Math Thema'."[159] Mathilde Schoenberg had left her husband in 1908, having become romantically involved with the artist Richard Gerstl. Schoenberg's friends, particularly Webern, persuaded her to return and Gerstl subsequently committed suicide. Mathilde became a virtual recluse in her own home, refusing to meet people. She "seems to have suffered a complete psychological breakdown from which she never fully recovered."[160]

The similarity with Maeterlinck's character, Mélisande, whose lover was killed by her husband and who was herself fatally wounded, is obvious. Dalen suggests that Berg actually paraphrased two leitmotifs from Schoenberg's own *Pelleas und Melisande*, but disguised them to the extent that they are barely recognisable.

Since Schoenberg had remarried (and was on honeymoon at the time of the publication of the Open Letter), it would hardly have been appropriate for Berg to refer to his deceased first wife in a birthday present. Yet Berg secretly and rather subversively

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[157]Ibid., 158.
[158]Ibid., 162-164.
[159]Ibid., 166.
[160]Ibid.

included a homage to Mathilde in a composition that was overtly a tribute to Arnold Schoenberg—not only to Schoenberg personally, but also the over-powerful personality that was Schoenberg. The dedication is to Berg's and Webern's teacher, and therefore, by implication, to the founder and leader of the Second Viennese School. (The compositional sketches reveal that Eduard Steuermann, Rudolf Kolish, Josef Polnauer and Erwin Stein, "also former pupils and trusted friends of Schoenberg",[161] feature in the first four, Enigma-type variations of the first movement.)

That Berg identifies Mathilde with the tragic heroine Mélisande indicates that he must have sympathised with Mathilde's attempt to leave Schoenberg, but not had the courage to take her side against Schoenberg. His use of the "Math Thema", concealed within Schoenberg's motive, may be seen as a criticism of his second wife, or at least of his marrying so soon after Mathilde's death. Mathilde's temporary escape from Schoenberg's influence was something Berg never managed to do; instead, he defied Schoenberg with a Trojan horse for a birthday present, hiding criticism inside the compliments.

Berg finally completed the full score of the Chamber Concerto on 23 July 1925. Within two months, he had begun working on the *Lyric Suite*.[162] The numerological symbolism in this composition was certainly not intended for publication and, had the annotated score been lost or destroyed, Berg's use of the number 10 would have continued to be misinterpreted as the use of five: "Berg's consistent dependence on the fateful number [23] and its 'alter ego,' 5, throughout the *Lyric Suite* in determining the length of its beats, its phrases, its sections, and its movements, points strongly to a desire on Berg's part to emphasise in a 'secret' way the personal character of the work."[163]

Green discovered the secret text of the sixth movement. His attention was drawn to the number 23 by Berg's uncharacteristic omission of metronome marks at two tempo changes in the *Adagio appasionato*, from which he concluded that if a tempo in this movement could not be expressed by a multiple of 23, no metronomic indications were

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[161]Ibid., 145.
[162]Jarman, *The Music of Alban Berg*, 9.
[163]Green, 18.

given at all. In the *Studienpartitur*, the original opening tempo of the *Largo desolato*, minim = 46, is changed to crotchet = 69, "the next slower speed possible when using units of 23." He also noted that the "last three movements employ no metronomic markings other than multiples of 23."[164] However, being unaware of the importance of 10, he apparently did not notice that "the number of bars in each section of the *Presto delirando* came to be a multiple of 10 (50, 70, 90, 110, 120, 20)."[165]

Before Perle gained access to the annotated score, he had discovered that "every one of the numerous changes of tempo is governed by ... one or the other of two sets of proportional relationships, each metronome mark being a multiple of either 23 or 50."[166] However, he considered the private number symbolism that motivated the composer's selection of these two integers unimportant; it was the interrelating of tempi throughout the composition that was of musical significance. This opinion was changed significantly by the subsequent revelation of the motivation behind Berg's private number symbolism.

Of the ninety pages in Hanna Fuchs's pocket score, "only eight are without handwritten annotations by Berg ... At the head of the title page there is a dedication, 'Für meine Hanna.'" The annotations indicate where Berg used 10 and 23, inserted the initials "H F" and "A B", and included musical references to Hanna's children, "Munzo" and "Dodo". There are also comments on specific programmatic elements in the music.[167]

For example, Berg circled the number, 69, of the last bar of the first movement, and wrote "3 X 23 Takte" above it. Similarly, he identified the 150 bars in the second movement as "15 X 10 Takte," and the 69 bars in the fourth movement as "3 X 23 Takte". In the third movement, the *misterioso* section comprises "3 X 23 Takte"; the *Trio estatico* ends at bar 92 ("4 X 23"); the entire movement consists of 138 bars, "6 X 23 Takte".[168] Each section of the fifth movement "adds another multiple of 10 to the number of bars that have passed. This too is shown in the inserts: 5 X 10, 12 X 10, 21 X 10, 32 X 10, and

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[164]Ibid.
[165]Perle, *Lyric Suite*, 5.
[166]Ibid.
[167]Ibid., 7.
[168]Ibid., 7-9.

finally, 2 X 23 X 10."[169] The finale of 46 bars, "2 X 23 Takte", has 10 overlapping set statements in the last seven bars, again linking Hanna's number with Berg's number.[170]

Annotations concerning the significance of the metronome marks in the *Lyric Suite* are conspicuously absent. It is possible, though improbable, that Berg considered the significance too obvious to mention. Green noticed that all the marks in the second half are divisible by 23, without any knowledge of the annotated score, but it is unlikely that Hanna Fuchs would have analysed her score, looking for multiples of 10 and 23 other than those that Berg had indicated. Perle posed the question: "Did he hope that some day the cryptic clues to the presence of a mystery that he had placed in the public's version of the score would be understood, and did he look upon those that were hidden in the metronomic numbers as something of a special nature, to be shared with his brothers in art rather than with Hanna?"[171]

Stadlen nullifies this assumption of a "special [rather chauvinistic] nature", pointing out that "in the letter to Schoenberg the metronome marks of the Chamber Concerto are not referred to either"[172]—Berg would hardly encode for potential brothers in art that which he had evidently withheld from Schoenberg, his Big Brother in art. Moreover, while Dalen has shown that Berg did indeed hide a eulogy to the late Mathilde Schoenberg behind the public dedication to his teacher, Perle's suggestion that the significant metronome marks in the *Lyric Suite* were cryptic clues for future musicians is problematic, since all but two of the 50 metronome marks are divisible by three, therefore any symbolism would be connected to Arnold Schoenberg, not to Mathilde.

In his study of the final movement of the *Lyric Suite*, Green wrote: "One is reminded of Bach's hidden 'double signature' to his last work, the organ chorale *Vor deinen Tron tret' ich hiermit*, BWV 668, brought about by the number of notes in the chorale melody."[173] Berg's Violin Concerto was dedicated: "Dem Andenken eines Engels"; part of this tribute is the Bach chorale *Es ist genug*, which is quoted in the last movement.

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[169]Ibid., 10.
[170]Ibid., 11.
[171]Ibid.
[172]Stadlen, 176.
[173]Green, 18.

The angel was Manon Gropius, the daughter of Alma Mahler, who died at the age of 18. While most commentators "... have drawn attention to the requiem-like character of the piece ... [and] have repeated the description of the programme of the work given by Willi Reich, a description based on information provided by the composer himself ...",[174] there is also another, secret programme underlying the Violin Concerto. This programme has several symbolic aspects, which are revealed not only by the symbolic numbers, but also, as in the *Lyric Suite*, by a secret text.

Berg's sketches include numerous calculations, in the margins, involving the numbers 10, 23 and 28; the structural importance of 10 is announced in the published score: "Introduction (10 Takte)". The Concerto is in two sections, the second part consisting of 230 (10 X 23) bars; the first metronome mark is a crotchet = 69 (3 X 23), and at bar 23 a *Hauptrhythmus*, or fate-rhythm, enters for the first time. "Beginning at bar 157, the 23rd bar of the chorale, [actually bar 158, bar 157 is the 22d bar of the chorale] the notes B-flat, A, G, E, (the letters of Berg's name that can be represented musically and that form the 'Alban Berg' part of the motto theme of the earlier Chamber Concerto) appear prominently in the horns, with the marking 'misterioso'."[175]

Five inverted statements of what Jarman terms the "amoroso" phrase—the last four notes of the chorale melody, consistently marked *amoroso*—begin at bar 194.[176] Five, like 230, can have a double significance, either as 2 + 3, or as half of 10. "Finally, preceded by a statement of Hanna's initials on the solo violin at bar 222, the 'amoroso' phrase returns in its prime form at [the upbeat to] the tenth bar of the coda."[177]

Jarman includes an analysis of Part II of the Concerto, which is in overlapping sections of 10 (or 20) and 23 bars, with one section of 28 bars. He suggest a division of the work into two parts, rather than into four movements, a female-male division, based on Berg's apparent use of 28 in Part I and 23 in Part II (Fliess's female and male numbers). However, apart from the metronome markings for Part I, crotchet = 56 (2 X 28) and crotchet = 112 (4 X 28), Jarman's analysis includes only three instances involving 28: "the

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[174]Jarman, "Violin Concerto", 185.
[175]Ibid.
[176]Ibid., 190.
[177]Ibid., 192.

bridge passage of the Andante begins at bar 28; the 'tempo primo' which marks the beginning of the codetta starts at bar 84 (3 X 28) and the 'ritmico' figuration of the Allegretto is first introduced at bar 140 (5 X 28)."[178]

An analysis of a movement into sections *x* bars long is quite different to an analysis indicating significant instances which occur at bar *x*, in which case the preceding section would consist of *x* - 1 bars. Using both forms of analysis simultaneously may be interesting, but yields inconclusive proof of the presence of symbolic numbers. An analysis of the first two movements into sections delineated by important tempo changes and, in the *Allegretto*, also by the key change at the quotation of the Carinthian folk tune (see table 2), indicates that 28 may be far less important than either 10, 23 or 18.

The first four sections of the *Andante* give a total of 46 bars, as do the fourth to seventh sections (bars 38-83); the first four sections of the *Allegretto* (including the only 28-bar section) give a total of 69 bars. Although Jarman mentions no calculations in the sketches involving 18, the apparent prevalence of the number has a feasible explanation—Manon Gropius was 18 years old when she died. The metronome mark for the *Adagio*, for which Jarman does not account, is crotchet = 54 (3 X 18).

The "constant use of ten- and 23-bar units throughout the work",[179] and "... the curious, and apparently inappropriate, marking 'amoroso', which appears far more frequently than any other expression mark,"[180] suggest that Berg included references to himself and to Hanna Fuchs. The number 28 could be a reference to Manon Gropius. Another possibility is suggested by the *Ländler* melody, which is initially sounded by the first horn at the upbeat to bar 214, Part I, with a footnote: "Diese hier unmerklich einsetzende kärniner Volksweise allmählich immer mehr hervortreten" ("This imperceptibly inserted Carinthian folk-tune gradually more and more prominent"). It reappears in Part II, unfolding from the chorale in the cello part, by bar 202: "übergehen in die Ländlermelodie (wie aus der Ferne)".

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[178]Ibid., 186.
[179]Ibid.
[180]Ibid., 190.

Table 2.—Analysis of the *Andante* and *Allegretto* movements of Berg's Violin Concerto

Bar numbers	Tempo indications	No. of bars
	ANDANTE	
1-10	*Introduction*	10
11-20	*a tempo ... rall. _ _ _ ,*	10
21-37	*a tempo ... rall. _ _,*	17
38-46	*a tempo, un poco grazioso*	9
47-53	*un poco più animato ... poco allarg. _,*	7
54-76	*a tempo (grazioso) ... calmando e rit. _ _ _*	23
77-83	*molto più tranquillo ... calando _ _ _(molto)_ _ _*	7
84-103	*Tempo I*	20
	ALLEGRETTO	
104-131	*(scherzando) ... Rubato*	28
132-136	*Tempo I ... poco a poco accel. _ _ _*	5
137-154	*Subito un poco energico ... poco a poco calmando*	18
155-172	*Meno mosso ... poco a poco calmando*	18
173-195	*Quasi Tempo I ...'* (solo violin ceasura)	23
196-213		18
214-239	(Carinthian folk tune) ... *poco a poco animando*	26
240-257	*a tempo, ma quasi Stretta*	18

Apparently unaware of the footnote, Jarman emphasised that this "is not simply a folk-like melody composed by Berg himself but the tune of a real Carinthian folk song, the text of which, in the translation of Mosco Carner, runs: '... I would have overslept in Mizzi's bed ... If everyone wants a rich and handsome girl ... Where ought the devil take the ugly one? ...'."[181] Berg included the text of the Bach chorale in the score, but not that of the Carinthian folk tune, obviously because the song had nothing to do with to Manon Gropius. It is unlikely that it was a reference to Hanna Fuchs either. "'Mizzi' is the common Austrian nickname for 'Marie'", and a woman named Marie Scheuchl "worked at the Berg family's summer home in Carinthia",[182] with whom Berg had a daughter, Albine, in 1902.

It is almost certain that Berg was referring to Marie Scheuchl when quoting the folk tune, and probably also when using 28 as a significant structural number, since she was the mother of Berg's only child and would have remained an important feminine image in Berg's mind. He may also have been prompted to include these allusions to the mother of his own daughter because he was writing about the death of his friend's daughter.

[181]Ibid., 188.
[182]Ibid., 189.

Berg was seventeen when Albine was born (practically the same age as Manon was when she died), which might be the reason for the 17-bar section in the *Adagio.* (He later chose seventeen as the number associated with the title character in *Lulu.*[183]) Alternatively, it may have been intended as a section of 18 bars; Berg's calculations in the sketches for the Violin Concerto include at least one addition error: "16 + 13 = 28".[184]

In the initial work on number symbolism in Berg's music, Perle wrote: "Only in the *Lyric Suite* does Berg's supposedly fateful number play a consistent role in the work itself."[185] Subsequent analyses of Berg's music have shown that 23 plays a significant role in both the concertos as well. The principal difference is that Berg supplied the concertos with public programmes, which effectively kept the secret programmes hidden, at least until after Helene Berg's death in 1976.

With reference to the Violin Concerto, Perle wrote to Jarman that the public and private programmes are like "'a jigsaw puzzle whose different pieces can be put together in different ways to make two completely different pictures'."[186] In fact, there seem to be three programmes in the Violin Concerto: the requiem for Manon Gropius; the numbers that refer to Berg's relationship with Hanna Fuchs; the Carinthian folk tune and the number 28, which refer to his relationship with Marie Scheuchl.

> The relation between the two programmes suggest the relation between the surface and the hidden metaphors in *Wozzeck* and *Lulu*, but there is still a difference because the keys to the hidden metaphors in the operas are intrinsic to the music even if they have no direct meaning in terms of auditory perception.[187]

Berg saw the Viennese première of Georg Büchner's *Wozzeck* in 1914 and started working on his opera soon afterwards. Although his work was severely interrupted by compulsory military service, his experience of the war constructively influenced his perception of Wozzeck. He wrote to his wife on 7 August 1918: "There is a bit of me in his character. I have been spending these war years just as dependent on people I hate, have

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[183]Jürg Stenzl, "Lulus 'Welt'", in *Alban Berg Symposion, Vienna 1980,* Alban Berg Studien II, 33.
[184]Ibid., 186.
[185]Perle, *Lyric Suite,* 5.
[186]George Perle, quoted in Jarman, "Violin Concerto", 191.
[187]Ibid.

been in chains, sick, captive, resigned, in fact humiliated."[188] As is clear from his letter to Schoenberg in June, 1914, he had already begun to identify himself with the number 23; however, 23 does not appear to be a significant number in *Wozzeck*, despite Berg's overt and subtle ways of identifying with his character, Wozzeck.

Büchner's play was based on a factual occurrence; a young barber named Woycek murdered his lover, on 21 June, 1821. Berg's opera was therefore completed a hundred years after this event (the generally accepted date is April 1921). Furthermore, Pernye has counted 1921 "sounding bars" in *Wozzeck*; out of a total of 1927, he excludes the 4 silent bars at the end of Act II and the 2 at the beginning of Act III.[189] (There are actually 4 other bars in *Wozzeck* that are General Pauses, and therefore silent, but Pernye differentiates, not entirely convincingly, between these bars and the 6 that connect Act II to Act III, on the grounds that the General Pause bars can be described as articulated time, while those at the end of Act II cannot, since no music follows, and *vice versa* for the bars at the beginning of Act III.)

Between Berg's attendance at Büchner's play and his completion of the opera, 7 years elapsed. Pernye isolates the numbers 21, which 1821 and 1921 have in common, and 7, which is a third of 21, as the numbers which play an important role and function in the structure of *Wozzeck.*[190]

Other than arranging his libretto into 15 scenes, omitting a few scenes and minor characters, Berg made few substantive changes to Büchner's text. "The only material revision of the wording itself occurs in Act I, Scene 4, where the Doctor's anger with Wozzeck is attributed to the latter's inability to control the functions of his diaphragm rather than of his bladder."[191] It is also in this scene that, "in substituting "beans" for "peas", and in replacing Büchner's word for mutton, "Hammelfleisch," by the more familiar Austrian term "Schöpsenfleisch," Berg causes the text to refer to staples of his own diet as a soldier

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[188] *The Berg-Schoenberg Correspondence*, 129.
[189] A. Pernye, "Alban Berg und die Zahlen", *Studia musicologica Academiae Scientiorium Hungaricae* 9 (1967): 142-143.
[190] Ibid., 144.
[191] George Perle, *The Operas of Alban Berg: Volume One / "Wozzeck"* (Berkeley and Los Angeles: University of California Press, 1980), 38.

in the Austrian Army."[192] Significantly, this scene in the Doctor's study is the one in which Wozzeck most resembles Berg himself. It is also the scene on which Pernye focuses for its numerological structure.

The 12-tone passacaglia theme which opens the scene is 7 bars long, and is followed by 21 (7 X 3) variations. Fourteen (7 X 2) of these variations are each 7 bars long; the eighteenth consists of 14 (7 X 2) bars; the seventh, tenth and twelfth are each a single, $^{7}/_{4}$ bar. (The last 3 variations are 9, 18 and 18 bars long, respectively.) *Wozzeck* was Berg's Opus 7, the last of his works to be given an opus number. Schoenberg's Opus 21 was designated on the title page: "*Dreimal sieben Gedichte aus Albert Girauds Pierrot lunaire* ... Op. 21."[193] It is possible that Berg was referring to *Pierrot lunaire* in these 21 variations, as he referred to Schoenberg's Chamber Symphony in his orchestration of II/iii.

The first three notes of the passacaglia theme, E-flat, B and G, form an augmented triad, and correspond to the letters "S", "H" and "G" in "Schoenberg". The musical equivalents for the letters in "Berg", when rearranged, form a diminished triad: E, G, and B-flat; this corresponds to the diminished chord formed by the last three notes of the theme: F, A-flat, D. The Doctor, who craves immortality and uses Wozzeck for his experiments, is associated with the augmented triad; Wozzeck, who is psychologically and intellectually belittled by the Doctor, is represented by the diminished triad. "So much of the music of this scene is determined by the augmented and diminished triads of its theme ... it is unlikely that he [Berg] would not have associated this particular transposition of the augmented triad with Schoenberg ... he saw the Doctor as Schoenberg"[194] and himself in the position of Wozzeck.

When the Doctor manages to restrain his anger at Wozzeck, and checks that his pulse is beating its usual 60, the Celesta plays repeated B-flats, crotchet and quaver in triplet rhythm, imitating a pulse rate. The metronome mark, naturally, is crotchet = 60. "The sustained chord ... is identical with the basic chord of the third movement of

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[192]Ibid., 56.
[193]Ibid., 128.
[194]James May, "Schoenberg and Berg: Wozzeck, Act 1, Scene 4" (Paper delivered at the 21st Annual Conference of the Musicological Society of Southern Africa, Cape Town, 19 August 1994).

Schoenberg's Five Pieces for Orchestra".[195] Once again Berg seems to have taken a complimentary allusion to Schoenberg and his music, and used it as an accusation against Schoenberg's character.

Perle has suggested that the importance of the number 7 in *Wozzeck* III/i is an allusion to the "Three times Seven Poems" of *Pierrot Lunaire*.[196] The theme of III/i is 7 bars long and, of the 7 variations, 5 are 7 bars long. Every one of the metronome marks—56, 168, 112, 49 and 42—is a multiple of 7, and the fugue, during which the curtain rises and falls for the scene change, lasts 21 bars. It is more likely that 7 is used here because of its religious connotations; it is in this scene that Marie reads to her son of the mercy given to Mary Magdalene and prays for mercy herself. Berg referred to this numerical structure in his lecture on *Wozzeck*:

> The strictness of architecture (I use this term deliberately) is responsible for the fact that this dual theme, with its antecedent and consequent, consists of seven bars, that it returns in sevenfold variation, and that the double fugue, consisting of two subjects in accordance with the dualism inherent in the original theme, is based on a theme consisting of seven notes. The mathematical character of this form might easily be scoffed at. That is what actually happened at the occasion of the first concert performance of this piece. It occurred in a review of a performance of this so called Bible-scene which never took place. Although not a single note of the music of that particular scene had actually been performed, the hyper-sensitive music critic was able to notice and duly to report to his readers the utter inefficiency of such an absurdly mathematical structure ...[197]

Criticism about music critics aside, it is unfortunate that Berg did not explain why he had used 7 in this scene, and puzzling that even here he says nothing about the metronome marks. The mathematical structure is neither absurd nor inefficient. *Wozzeck* has become a landmark in the history of operatic composition precisely because of its remarkable structure. Berg had "discovered the essential role that traditional forms and traditional stylistic details could play in restoring the possibility of coherent large-scale structure which the dissolution of the classical tonal system had destroyed."[198]

Berg certainly considered the formal aspects of *Wozzeck* extremely important. He wrote to his wife (on 11 April 1923) about Viebig's "fabulous" article in *Die Musik*:

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[195]Perle, *Wozzeck*, 123.
[196]Stadlen, 176.
[197]Alban Berg, quoted in Redlich, 208.
[198]Perle, *Wozzeck*, 17.

> [He] speaks continuously of the *novelty* in everything that belongs to this style, and ... discloses all its *formal secrets* (the Suite, etc.)! ... what is purely human (the common folk) is stressed, rather than the fate of the individual. He especially praises my stage adaptation into three acts (15 scenes out of Büchner's 25 scenes) ... I hadn't thought it possible that anyone could come upon it by *himself, everything* that I had intended in *Wozzeck*: morally, theatrically, musically, etc., etc.[199]

Act I consists of 5 character pieces, Act II of 5 symphonic movements, Act III of 5 variations (with a sixth forming the interlude between scenes 4 and 5). Many of these musical forms, such as the Military March and Lullaby (I/iii), the Ländler and Waltzer for the tavern garden scene (II/iv), have an obvious dramatic purpose. Others, for example the passacaglia with variations (I/iv), have an implicit association with the drama; a passacaglia is an intellectual compositional device, the Doctor fancies himself as an intellectual. Those forms that appear to have no relationship to the stage, do have a subtle dramatic function. It is partly the imposed system of rules and order, which completely disregards "the fate of the individual", and which Wozzeck does not understand, that pushes his already deranged psyche over into murder and suicide.

> As in Mozart, the sound and the sense of the text are projected through a non-verbal material that imposes its own logic and its own proportions. In Berg as in Mozart, a constant and inevitable order subsumes the dramatic details, but Berg's order, unlike Mozart's is irrational, meaningless, non-human, indifferent, for it embraces the casual and the essential, the momentous and the trivial, with equal impartiality.[200]

The indifference of society to the deaths of Marie and Wozzeck is shown in the last scene of the play, where even their own child does not react to the news that his mother is dead. In *Wozzeck* as in Mozart's *Die Zauberflöte*, there is evidence of numbers playing a part in the structural design. Stadlen found that the metronome mark of 49 in III/i is not a Maelzel figure, nor is 70, "found three times in the 2nd and 3rd scene—which finally proves that the divisibility by 10 of all the 31 figures occurring in scenes 2, 3 and 4 is no coincidence but must be intentional."[201] Unlike the obvious Masonic symbolism in Mozart's opera, Berg's numerological intentions in *Wozzeck* remain mostly elusive.

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[199]*Briefe an seine Frau* (Munich: Langen-Müller Verlag, 1965); quoted in Perle, *Wozzeck*, 194.
[200]Perle, *Wozzeck*, 36.
[201]Stadlen, 176.

Considering Berg's sometimes unreliable arithmetic, it is surprising that he used a device in *Wozzeck* which has since become known as metric modulation. The structure is so detailed that even the raising and lowering of the curtains is specified as to timing and placing in the score. In Act II, "the duration of the curtain that falls upon Scene I is seven quarters at [quarter] = 49 (= 7 X 7); the duration of the curtain that rises upon Scene 2 is six quarters at [quarter] = 42 (= 6 X 7)."[202] Although the tempi of the music for the falling and rising curtain are different, the duration of the curtain movement is the same in both instances, exactly one-seventh of a minute.

Similarly, with regard to the two falling curtains which frame the third movements of Act II: "In the first instance there are nineteen eighth-notes at [quaver] = 132-144, in the second eighteen quarter-notes at [crotchet] = 132-144, the slight discrepancy being made up by the *ritardando* of the last two bars".[203] Furthermore, "the second interlude, marking the fall of the curtain, is a retrograde version of the first, which marked the fall of the curtain upon the preceding scene."[204]

The arch structure of the entire opera has its midpoint in this movement. In commenting on its "sectional and independent structure", Berg mentions its "one other peculiar feature: it is scored for a 'chamber orchestra' which is modelled on the Chamber Symphony No. 1 of Arnold Schoenberg. Incidentally, I intended thereby to pay homage to my teacher and master at this pivotal point of the opera."[205]

In January 1923, Berg printed cards announcing the publication of the vocal score of *Wozzeck*: "... Der Auszug hat 230 Grossquartseiten, kostet 150.000 österr. Kronen und ist direkt von mir zu geziehen ...".[206] That the price of each copy is a multiple of the number of scenes in the opera, and the number of pages is a multiple of 23, is probably coincidental. Another coincidence is that Georg Büchner died of typhus at the age of 23.

Berg's final and unfinished work was *Lulu*, based on the plays *Erdgeist* (*Earth Spirit*) and *Der Büchse der Pandora* (*Pandora's Box*) by Frank Wedekind. In Wedekind's

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[202]Perle, *Wozzeck*, 90.
[203]Ibid.
[204]Ibid., 59.
[205]Alban Berg, quoted in Redlich, 276.
[206]Perle, *Wozzeck*, Illustration 13.

plays, the character Alwa is a writer, "the author, it is revealed in *Pandora's Box*, of *Earth Spirit* itself."[207] Berg adapts this self-referential conceit by turning Alwa into a composer, and making jokes about his own libretto. In I/iii, Alwa sings about Lulu, "One could certainly write an interesting opera about her. First Scene: The Professor of Medicine ... Already rotten! [Schon faul!] ... Second Scene: The Painter ... Still more impossible! – Third Scene: Will it really continue like this?"

Lulu begins with an 85-bar prologue, in which an Animal Tamer introduces all the wild animals in his menagerie, each of them identified as one of the principal characters in the opera. Only Alwa is excluded from the menagerie; in fact, "the Animal Trainer [who controls the menagerie of characters] is identified musically as Alwa".[208] Lulu is described as a snake, and appears in bar 46, twice Berg's fateful number.

Constantin Floros has referred to the "Fate-number" five of the *Hauptrhythmus*;[209] perhaps this is an example of five being the "alter-ego" of 23, as Green supposed when analysing the *Lyric Suite*. However, the *Hauptrhythmus*, to which Stenzl refers as the "fate- or principal-rhythm", is more accurately related to the number 10; the 10 quavers are not divided as 2 X 5, but as 3 + 3 + 1 + 3. "The blaring opening fanfare at the beginning of the Prologue also lasts for ten quavers."[210] Since there is no character in *Lulu* that Berg would want to associate with Hanna Fuchs, he may have included her number in the *Hauptrhythmus* instead.

Stenzl deduces a social hierarchy ("Gesellschaftshierarchie") from the numbers attached to five of the characters. Dr Schön, with the highest number of 27, stands at the apex of the hierarchy, which descends through his son and Lulu down to Schigolch. At the lower extreme is the Countess Geschwitz with five, the number of mortal beings. In this way the Countess becomes detached from the patriarchal society's hierarchy. "It is no surprise that Berg's own fateful number 23 becomes Alwa's symbolic number ...".[211]

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[207]Douglas Jarman, *Alban Berg: "Lulu"*, (Cambridge: Cambridge University Press, 1991), 22.
[208]Ibid.
[209]Stenzl, 33.
[210]Ibid.
[211]Ibid., 34. Stenzl refers to five as "der Erdgeistzahl", which may be a reference to Wedekind's play.

CHAPTER 5

GEORGE CRUMB AND THE QUADRIVIUM

Yes, there is something quasi-Medieval in my music.
George Crumb

The medieval quadrivium—arithmetic, geometry, astronomy and music—is a useful starting point for an analysis of George Crumb's music. Although his references to the cosmos are properly astrological rather than astronomical, the distinction between the two terms was not yet established in medieval perceptions of the universe. Copernicus was criticised as an "upstart astrologer" by Martin Luther, for his proposal that the earth revolved around a stationary sun, rather than *vice versa*.[212] Furthermore, Kepler's response to the newly-invented telescope indicates that the science of astronomy still had poetic aspects in the seventeenth century:

> "Shall we make a Mercury's magic wand to cross the liquid aether with, and like Lucian, lead a colony to the uninhabited evening star, allured by the sweetness of the place? Or shall we make it Cupid's arrow, which, entering by our eyes, has pierced our inmost mind and fired us with a love of Venus?"[213]

The geometrical branch of learning corresponds to the structure and form of Crumb's music. In general, the music consists of motivic elements, combined to form a "mosaic" (Crumb's own term). Entire compositions are usually in some version of arch-form, which is an architectural concept. In a sense, all music is constructed from points (theoretically having no dimensions) called notes, placed on staves (which are lines, and therefore one-dimensional). Crumb's mosaic implies a (two-dimensional) floor-plan; the arch-form creates the third dimension. The fourth, non-spatial dimension is time, through which all music moves. Thus, geometry becomes the analogy for musical structure.

As with the study of the stars, Medieval mathematics included not only the physical properties of numbers, but also their mystical, or theological, connotations. Galileo was

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[212]Bryan Appleyard, *Understanding the Present: Science and the Soul of Modern Man* (London: Pan Books Ltd., 1992), 34.
[213]Ibid., 35.

condemned by the Inquisition (in 1616 and again in 1633) for his heretical discoveries, including the existence of moons orbiting Jupiter, which challenged the sacredness of the number seven.[214] The Sabbath was the seventh day, there were seven churches of Asia, seven-branched candlesticks, and there should have been seven heavenly bodies: the sun, moon and five planets. "But if we have to add Jupiter's four moons, that makes eleven–a number which has no mystic properties. On this ground the traditionalists denounced the telescope ...".[215]

The traditionalists were those philosophers still bound by Medieval assumptions that important things in heaven and earth should be important in number as well. The answers to their arithmetical calculations were not merely numbers, but also the significance behind those numbers.

Crumb's use of number symbolism is exemplified in his 1970 composition for Electric String Quartet, *Black Angels (Thirteen Images from the Dark Land) (Images I).* The number symbolism is an integral part of "the numerous quasi-programmatic allusions in the work", which include acknowledged quotations of Schubert's "Death and the Maiden" quartet, Tartini's "Devil's Trill" sonata, and the *Dies Irae.*[216]

During an interview in 1992, Crumb said, "Numerology occurred to me when writing *Black Angels*, so I structured in a symbolic use of the magic numbers 7 and 13."[217] This implies that none of the compositions which predate *Black Angels* was structured around symbolic numbers. There is evidence of symbolic numbers in several of Crumb's works, written before and after *Black Angels*; however, he identified and explained the significance of the numbers only in the string quartet.

Sometimes the symbolism is quite obvious, and could be described more correctly as word-painting, although it does involve numbers. In the *Apocalyptica* section of *Star-*

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[214]Galileo found only four satellites; there are at least fourteen, a number which might have been accepted by the religious authorities.
[215]Bertrand Russell, *History of Western Philosophy: and its Connection with Political and Social Circumstances from the Earliest Times to the Present Day* (n.p., George Allen & Unwin Ltd., 1961; reprint, London: Routledge, 1991), 520.
[216]George Crumb, quoted in Don Gillespie, ed., *George Crumb: Profile of a Composer* (New York: C. F. Peters Corporation, 1986), 107.
[217]Crumb, "A Conversation with George Crumb", interview by Thomas Riis (Boulder, 10 October 1992), *American Music Research Centre Journal* 3 (1993): 49.

Child (1977), the 7 trumpets in the text (which is adapted from the *Dies Irae*) are represented literally, climaxing with "a heroic high F on the fateful seventh trumpet".[218] The 4 horsemen of the apocalypse are portrayed, more figuratively, by 4 drummers, each playing 4 tom-toms. An analogous instance can be found in the opening bars of *The Sleeper* (1984), where bell-like harmonics ring in the midnight hour.[219]

Other occurrences of number symbolism are far more subtle. *Gnomic Variations* (1981) is in 3 sections; Variation 7 is the first in the second section; the third opens with Variation 13, which is described as "ominously mysterious" by the pianist Jeffrey Jacob, who commissioned the work.[220] *Lux Aeterna*, scored for soprano, bass flute, sitar and percussion (two players), is in one movement, but an instrumental Refrain interrupts the vocal sections on 4 occasions. The music of the Refrains is recognisably different; the sitar plays throughout all of them and is not used in the vocal sections. However, the numerical structure of the Refrains is probably as imperceptible to an uninformed listener as the symbolism in *Gnomic Variations*. The number of beats in each Refrain is, successively, 77, 55, 33 and 11.[221]

The significance of these numbers, if they have any significance for Crumb, is hidden. He entitled the Refrains "Masked Dance: Elegy for a Dead Prince",[222] which immediately suggests Ravel's *Pavane pour une infante défunte*. Crumb's unusual instrumentation is similar to that of another work by Ravel, *Chansons madécasses*. It is possible that Crumb derived his scoring from Ravel, substituting percussion and sitar for piano and cello.

Considering Crumb's writing for the piano and cello in *Vox Balaenae*, in particular the sitar effects in the cello part, makes this possibility more plausible. Much of the piano part in *Vox Balaenae* is extremely percussive; the section using glass rods on the strings imitates the sound of a dulcimer, and other specifications, such as muting the low strings

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[218]George Crumb, quoted in Gillespie, 111.
[219]George Crumb, quoted in Gillespie, 113.
[220]Jeffrey Jacob, quoted in Gillespie, 112.
[221]David Burge, quoted in Gillespie, 108.
[222]Ibid.

while playing *fortissimo* on the keys, transform the sound of the piano into that of a variety of percussion instruments.

This apparent double allusion to works by Ravel imply that any symbolism in *Lux Aeterna* that is not connected with the text could be a reference to Ravel himself. *Vox Balaenae* and *Lux Aeterna* were both completed in 1971. During the summer of the previous year, Crumb wrote *Ancient Voices of Children*, which has an *ostinato* bolero rhythm in the third movement. This may be insignificant, since the text is Spanish, but it is practically impossible to hear a bolero rhythm without thinking of Ravel's composition.

From 1962 to 1970, Crumb focused his creative activity on an extended cycle of vocal works based on the poetry of Federico García Lorca, which culminated in *Ancient Voices of Children.* Although he does not speak or write about Ravel as an important influence on his work, it is likely that Crumb would have studied the music of another non-Spaniard who had written in a Spanish idiom. If the numbers in *Lux Aeterna* are symbolic, they may be a personal homage to Ravel.

The four books of *Madrigals*, settings of fragments from Lorca,[223] were composed in pairs, in 1965 and 1969. Each is a collection of 3 madrigals, and this number is reflected by the number of musicians required for the cycle. All four books are scored for soprano and percussion, with the addition of double bass in *Book I*, flute in *Book II* and harp in *Book III* (i.e., there are 3 performers for each of these). The 3 alternative instruments are combined, with the soprano and percussion, in *Book IV.*[224]

According to Donald Chittum, there are no "esoteric constructive devices" in the *Madrigals*, with two notable exceptions: "In both cases, however, the use of these devices is not arbitrary, but rather suggested by the text itself."[225] It would be difficult to prove that any of Crumb's "devices" was arbitrarily chosen; those instances of symbolism which are not immediately explicable may, nevertheless, have some significance for Crumb himself.

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[223]Although the name is technically "García Lorca", "Lorca" has become conventional in English texts.
[224]William A. Baker, "Madrigals, George Crumb: 'Mysteriously With a Sense of Wonder'" (unpublished essay for the Peabody Conservatory of Music, Johns Hopkins University, 1981), 4.
[225]Donald Chittum, quoted in Gillespie, 105.

The first madrigal in *Book IV* contains retrograded passages, which echo the text: "¿Por qué nací entre espejos?" ("Why was I born surrounded by mirrors?"). *Book III* opens with a setting of "La noche canta desnuda sobre los puentes de marzo" ("Night sings naked above the bridges of March").[226] The soprano sings over a bridge created by the isorhythmic harp and percussion; the vocal line, written above the instrumental parts, is naked in that it is not isorhythmic. Although Crumb marks the instrumental parts as isorhythmic, there is no juxtaposition of melodic and rhythmic units of different lengths; they are not isorhythmic in the fourteenth-century sense of the term.

Other, more esoteric, numerical devices are used in this madrigal. The percussion, which begins a bar before the harp, has a 7-bar isorhythm, repeated 7 times during the madrigal; the harp isorhythm is 10 bars long, and is repeated 5 times. This gives a total of 51 bars, which can be split symmetrically into 25 + 1 + 25. The second vocal entry occurs precisely in the middle bar of the piece; the first and third entries are, respectively, 14 bars before, and 14 bars after, bar 26.[227]

The relevant numbers are clearly 5 and 7, sometimes used in the guise of 10 and 14. Both the phrases whispered by the instrumentalists—"la noche canta" and "canta desnuda"—are 5 syllables long. There are 5 semiquaver beats in every bar, and 5 percussion instruments (2 bongo drums and 3 timbales), sounding 5 distinct pitches, although the instruments are, technically, unpitched.[228] The design of the harp makes only 7 different pitches possible at any given time. The metronome mark is "ca. 176", which can be converted into 1 + 7 + 6 = 14 = 7 X 2. Since Crumb had completed the first two books of madrigals, this is the seventh.

Crumb used isorhythmic techniques again in *Music for a Summer Evening (Makrokosmos III)* (1974). The fourth movement, "Myth", consists of simultaneously performed taleas of 13, 7 and 11 bars.[229] In *Star-Child* the sense of synchronisation and vertical alignment is erased. Four conductors are required, not so much because of the number of musicians—"Soprano, Antiphonal Children's Voices, Male Speaking Choir and

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[226]Ibid., 106.
[227]Baker, 7.
[228]Ibid., 8.
[229]George Crumb, quoted in Gillespie, 110.

Bell Ringers, and Large Orchestra"—but because of the nature of the music. Crumb frequently juxtaposes different tempi and metrical beats, most of them odd-numbered; "the opening string music is in 11/4 time, the entire *Apocalyptica* in 5/16, and there are other sections based on sevens and threes ...".[230]

The structural importance of numbers in these works is clear, but the significance of the numbers is not, nor is it established that they have any symbolic significance at all. In conversation with the author, Crumb said that his only deliberate use of numbers was in *Black Angels*, which he still considers to be unlike any of his other works, and that his use of rhythms based on 5 and 7 was derived from Bartók's music.[231] However, David Burge, Crumb's friend from the University of Colorado at Boulder, and the dedicatee of *Five Pieces for Piano* and *Makrokosmos, Volume I*, wrote that "numerology is one of Crumb's pet fascinations."[232]

Léon Leclère, known as Tristan Klingsor, described his friend Maurice Ravel in terms which are eerily appropriate to George Crumb: "He was comparing, inwardly analysing and, while appearing to be idle, working and immersing himself ever more deeply in the magical, mathematical world of music. He used to keep his thoughts to himself."[233]

Crumb's reticence in speaking about number symbolism may be because he, like Ravel, prefers to keep his thoughts to himself. It is also possible that he was annoyed or alarmed by the great interest shown in the numerical aspects of *Black Angels*, rather than in the musical substance. It is unfortunate that the symbolism behind the numbers and the quotations, surely intended to add a deeper level of significance to the anti-war character of the work, has tended to overshadow the extremely powerful effect of the music itself.

Black Angels is probably the only string quartet to be inspired by the Vietnam War, and is also Crumb's only composition with an acknowledged structure of symbolic numbers. The score is inscribed: "in tempore belli ... Finished on Friday the Thirteenth,

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[230]Ibid., 111.
[231]George Crumb, conversation with author, 23 May 1997, Cape Town.
[232]David Burge, quoted in Gillespie, 108.
[233]Tristan Klingsor, *Maurice Ravel par quelques-uns de ses familiers* (Paris, 1939); trans. and quoted in Roger Nichols, ed., *Ravel Remembered* (n.p., 1987; reprint, New York: W. W. Norton & Company, Inc., 1988), 14.

March, 1970 ...". The structure of each of the 13 images is based on 7 and/or 13. These two numbers determine phrase-length, groupings of single tones, durations, patterns of repetition, and even pitch. An important melodic cell—descending E, A, D-sharp—symbolises 7 and 13 by the number of semitones from E to A, and E to D-sharp, respectively. This cell has a double significance, the interval from A to D-sharp being a tritone: *diabolus in musica.*

The image of a "black angel" was a conventional device among early painters to symbolise the fallen angel;[234] it combines two different personas attributed to the devil: Belial, the angel of darkness and spirit of wickedness, and Lucifer, the fallen angel of light, who was cast out of heaven because of his pride.[235] This fall from grace and spiritual annihilation are represented by the first two sections of *Black Angels*, "Departure" and "Absence". The third stage of the voyage of the soul is "Return"—redemption.[236] The titles of the sections are almost exact translations of "Das Lebewohl", "Die Abwesenheit" and "Das Wiedersehen" from Beethoven's opus 81a, which was also written in a time of war.

Black Angels begins and ends with a "Threnody: Night of the Electric Insects", and the palindromic arch structure, graphically explained in the score, involves analogies of scoring, thematic material and symbolism. The central, seventh image, "Threnody II: Black Angels!" is marked "7 times 7 and 13 times 13". The word "thirteen" is shouted by the violinists and violist in Japanese, Russian and Swahili, and by all four players in German, which makes a total of 13. The final "dreizehn!" is preceded by counting from "eins" to (a whispered) "sieben".

When asked recently about the number symbolism in *Black Angels*, Crumb answered, "Well I think a lot of my imagery comes maybe from Lorca, a poet that I've set in so many works. Somehow the influence of his poetry has spilled over into also instrumental works and the word, the title *Black Angels* would have been an image from a Lorca poem, also applied to this instrumental piece."[237]

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[234]George Crumb, quoted in Gillespie, 107.
[235]*Encyclopaedia Britannica*, 15th ed., s.v. "Christianity".
[236]George Crumb, quoted in Gillespie, 107.
[237]George Crumb, interview by Bongani Ndodana, 23 May 1997, Cape Town, for the South African Broadcasting Corporation.

This is not merely an evasion of the subject of number symbolism. All but four of Crumb's vocal works are settings of Lorca and, naturally, these works derive much of their structure from the text itself. However, Crumb's identification with Lorca's ideas and imagery is such that at least two of his instrumental compositions are structurally related to a phrase from Lorca: "... y los arcos rotos donde sufre el tiempo", translated as "... and the broken arches where time suffers".

The arch-form is the most important structural device in Crumb's music; it is the basis of *Black Angels*, and also of his first published work, the *Sonata for Solo Violoncello* (1955). The first and third movements, a Fantasia and a Toccata, are based on rising and falling thirds, and are tonally ambiguous in comparison to the second movement. Another contrast is created by the improvisatory character of the outer movements, and the stricter formal design of the central movement, which is entitled "Tema pastorale con variazione". The entire work is in arch form, and the middle movement is itself almost symmetrical: there are three variations, and a modified, shortened version of the theme forms a coda.

In *Eleven Echoes of Autumn, 1965 (Echoes I)* and *Echoes of Time and the River (Four Processionals for Orchestra) (Echoes II)*, a completely abstract structural device acquires symbolic meaning. *Eleven Echoes of Autumn* is in arch-form and the central three *echi* have cadenzas for the alto flute, violin and clarinet. The Lorca phrase, "... y los arcos rotos donde sufre el tiempo", is whispered before or during the cadenzas, and the music accompanying each cadenza is written in two semi-circles, or broken arches. Crumb achieves an extraordinary synthesis of poetic and visual imagery, and creates a structure that has both architectural and psychological aspects.

In *Echoes of Time and the River*, "... y los arcos rotos donde sufre el tiempo" is heard after the quiet opening of the second movement, *Remembrance of Time*, which ends with the hymn tune, "Were You There When They Crucified the Lord?"[238] Here Crumb juxtaposes the suffering of time with the suffering of Christ. There is a subtler connection between the broken arches and the body of Christ, broken symbolically as the bread at his last supper.[239]

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[238]Gillespie, 106.
[239]Luke 22:19.

Crumb also uses circular or semi-circular notation to represent the sun, the moon or the stars. In *Casida de las Palomas Oscuras* ("Casida of the Dark Doves"), Lorca likens two doves to the sun and the moon; Crumb's setting of the poem in *Songs, Drones and Refrains of Death* (1968) contains two pairs of circles, marked "El Sol" and "La Luna". Similarly, in "Notturno III", the first vocal movement of *Night Music I* (1963, revised 1976), Crumb's circular notation of the instrumental parts is a visual adaptation of Lorca's descriptions. The rising of a full moon is followed by images of oranges and of silver coins, and the "lunar shape of the notation for the piano/celesta circle is likewise reflected by the percussion circle."[240]

Perhaps the strongest criticism of symbolism in music, especially visual symbolism, is that it is invisible (or inaudible) and therefore irrelevant to the audience. While Bruns acknowledges that the number of circular percussion instruments used in *Night Music I* may be fortuitous, he mentions two important percussive effects that should have symbolic associations for anyone who understands the text. The soprano holds two finger cymbals, which she strikes together at the end of each stanza, and which can be seen as Lorca's silver coins. The song ends with a "water-gong", a tam-tam rising out of a tub of water while the percussionist executes a roll, producing a descending glissando, and recalling an earlier line from the poem: "Cuando sale la luna, el mar cubre la tierra" ("When the moon rises, the sea covers the land").[241]

Night of the Four Moons was written in 1969 during the Apollo 11 flight, and expresses Crumb's ambivalent feelings towards the lunar landing. Although it contains no calligraphic symbolism, there are references in the score to the concepts of celestial and human music. During the final poem, the singer, flautist, banjoist and percussionist leave the stage; the cellist then plays "Musica Mundana", with "Musica Humana", performed by the offstage musicians, emerging and fading "like a distant radio signal."[242] Crumb simultaneously pays homage to Haydn and Mahler: the "Musica Humana" is inscribed, "Epilogue: Farewell-music as Berceuse (in stilo Mahleriano)"; the F-sharp major tonality

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[240]Steven M. Bruns, "'In stilo Mahleriano' Quotation and Allusion in the Music of George Crumb", *American Music Research Centre Journal* 3 (1993): 12.
[241]Ibid., 11-12.
[242]George Crumb, quoted in Gillespie, 107.

and the theatrical gesture of the preceding processionals recall the concluding pages of Haydn's "Farewell" Symphony.

Sometimes the circles depicting objects in space have a temporal function as well. Having stated that there is no esoteric philosophical basis to *Star-Child*, Crumb seems to contradict himself:

> The germinal idea, "Music of the Spheres" (strings, *pianissimo*), moves throughout the work in a circular and therefore static manner, a kind of background music over which the human drama is enacted. This idea consists of a continuum of chords built upon the interval of a perfect fifth.[243]

"Music of the Spheres" is, by definition, pure and perfect; Crumb's representation of this music implies perfection. The concept that circles and circular motion are perfect influenced Ptolomy's model of the universe; the sun, moon and planets move in concentric circles around the earth, as do the fixed stars, which are in the outermost circle and are always in the same position relative to each other, forming a static background. When a heliocentric universe was proposed. Kepler modified Copernicus's theory by suggesting elliptical rather than circular orbits for the planets, but found the hypothesis rather repugnant, since ellipses were clearly less perfect than circles.[244] The interval of a fifth was the first to be accepted by the medieval church as consonant, and retains its designation as perfect. Unfortunately, the perfection of the circle of fifths is marred by the Pythagorean comma. Either the circle, or the size of the fifths can be perfect, but not both–a musical analogy for Heisenberg's uncertainty principle.

A more spiritual circularity is portrayed in *Apparition* (1979). The text is from a section of Walt Whitman's "When Lilacs Last in the Dooryard Bloom'd", subtitled "Death-Carol". Death is not depicted as an ending of life, but as a beginning or a return. Crumb's setting begins and ends with "The Night in Silence under Many a Star"; the recapitulation has only minor musical adjustments and no textual changes; thus, "Crumb re-affirms Whitman's view of the circularity of life and death."[245] Similarly, in *Ancient Voices of Children*, the third song is subtitled "Dance of the Sacred Life-Cycle", and is notated as a

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[243]George Crumb, quoted in Gillespie, 111.
[244]Stephen W. Hawking, *A Brief History of Time: From the Big Bang to Black Holes* (London: Transworld Publishers Ltd., Bantam Press, 1988), 2-4.
[245]William Bland, quoted in Gillespie, 111-112.

circle of elements for oboe, piano, mandolin, harp, and soprano, to be performed in specified order two and a half times.

Reflecting on Lorca's poetry, Crumb wrote, "I feel that the essential meaning of this poetry is concerned with the most primary things: life, death, love, the smell of the earth, the sounds of the wind and the sea. These '*ur*-concepts' are embodied in a language which is primitive and stark, but which is capable of infinitely subtle nuance."[246] Crumb discovered Lorca's poetry when he was a student and was immediately drawn into it. "I find his poetry stimulates me to find musical sort of echoes, you know, of ideas in his poetry."[247] Perhaps the way Lorca wrote about them was more important than the '*ur*-concepts' themselves; his talent for describing archetypes with intensely personal images inspired Crumb to create an analogy to his poetry.

Crumb's compositional procedure usually begins with the creation of germinal cells, which he then combines in a mosaic.[248] The inspiration for these elements comes from a wide range of sources, often historically or geographically distant from Crumb. While providing him with musical material that is the basis for his compositions, these motives and themes also play an important part in the emotional effect his music almost invariably has on audiences. "Music is full of cross references. When we hear a new work our ears can pick up these associations. That's the culture of music."[249]

Crumb's earliest works were constructed from short, easily recognisable elements, that are characterised by timbre, dynamics, rhythm, pitch and specific intervals or melodic contours. *Variazioni* (1595), like the *Sonata for Solo Violoncello*, depends on arch-form and variation technique. Touches of Schoenberg, Berg and Dallapiccola influenced this composition, and the theme is based on a twelve-tone series,[250] but Crumb ultimately found that he couldn't make twelve-tone technique work,[251] and felt "restricted by the limitations of unrelieved chromaticism ...".[252]

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[246]George Crumb, quoted in Gillespie, 107.
[247]Crumb, interview by Ndodana.
[248]Crumb, interview by Riis, 48.
[249]Ibid., 47.
[250]Gillespie, 104.
[251]Crumb, interview by Riis, 49.
[252]Crumb, "Interview: George Crumb/Robert Shuffett", in Gillespie, 36.

Apparently uncomfortable with contemporary musical trends, Crumb began searching for his own means of expression. The Lorca text which he chose to open his *Ancient Voices of Children* translates as: "The little boy was looking for his voice". He dedicated the *Sonata for Solo Violoncello* to his mother, later saying that he had chosen the instrument partly because of its enormous melodic and timbral range, and partly because he was so familiar with the solo cello repertoire his mother had played, especially the Bach Suites.[253] "I think all composers draw on what they've lived and heard. We have memories and everything we've heard becomes a part of our subconscious."[254]

The musical terms "Fantasia", "Toccata" and even "Variations" all originated in the sixteenth century. It appears that Crumb was travelling back in time, looking for ideas and idioms. He is fond of quoting Stravinsky's opinion that good composers do not borrow, they steal, and he is convinced that the study of older music is important. "This is the normal way to develop ... you really have to go through the history of music almost methodically, writing pieces that are copies of earlier composers."[255]

The use of a *siciliana* as the "Tema pastorale" in the *Sonata for Solo Violoncello* shows the influence of Bach's music for solo cello on Crumb's work. There is a Baroque influence in *Black Angels*; the titles of the sixth and eighth images are, respectively, "Pavana" and "Sarabanda". The "Pavana" is subtitled "der Tod und das Mädchen" and is to be played "like a consort of viols (a fragile echo of an ancient music)".[256]

Crumb's music from the mid-sixties onwards displays various aspects of medievalism. The lack of vertical synchronisation in *Star-Child* resembles the practices of medieval counterpoint, and the use of isorhythms, in *Music for a Summer Evening* and in one of the *Madrigals*, is derived from music written circa 1300-1450. Madrigals themselves were first sung in Italy towards the end of the thirteenth century.[257] One of the most consistent is the use of fermatas to delineate phrases and sections, which can be compared

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[253]George Crumb, masterclass attended by author, 22 May 1997, Cape Town.
[254]Crumb, interview by Riis, 40.
[255]Ibid., 42.
[256]The performers are instructed to bow behind the left hand, near the pegs, holding their bows in the manner of viol players.
[257]*Oxford Dictionary of Music*, s.v. "Madrigal".

to medieval *puncti.*[258] They are notated to last a certain number of seconds, and the duration is sometimes of additional symbolic value.

The concept of time, including "psychological and philosophical time", is the unifying theme in the four movements of *Echoes of Time and the River.*[259] The spatial projection of time is created, as the subtitle indicates, by the *Four Processionals for Orchestra.* Borroff sees the synchronised movement of the players as "a pale echo of Medieval church festivals", an anachronistic imitation of the medieval philosophy that equated time with gesture and motion.[260]

This philosophy could also be related to the theory of a space-time continuum, to the creation of an intersection between time and space, with musicians producing sounds that travel through both dimensions. Echoes are, quite simply, the result of sounds travelling through space and time, and are a recurring feature in Crumb's music. "I came from a place where echoes existed ... I love reverberating sounds, sounds that ricochet, or sounds that go on and on."[261]

Sometimes Crumb deliberately echoes the music of the past by means of quotation. The text for *Star-Child* is adapted from the *Dies Irae* and *Massacre of the Innocents,*[262] which both date from the thirteenth century, and the plainsong melody of the *Dies Irae* is quoted several times. The *Dies Irae* also appears in *Black Angels*, and the significance of the melody in each context is obvious. Perhaps it is significant that Crumb has described these two works as parables.

His description of the "Music of the Spheres" in *Star-Child*, in which he associates Einstein's concept of the (space-time) continuum with the Pythagorean concept of perfect fifths, poetically reflects his juxtaposition of music from different periods, in this and in many other compositions. As he wrote in his notes for *A Haunted Landscape* (1984): "Sometimes one feels an idyllic sense of time suspended."[263]

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[258]Edith Borroff, *Three American Composers* (Lanham, Maryland: University Press of America, 1986), 222.
[259]Gillespie, 105.
[260]Borroff, 243.
[261]Crumb, interview by Riis, 43.
[262]Gillespie, 111. Crumb also uses John 12:36.
[263]George Crumb, quoted in Gillespie, 113.

Other than establishing psychological bridges across musical history, Crumb's reasons for quoting specific works are not always discernible. Passages from Bach's D-sharp minor fugue (*Well-tempered Clavier*, Book II) are included in *Music for a Summer Evening*. No explanation for the quotation is given, except that it forms part of a relatively tonal section that is based on the polarity of F-sharp major and D-sharp minor, a polarity Crumb considers "most traditional".[264]

The "Litany of the Galactic Bells", in *Makrokosmos, Volume II*, has a quotation inspired by a science fiction novel, Fred Hoyle's *The Black Cloud*. Robert Miller, for whom that work was composed, describes the effect of the quotation: "The opening music—a shimmering bell effect which obviously recalls the Coronation Scene from Mussorgsky's *Boris Godunov*—gradually subsides and moves almost imperceptibly into a short excerpt from Beethoven's *Hammerklavier* sonata."[265] In Hoyle's book, the sonata, rather than any of the earth's languages, is used to convey a message to the cloud. "This is exalted stuff, the *Hammerklavier*. That's why I quote a little ...".[266] This seems to imply that Crumb quotes only music he considers exalted in some way, but his explanation for using the tune of "Amazing Grace" in *Quest* was simply that he had always liked the tune.[267]

Several allusions to the music of Mahler are used in conjunction with unrelated stylistic elements. Crumb was intrigued by the idea of fusing the seemingly incongruous: the simultaneous references to Mahler and Haydn at the end of *Night of the Four Moons*; the "gentle oscillation between the pitches B/G-sharp and the tender lyricism of the baritone melody, [which] is consciously reminiscent of Mahler" in the overtly Spanish *Songs, Drones and Refrains of Death*;[268] and "a reminiscence of Mahler with a breath of the Orient"[269] in *Ancient Voices of Children.*

A few bars of "Bist du bei mir", from the *Clavier-Büchlein* for Anna Magdalena Bach are played (on a toy piano) in the fourth song of *Ancient Voices of Children*, "Todas

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[264]George Crumb, quoted in Gillespie, 110.
[265]Robert Miller, quoted in Gillespie, 109.
[266]Crumb, interview by Riis, 48.
[267]George Crumb, masterclass attended by author, 22 May 1997.
[268]George Crumb, quoted in Gillespie, 106.
[269]George Crumb, quoted in Gillespie, 108.

las tardes en Granada, todas las tardes se muere un niño" ("Each afternoon in Granada, a child dies each afternoon"). Crumb may have been thinking of the 13 children born to Anna Magdalena Bach, 7 of whom died in infancy or early childhood. "It later occurred to me that both Bach and Mahler drew upon many disparate sources in their own music without sacrificing 'stylistic purity'."[270]

Crumb also quotes his own music, not as a reference to himself, but to the symbolism associated with the previously composed piece. A melodic fragment from "Wanderer-Fantasy", in *Music for a Summer Evening*, reappears in the fourth piece, "Adoration of the Magi", of *A Little Suite for Christmas, A.D. 1979.* The quotation extends the programmatic aspect of the piece by referring to the journey of the Magi, who wandered from afar to Bethlehem. An extraordinary familiarity with Crumb's music is necessary to appreciate this reference. "Although this is a particularly private example of musical symbolism, it is consistent with Crumb's use of quotation to add an additional level of musical expressiveness."[271]

> It is sometimes of interest to a composer to recall the original impulse—the "creative germ"—of a compositional project. In the case of *Ancient Voices* I felt this impulse to be the climactic final words of the last song: "... and I will go very far ... to ask Christ the Lord to give me back my ancient soul of a child."[272]

In a sense, Crumb as a composer has travelled very far, back in time, searching for the ancient soul of music. The medieval qualities of his music are not merely the elements that can be related to the divisions of the quadrivium. His references to the "Music of the Spheres" and other ancient Greek ideas, which were an integral part of medieval music, are more than compositional conceits.

The unifying factor in *A Haunted Landscape* is a B-flat, sustained by two solo contrabassists. "I had imagined that this low B-flat (60 cycles—the frequency of alternating current) was an immutable law of nature and represented a kind of 'cosmic drone.' But, alas, science defeats art—a chemist friend informed me that alternating current is arbitrarily determined ... not even international, much less intergalactic!"[273] "I think of music as being

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[270]Ibid.
[271]James Primosch, quoted in Gillespie, 112.
[272]George Crumb, quoted in Gillespie, 108.
[273]George Crumb, quoted in Gillespie, 113.

so intimately connected with nature to start with, though.... Maybe this is an ancient Greek idea."[274]

A Little Suite for Christmas, A.D. 1979 (after Giotto's Nativity frescoes in the Arena Chapel at Padua) is a perfect example of medieval inspiration combined with contemporary piano techniques. Two of the seven pieces, *The Visitation* and *Adoration of the Magi*, are based on Giotto's panels, which were completed in 1305. *Canticle of the Holy Night* has a setting of the "Coventry Carol", which dates from 1591 and is to be played "like a minstrel's harp"; *Nativity Dance* "mirrors the dancing and pageantry of a Medieval 'mystery play.'"[275]

Whether by quotation or allusion, "Crumb's pieces show the profound influence of the past in virtually every dimension: in their titles, formal designs, instrumentation, notation, poetic imagery, motivic structure, and even theatrical effects."[276]

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[274]Crumb, interview by Riis, 46.
[275]William K. Bland, "Program Note" for *A Little Suite for Christmas, A.D. 1979*, by George Crumb (New York: C. F. Peters Corporation, 1980), [3].
[276]Bruns, 10.

CHAPTER 6

THE GENESIS OF THE *MAKROKOSMOS* CYCLE

Oh, these are just poetical titles ....
Never pin a composer down with his titles.
George Crumb

The descriptive titles *Nocturne*, *Notturno* and *Night Music* or *Nachtmusik* were used by Haydn, Mozart, Field, Chopin, Debussy, Bartók, and other composers, primarily to denote a nocturnal atmosphere. Part of this atmosphere is the darkness and, implicitly, the visibility of the stars. Thus, Crumb's depiction of the stars can be traced back to 1959; the first *Fantasia* in *Variazioni* is entitled "Notturno". The centre of the arch-form in his next work, *Five Pieces for Piano* (1962), is a "Notturno",[277] and both *Night Music I* (1963) and *Four Nocturnes (Night Music II)* (1964) consist of movements each called "Notturno".

Crumb conveys a poetic, rather than scientific, image of the night sky. His concern about the psychological effects of cosmological knowledge becoming fairly common was expressed in *Night of the Four Moons.* The first movement is a requiem for the death of the moon's mystique, which had been eroded by accumulating knowledge, but was almost completely destroyed when humans walked on this once celestial body. The alto sings the same line three times: "La luna está muerta, muerta" ("The moon is dead, dead").

The text for the fourth movement is taken from Lorca's *Romance de la luna, luna.* The poem becomes a parable for the human attempt to colonise and transform the moon. It reveals Crumb's own perception of the moon, and of other beautiful things in the sky, for it is clear that his sympathies lie with the child, and with the moon herself.

"Run away moon, moon, moon.
If the gipsies should come,
they will make of your heart
necklaces and white rings."
"Child, let me dance.
When the gipsies come,
they will find you on the anvil
with your little eyes closed."

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[277]Gillespie, 104.

"Run away moon, moon, moon,
for I hear now their horses."
"Child leave me, do not step
on my starched whiteness."
.....
How the owl hoots!
Ah, how it hoots in the tree!
Through the sky goes the moon
holding the child by the hand.[278]

The musical ideas which evolved into the first two volumes of *Makrokosmos* were originally part of a three-volume conception for solo piano. As Crumb developed his architectural plan, he narrowed this down to two volumes, first of ten pieces each, then of thirteen; his sketches for the "Epilogues" in each volume, were allocated to *Music for a Summer Evening (Makrokosmos III)*. The title *Makrokosmos* was initially used for individual pieces in each volume, and later for the Epilogues. Only in the final draft of the overall design did it replace Crumb's previous titles, which included "The Mysterious Universe: 13 'Fantasy Pieces' for Piano" and "The Phantom Gondolier".[279]

The subtitle for both *Makrokosmos I* and *II* is *Twelve Fantasy-Pieces after the Zodiac for Amplified Piano*—each piece is an attempt to capture the quality of the various astrological signs, "and these are matched up with real people, or people I admired in the past, composers. The initials of the friends and composers are at the end of each little piece and I found that musicians are not born at certain points of the year, they tend to be crowded into very few astrological signs ... I had trouble filling in some of the places."[280]

The generally accepted dates for the signs of the Zodiac, and the more esoteric symbols which Crumb uses, are shown in table 3. *Volume I* is written "in memoriam" Béla Bartók ("B.B. ♈"), *Volume II*, "in memoriam" Gustav Mahler ("G.M. ♋"). The identities of the people whose initials appear at the end of each piece are given in table 4.

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[278]*Lorca*, trans. and ed. J. L. Gili (Harmondsworth: Penguin Books Ltd., 1960), 35-36.
[279]Christopher Wilkinson, "*Makrokosmos I* and *II*: A Case Study of George Crumb's Compositional Process", in Gillespie, 1986), 55-57.
[280]Crumb, interview by Ndodana.

Table 3.—Zodiacal symbols, signs and dates

♈	Aries	21 March - 19 April
♉	Taurus	20 April - 20 May
♊	Gemini	21 May - 21 June
♋	Cancer	22 June - 22 July
♌	Leo	23 July - 22 August
♍	Virgo	23 August - 22 September
♎	Libra	23 September - 23 October
♏	Scorpio	24 October - 21 November
♐	Sagittarius	22 November - 21 December
♑	Capricorn	22 December - 19 January
♒	Aquarius	20 January - 18 February
♓	Pisces	19 February - 20 March

Table 4.—Initials, symbols and names assigned to each piece in *Makrokosmos I* and *II*

Volume I	
G.R. ♋	George Rochberg
W.R.C. ♓	William Reed Crumb
J.B. ♉	Johannes Brahms
R.L.F. ♑	Ross Lee Finney
G.H.C. ♏	George Henry Crumb
A.W. ♐	Anton Webern
P.Z. ♎	Paul Zukofsky
C.D. ♌	Claude Debussy
A.S. ♍	Arnold Schoenberg
D.R.B. ♈	David Russell Burge
F.G.L. ♊	Federico García Lorca
B.W. ♒	Beatrice Wernick
Volume II	
J.DeG.W. ♋	Jan DeGaetani West
R.M. ♐	Robert Miller
F.C. ♓	Frédéric Chopin
E.A.C. ♊	Elizabeth Ann Crumb
A.B. ♍	Anton Bruckner
P.P. ♉	Paul Parmlee
L.K. ♏	Lewis Kaplan
H.W. ♈	Howard Waltz
S.B. ♎	Storm Bull
E.M.C. ♒	Elizabeth May Crumb
R.V. ♌	Richard Veleta
R.W. ♑	Richard Wernick

Notes: William Reed, Elizabeth Ann and Elizabeth May Crumb are, respectively, the composer's brother, daughter and wife. Parmlee, Waltz and Bull were on the faculty of the University of Colorado at Boulder during the early 1960s, as was David Burge, to whom *Makrokosmos I* is dedicated. *Makrokosmos II* was written for Robert Miller. Many of

Crumb's vocal works were written for, and premiered by, DeGaetani. Zukofsky gave the first performance of *Four Nocturnes* (with Crumb as the pianist). Kaplan, a member of the Aeolian Chamber Players, was involved in the first performances and recordings of both *Eleven Echoes of Autumn* and *Dream Sequence.* Veleta, a pianist who performed with the Penn Contemporary Players, taught at the Universities of Colorado and Pennsylvania. Richard Wernick is a composer, conductor, and Music Director of the Penn Contemporary Players, who did the original recordings of the four books of *Madrigals* and *Lux Aeterna.* He and his wife Beatrice are close friends of George and Elizabeth Crumb.

As is the case with *Night of the Four Moons*, the music of the *Makrokosmos* cycle is a personal response to the cosmos, rather than the music of the spheres themselves. Crumb does not believe in the astrological control of human lives, and the initials were a whimsical idea of posing an enigma.[281] Nevertheless, the concept of *musica humana* and *musica mundana* is included by linking people with zodiacal signs. Crumb wrote about "certain recurrent haunting images", at the time he was composing *Makrokosmos I*:

> ... the "magical properties" of music; the problem of the origin of evil; the "timelessness" of time; a sense of the profound ironies of life (so beautifully expressed in the music of Mozart and Mahler); the haunting words of Pascal: "*Le silence éternel des espaces infinis m'effrai*" ("The eternal silence of infinite space terrifies me"); and these few lines of Rilke: "*Und in den Nächten fällt die schwere Erde aus allen Sternen in die Einsamkeit. Wir alle fallen. Und doch ist Einer, welcher dieses Fallen unendlich sanft in seinen Händen hält*" ("And in the nights the heavy earth is falling from all the stars down into loneliness. We are all falling. And yet there is One who holds this falling endlessly gently in his hands").[282]

These images are related to several of the poetic titles which describe the twelve pieces in *Makrokosmos I.* Magical qualities pervade *Part Two*: "The Phantom Gondolier *Scorpio*",[283] "Night-Spell I *Sagittarius*", "Music of Shadows (for Aeolian Harp) *Libra*" and "The Magic Circle of Infinity (Moto perpetuo) *Leo*". "Music of Shadows (for Aeolian Harp)" was probably inspired by the myth of Orpheus, whose music calmed Cerebus at the entrance to Hades, and who seems to be the archetypal character for the assumptions that music has magical properties. The dead in the Greek Underworld were called "shades" or "shadows".

"The Magic Circle of Infinity (Moto perpetuo) *Leo*", like the final pieces in *Part I* and *Part III*, is notated to reflect its title, and $3\frac{1}{3}$ revolutions of the circle are to be played.

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[281]George Crumb, quoted in Gillespie, 109.
[282]Ibid.
[283]The zodiacal signs for each piece are given in italics.

This is exactly one third of 10, the sacred number of the Pythagoreans; Pythagoras himself was reputed to have used the magical properties of music. Plato, Socrates and other Greek philosophers expounded on both the magical and educational properties, prescribing some modes and proscribing others in the curricula of schoolboys, maintaining that music influenced the temperaments and morals of impressionable youths. According to their theories, music itself could be a cause of evil.[284]

"Proteus *Pisces*" is another reference to ancient Greece. Proteus, while not exactly a fish, was indeed an aquatic deity, who had the power to change his shape, and to prophesy, which makes him an appropriate inclusion in a work based on the zodiac. "Spring-Fire *Aries*" could be a reference to Prometheus who, in Greek mythology, was the creator of man. He presented his creatures with the gift of fire, which was to develop into knowledge and civilisation. This god-like human potential is represented in the Garden of Eden by the forbidden fruit; the disobedience surrounding this tree has made it symbolise for some people the root of all evil.

There are three pieces in *Makrokosmos I* which begin with the same series of seven minor chords: "The Abyss of Time *Virgo*", "Primeval Sounds (Genesis I) *Cancer*" and "Crucifixus *Capricorn*". The symbolism is clearly that the innocence at the beginning of time was destroyed by the events recounted in Genesis, and redeemed by the crucifixion of Christ. This is supported by the zodiacal signs, Virgo and Cancer symbolising purity and malignancy, Capricorn being the sign which incorporates 25 December. "Crucifixus", the fourth piece in the volume, is written in the form of a cross.

"Pastorale (from the Kingdom of Atlantis, ca. 10,000 B.C.) *Taurus*" has an interesting date; the end of the last Ice Age, and the beginning of the Holocene Epoch, occurred about 10,000 B.C., "which is when archaeologists tell us that civilisation really began."[285] The legendary island of Atlantic also has connections with ancient Greece; it is described in Plato's *Timaeus* and *Critias*.[286]

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[284]This idea has contemporary adherents. The chapter on "Music" in Allan Bloom's *The Closing of the American Mind: How higher education has failed democracy and impoverished the souls of today's students*, associates popular music with sex, drugs, violence and the destruction of educational aspirations.
[285]Hawking, 7.
[286]*Encyclopaedia Britannica*, 15th ed., s.v. "Atlantis".

"Dream Images (Love-Death Music) *Gemini*" represents, in its subtitle, one of the "profound ironies of life", one that was expressed in Wagner's *Liebestod.* Crumb quotes Chopin's *Fantaisie-Impromptu*, and has the initials of Federico García Lorca at the end. There are certain similarities between Chopin and Lorca, and it is ironic that both were intensely nationalistic artists, yet Chopin died in exile at the age of 39, and Lorca was murdered during the early days of the Spanish Civil War when he was 38. In his lecture, "Theory and Function of the *Duenda*", Lorca spoke of "the delicate bridge uniting the five senses with that core made living flesh, living cloud, living sea, of Love freed from Time."[287]

(A further irony is that Crumb's use of the quotation from Chopin was not his original intention. Because of copyright problems with Rakhmaninov's *Rhapsody on a Theme of Paganini*, Crumb substituted the *Fantaisie-Impromptu*; he wanted something in D-flat, well-known and "beautiful but phoney".[288] This makes all the similarities between Chopin and Lorca appear entirely fortuitous.)

The twelfth piece, "Spiral Galaxy *Aquarius*", is notated symbolically and has the only explicitly cosmic title in *Makrokosmos I.* There are several in *Makrokosmos II*: "Cosmic Wind *Libra*", "Voices from the 'Corona Borealis' *Aquarius*" and "Litany of the Galactic Bells *Leo*", all in *Part III.* "Twin Suns (Doppelgänger aus der Ewigkeit) *Gemini*" is the final piece in *Part I* of *Volume II*, and is written as two circles, the second entitled: "Hymn for the Advent of the Star-Child".

Some of the titles and subtitles in *Makrokosmos II* are related to specific pieces in *Makrokosmos I*; "Morning Music (Genesis II) *Cancer*", "Ghost-Nocturne: for the Druids of Stonehenge (Night-Spell II) *Virgo*" and "Agnus Dei *Capricorn*" are counterparts for "Primeval Sounds (Genesis I)", "Night-Spell I" and "Crucifixus", respectively. There is a more subtle connection between "A Prophecy of Nostradamus *Aries*" and "Proteus", who was also prophetic. Crumb's association of Chopin and Lorca in "Dream Images (Love-Death Music)" recurs in "Rain-Death Variations *Pisces*" in *Makrokosmos II.* Chopin's

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[287]*Lorca*, 136.
[288]George Crumb, masterclass attended by author, 22 May 1997.

initials appear at the end, and the title it taken from the first book of *Madrigals* (which are settings of Lorca's poetry); the second song is in two sections: Rain Death Music I and II.

Constructing *Makrokosmos I* and *II* around the signs of the zodiac determined the number of pieces in each volume—either twelve or thirteen (if an Epilogue were included). The fundamental point of reference between Western music and astrology is the equal number of zodiacal signs and notes in the chromatic scale. The zodiac is represented as a circle, comparable to the circle of fifths. Tonalities most distantly related to each other, those a tritone apart, are 180 degrees apart on this circle. Similarly, the signs opposite each other on the zodiacal circle are said to determine opposite character traits.

Astrological signs are categorised according to two different criteria: the 4 elements—fire, earth, air and water—and 3 qualities—cardinal, fixed and mutable. This creates 4 different groups, each containing 3 signs (using the elements), or 3 groups of 4 (using the qualities). Both the elements and the qualities recur, in the stated order, around the zodiacal circle from Aries to Pisces, so that each sign is uniquely defined by its element and quality, thus:

> Aries (Fire/Cardinal); Taurus (Earth/Fixed); Gemini (Air/Mutable);
> Cancer (Water/Cardinal); Leo (Fire/Fixed); Virgo (Earth/Mutable);
> Libra (Air/Cardinal); Scorpio (Water/Fixed); Sagittarius (Fire/Mutable);
> Capricorn (Earth/Cardinal); Aquarius (Air/Fixed); Pisces (Water/Mutable).

Neither of Crumb's sets of fantasy pieces follows the order of the signs as they occur in the horoscope; although Crumb divided both volumes into 3 groups of 4, any correspondence to the astrological qualities is obscure. The sequence of qualities in *Makrokosmos I* is (denoted by their initials): C, M, F, C, F, M, C, F, M, C, M, F. That of *Makrokosmos II* is a less obvious pattern: C, M, M, M, M, F, F, C, C, F, F, C.

John Carbon's analysis of the sequence in *Volume I* is as a mirror-image of binary form; C-M-F being "A" and C-F-M being "B", hence "ABBA". His interpretation of *Volume II* is more complicated and less convincing. "If the top and bottom pieces are joined, this formation becomes a circle, consistent with the composer's use of symbolic circular notation in several of the pieces in both volumes of the cycle."[289] However, of the

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[289]John Carbon, "Astrological Symbolic Order in George Crumb's *Makrokosmos*", *Sonus* 10, no. 2 (1990): 76.

three pieces which are notated as circles, only one, "The Magic Circle of Infinity" in *Volume I*, is a closed circle, joining the end and the beginning of the music. The circles of "Twin Suns" and "Agnus Dei" in *Volume II* have no such connection, either in the music or the notation.

Carbon divides the palindromic structure of *Volume I*, placing the horizontal halves on either side of his circle of *Volume II*. This combination forms "a hidden, unseen symbol ... [which] might be the interlocking representation of a galaxy (perhaps the milky way) seen from a side view."[290] He justifies this symbol on the grounds of Crumb's own use of symbolic notation, especially that of the last piece in *Volume I*, "Spiral Galaxy", which is written as a spiral. Carbon asserts that his configuration represents the side view of a galaxy such as this, which Crumb has depicted as "seen from the top".

Apart from the suspect accuracy of terms such as "top" and "side" to describe a galaxy, the lengths to which Carbon goes to create this symbol undermine its plausibility. The palindromic binary form he deciphers from *Volume I* seems feasible, although it replaces Crumb's 3 groups of 4 with partitions into 4 groups of 3. Carbon's terminology regarding the grouping is misleading; he writes of "four groups of three qualities"[291] rather than four signs in each of the three groups defined by (three) qualities. There is nothing paradoxical in Crumb's three-part partition being based on the qualities, but it is ironic that Carbon had to change this into a four-part structure in order to make his analysis.

"The title and format of my *Makrokosmos* reflect my admiration for two great 20th-century composers of piano music—Béla Bartók and Claude Debussy. I was thinking, of course, of Bartók's *Mikrokosmos* and Debussy's *24 Preludes* ...".[292] Having completed the 24 pieces which make up *Makrokosmos I* and *II*, Crumb's next composition was a tribute to Bartók's instrumentation for his Sonata for Two Pianos and Percussion of 1937; *Music for a Summer Evening (Makrokosmos III)* is scored for two amplified pianos and percussion (two players).[293]

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[290]Ibid., 77.
[291]Ibid., 66.
[292]George Crumb, quoted in Gillespie, 109.
[293]The arch-form structure of this, and of most of Crumb's compositions, can also be seen as Bartók's influence.

The first, third and fifth movements—"Nocturnal Sounds (The Awakening)", "The Advent" and "Music of the Starry Night"—are for the full ensemble, and were intended to "define the primary import of the work (which might be interpreted as a kind of 'cosmic drama')."[294] "Music of the Starry Night" includes "intermittently resounding 'Five-fold Galactic Bells' in F-sharp", transposed from *Makrokosmos II.* "The Advent" is an "egregious example of self-plagiarism",[295] an elaboration of "Twin Suns (Doppelgänger aus der Ewigkeit)"; the movement ends with "Hymn for the Nativity of the Star-Child", an adaptation of the title for the second circle in "Twin Suns".

In *2001: a space odyssey*, the character David Bowman is transformed into the Star-Child. Whether or not this was the source of Crumb's title, there are other parallels between it and Crumb's work. In the film version, Strauss's *Also sprach Zarathustra* is part of the soundtrack; Crumb parodied this piece in *Vox Balaenae.* In Arthur C. Clarke's novel (based on the screenplay by Clarke and Stanley Kubrick) there are sections entitled "Primeval Night" and "Abyss",[296] which correspond to "Primeval Sounds" and "The Abyss of Time" in *Makrokosmos I.*

Crumb used the title again in 1977, for *Star-Child.* The image of a *Doppelgänger,* which is illustrated in the calligraphy of "Twin Suns", accompanied the title from *Makrokosmos I* to the section in *Star-Child* called "Voice Crying in the Wilderness", a duet for solo soprano, singing extracts from the *Dies Irae,* and solo trombonist. "The 'Voice' is therefore a composite voice, with the trombone functioning as a kind of *doppelgänger.*"[297]

Schubert's *Der Doppelgänger* must have been the inspiration for Crumb's use of the title. The second movement of *Music for a Summer Evening (Makrokosmos III)* is scored mostly for the two pianos alone; the title "Wanderer-Fantasy" is from Schubert's *Fantasia* in C (D760), which acquired its nickname because of the variations on a passage from his own *Der Wanderer* (D493).[298] Schubert often practised what Crumb calls self-plagiarism; the second movement of the String Quartet in D minor (D810), which Crumb quotes in

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[294]George Crumb, quoted in Gillespie, 109.
[295]Ibid.
[296]Arthur C. Clarke, *2001: a space odyssey* (London: Century Hutchinson Ltd., 1968; reprint, London: Arrow Books Ltd., 1968).
[297]George Crumb, quoted in Gillespie, 109.
[298]*Oxford Dictionary of Music,* s.v. "'Wanderer' Fantasy".

Black Angels, is a set of variations on the piano introduction to *Der Tod und das Mädchen.* In *Songs, Drones and Refrains of Death*, there is an extended cadenza for the two percussionists to evoke the sound of a galloping horse, reflecting the line: "Little black horse. Where are you taking your dead rider?" "The prototype of the genre represented by *Song of the Rider, 1860* is obviously Schubert's *Erlkönig.*"[299]

> The second intermezzo [the fourth movement, "Myth"] is cast as a fourteenth-century isorhythmic hoquetus with double tenor.... metrical divisions are *in perfectio*: one long, the bar, divides into three breves, dotted halves (*modus perfectus*), which divide into nine semibreves (*tempus perfectum*); the semibreve, however, divides into five minims, sixteenths, at the prolation level. Quintuplet division is a secondary system ...".[300]

Moevs describes the isorhythmic structure of "Myth" as depending primarily on the numbers 7 and 13, with 3 and 5 also determining the lengths of *taleae* and the patterns of repetition.[301] This number symbolism is not confined to the fourth movement. In the work as a whole, "measured figures will be triplets, quintuplets, septuplets; rests will be of five, seven, and thirteen seconds; the number of figures or bars in a section will total seven; the number of sections will be three or five."[302] Crumb's deliberate medievalism, and his use of symbolic numbers, which are surely too consistent to be coincidental, show the pervasive influence of ancient philosophy on *Music for a Summer Evening.*

Crumb wrote that he thought of the first three volumes of *Makrokosmos* as a trilogy,[303] but in 1979 he completed *Celestial Mechanics (Makrokosmos IV).*[304] He described this as a set of "Cosmic Dances for Amplified Piano—4 Hands", although, at two points in the score, the medium is extended to six hands, including those of the page turner, "in the whimsical manner of Charles Ives".[305] Crumb emphasised that the titles of

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[299]George Crumb, quoted in Gillespie, 106.
[300]Robert Moevs, review of the Nonesuch recording of *Music for a Summer Evening (Makrokosmos III)*, by George Crumb, in *Musical Quarterly* LXII, no. 2 (April 1976): 297.
[301]Ibid., 298-299.
[302]Ibid., 294.
[303]George Crumb, quoted in Gillespie, 110.
[304]Douglas Adams created a similar misnomer with *The Hitch Hiker's Guide to the Galaxy: A Trilogy in Four Parts*, later adding a fifth book to complicate matters further.
[305]George Crumb, quoted in Gillespie, 111.

the individual movements, "the beautiful names of stars of the first through the fourth magnitude", were "added after the music was completed!"[306]

His perception of the piano-duet repertoire was of a free, spontaneous style, and "dances of various types. [He mentions Mozart, Schubert and Brahms as specific composers.] The majestic movement of the stars does indeed suggest the image of a 'cosmic choreography' and, in fact, I briefly considered opting for an alternative title (proposed by my brother, punster that he is)—*The Celestial Ballroom.*"[307]

Crumb borrowed *Celestial Mechanics* from Pierre Simon de Laplace, a French mathematician, astronomer and physicist, whose *Philosophical Essays on Probabilities* dealt with determinism–the belief that everything is due to cause and effect, and that it is therefore possible to predict the future. The universe obeys natural laws which, at least theoretically, could all be reduced to mathematical formulas; in poetic terms, it is a "cosmos of number". Although number symbolism is irrelevant, the connection between "the movement of the greatest bodies in the universe and that of the lightest atom" evokes concepts of *musica mundana* and *musica humana*, and it is difficult to consider the implications of determinism without being reminded of the Zodiac.

> The future is knowable if we can process all the information about the past. It is, therefore, fixed and unavoidable. We cannot escape this by fleeing into our Cartesian souls for we too must be made of numbers and these numbers must be subject to the same iron logic of cause and effect. We do things because of other things and we are joined to the whole universal chain of causality. Free will is an illusion ..."[308]

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[306]Ibid.
[307]Ibid.
[308]Appleyard, 64-65.

CHAPTER 7

AN ANALYSIS OF *MAKROKOSMOS, VOLUME I*

Music might be defined as a system of proportions
in the service of a spiritual impulse.
George Crumb

In discussing the "widely conflicting opinions" on the role of pitch in contemporary music, Crumb wrote that the ideal solution would be to combine the possibilities of chromaticism "with a sense of strong tonal focus. An interesting practice in music since the atonal period of the Viennese composers has been the widespread use of a few tiny rhythmic cells."[309] He gives three examples of these cells, the combined major-minor third [0,1,4], the perfect fourth flanked by tritones [0,1,6,7], and the chromatic cluster [0,1,2]. These pitch-class sets, as well as the symbolic numbers 3, 4, 5, 7 and 12, are important structural elements in *Makrokosmos I.*

1. Primeval Sounds (Genesis I) *Cancer*

The piece begins with an ascending motive, *x*, which consists of 7 minor triads, each lasting approximately 3 seconds, and each preceded by a minor triad a tritone below it, played as an acciaccatura. The first 3-second triad is F minor in root position, followed by E minor in first inversion, then D-sharp minor in second inversion; thus, the roots of the triads descend chromatically, while the triads themselves ascend in pitch. The seventh triad is B minor in root position, therefore a tritone relationship exists between the roots of the first and seventh triads.

Motive *x* is followed by a slow glissando on the piano strings from A to D-sharp, another tritone. Seven seconds elapse between the beginning of this glissando and the first triad of x_1, which is a transposition of *x*, up a tritone.[310] The subsequent string glissando, also from A to D-sharp, is to be played rapidly, and a light metal chain should be dropped

[309]George Crumb, "Music: Does It Have A Future?", in Gillespie, 18.
[310]This 7-second interval is notated as a fermata.

onto the bass strings, striking them precisely with the glissando. As before, a 7-second fermata is written over the glissando. Crumb explains in a footnote that the chain "will produce metallic vibrations throughout the piece."[311]

Crumb used the tritone in its guise as *diabolus in musica* in *Black Angels*; it may be serving the same purpose in this composition. In particular, Guide d'Arezzo took the pitches B and F as an example of a discordant, forbidden interval;[312] A and D-sharp are, enharmonically, the pitches Liszt used for the descent into the "Inferno" at the beginning of his *Dante Sonata.* The glissando from A to D-sharp occurs 14 (7 X 2) times during this piece.

Number symbolism can also be found in the minor triads: the third is 3 semitones above the root, the fifth is 7 semitones above. The pitch-class set (pcs) of a minor triad is [0,3,7,] in its prime form. While this symbolism is inaudible, many of the groupings of notes and repetitions of motives, based on significant numbers such as 3 and 7, are aurally perceptible.

After the introduction, there are 3 statements of a different 7-chord motive, *y*, which emphasises the tritone as a melodic interval. The motive consists mainly of chords of the pcs [0,1,4]; the sixth chord in y_1 and in y_3 is a perfect fourth, with the upper note doubled at the lower octave; y_2 contains two fourth chords (the third and seventh). Both y_2 and y_3 vary the melodic contour of the motive, y_3 also has rhythmic alterations. A string glissando from A to D-sharp occurs after the first two chords of each statement of *y*, and each statement is succeeded by a repeated-note figure of 14 notes in triplet rhythm.

The first two pairs of tritone-related chords from y_1 are stated again in the third line, with a tremolo effect in septuplet rhythm alternating between the hands. Each pair is followed by the A - D-sharp glissando. A third statement uses the pitches of the second pair of [0,1,4] chords in y_2, and is immediately followed by a statement of [0,1,4] at a pitch level that is not found in any of the versions of *y*. This is played 3 times, giving a total of 12 (3 X 4) septuplets in this section.

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[311] Crumb's instruction at the end of the piece, "Remove glass rod precisely with glissando!" must be accepted a mistaken reference to the chain, since no other mention is made of a glass rod.

[312] *Harvard Dictionary of Music*, 2d ed., s.v. "Tritone".

A juxtaposition of the two whole-tone scales occurs in the fourth line, with a passage of ascending and descending scales over 5 quaver beats. The notes in the 7-second tremolo are also arranged to represent the whole-tone scales on different staves, but on different staves from those used for the scales.

The remainder of the piece is a variation on this material, excluding that of the introduction, although the chromatic clusters on the upper stave of the fifth line, which are notated in triplet rhythm, span the tritone interval F - B, which is prominent in both *x* and x_1. These clusters occur simultaneously with clusters from A to E-flat, the enharmonic equivalent of A - D-sharp used for the glissandos.

The restatement of y_1 has the first 4 chords expanded to pcs [0,1,4,5], forming acciaccaturas in alternating groups of 3 and 5. The rhythm of the last 3 chords is taken from y_3. A glissando precedes the repeated-note motive, which is also decorated by a semitonal acciaccatura. The same alterations are made to the repeated-note motive following y_2. The first 4 chords of y_2 have the lower dyads as acciaccaturas to the upper note; otherwise, this restatement is unchanged (except for the addition of the semitonal clusters).

The seventh chord of y_3 is omitted, and the motive is extended with two septuplets and a quintuplet (using the fifth and sixth chords alternately) which form a measured accelerando. This replaces the passage of septuplets, and delays the repeated-note figure until the next line, leading straight into a second whole-tone passage, which is a tritone higher than the first. Only the upper stave of the tremolo is altered, by inversion, but the duration is extended to 13 seconds.

The following glissando is reinforced by a semitonal cluster spanning A - E-flat, which forms a triplet with the dyad A - B.[313] The six-note acciaccatura, marked "explosively!" has a statement of pcs [0,1,4] on each stave. "Primeval Sounds" ends with a silently depressed chord which covers 25 (5 X 5) notes, and is sustained until the beginning of "Crucifixus".[314]

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[313]These 3 pitches–A, B and E-flat/D-sharp–are used in the figure following *x* in "Crucifixus".

[314]This could be interpreted as a further link between the symbolism of "Primeval Sounds" and "Crucifixus".

The subtitle of this piece is "Genesis I". Although the first chapter of Genesis describes only the six days of creation, the seventh day, on which God rested, is usually included in our perception of the Biblical creation. Likewise, the concept of the Trinity has become part of the Christian reading of Genesis, following St John's writing that the Word was with God in the beginning.[315] This explains the symbolism of 3 and 7 in this context.

It is interesting that the last 4 fermatas are either 5 or 13 seconds long. Five is the number of human beings. Thirteen, and the use of the tritone, can be seen as references to evil and the devil, perhaps alluding to the events recounted in the third chapter of Genesis, in which the serpent tempts Eve.

2. Proteus *Pisces*

This and the following piece are the only two in *Makrokosmos I* written using bar lines. ("Night Spell I" and "The Abyss of Time" have bar lines for certain sections, and "Dream Images (Love-Death Music)" has the Chopin excerpts in original notation.) The time signature of "Proteus" is 4 semiquaver beats per bar.

The 13 notes in bar 1 span 13 semitones, beginning semitonally and ending with leaps of six, 7 and six semitones. This motive reappears in bars 5 and 30, transposed up 5 semitones; bar 18 transposes the original motive down 3 semitones. Bars 2, 19 and 25 each contain two statements of [0,1,4]; the pairs in bars 2 and 25 are a tritone apart.

There are 16 (4 X 4) notes in bars 6-7; 3 pitches [0,1,2] are arranged to create a span of 13 semitones between the lowest and highest pitches. This motive is notated as 4 sextuplet groups, the first group comprising 7 notes and the subsequent 3 groups, 3 notes each. (Rests complete the sextuplet rhythm.) Bars 39-40 contain a transposition, down 5 semitones, of the material from bars 6-7. Bar 40 has an added six-note chord, which consists of two statements of [0,1,4] at different pitch levels, one on each stave.

Bar 10 has 10 articulations (played in the time of 4 semiquavers), beginning with a 10-note chord, spanning 25 (5 X 5) semitones. Each subsequent articulation eliminates the lowest note of the chord, so that the ninth articulation is a dyad and the tenth is a single

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[315]John 1:1-2.

note. This gives a total of 55 (5 X 11) notes in the bar. The same pattern occurs in bar 35, although the span between the lowest and highest notes is 26 (13 X 2) semitones. Bar 36 is a repetition of the pitches from the second half of bar 35. The 4 pitches [0,1,2,3] in bar 11 span 11 semitones; a similar figure [0,1,2,3,4] in bar 37 spans 21 (3 X 7) semitones.

Bar 12 has 24 (3 X 4 X 2) notes spanning 30 (3 X 5 X 2) semitones; the lowest and highest pitches are F and B, respectively. Bar 38 is an exact transposition of bar 12, up 3 semitones. The 26 (13 X 2) notes in bars 13-14 are notated as 3 triplet and 3 sextuplet groups, divided between the staves into black and white notes. This division is used again in bar 34, which contains 7 accented notes on the lower stave, each followed by 3 unaccented notes. This is the conclusion of a virtuosic passage which begins in bar 31 with material derived from the motive first heard in bar 1. The semitonal section of this motive is used in bars 15, 24, 27, 28 and 42, in each case forming a septuplet. (Bar 24 begins with a 3-note semitonal cluster.)

Bars 22-23 have 10 principal notes on each stave; including the 5 acciaccaturas gives a total of 25. The upper stave consists of 4 triplets. The two 5-note chords in bar 26, also forming part of a triplet, juxtapose pitches from the two whole-tone scales.

The total number of bars in "Proteus" is 42. However, the passage in bars 31-34 disregards the subdivision into bars, and is marked "velociss.", indicating a departure from the tempo. The bar lines are incomplete, and the 96 notes are to be played in the time of one double-dotted minim, giving the visual and aural impression of one continuous bar. Therefore the number of bars would be more accurately represented as 38 + 4. The product of 38 and 4 is 152, which is the metronome mark.

3. Pastorale (from the Kingdom of Atlantis, ca. 10,000 B.C.) *Taurus*

The first bar contains two 3-note motives: m, pcs [0,2,5], and m_1, pcs [0,1,6]. There are 13 statements of m, and 11 of m_1, in "Pastorale", making 24 (2 X 3 X 4) in total. The repeated-note motive n, pcs [0,1,2,6], in the second bar, consists of 3 quintuplet groups. A variant of this motive, n_1, pcs [0,1,2,6,7], appears in bars 7 and 22. Subsequent statements of n and n_1 consist of either one, two, or three quintuplets. Those of two

quintuplets are directly followed by statements of single quintuplets, separated only by rests, as in bars 4-5. Bar 20 reverses the order, having the single-quintuplet statement first. These arrangements preserve the 3-part nature of the original. The only exception is at the end of the piece, where 3 statements of *n* constitute 5 quintuplets.

There are 12 occurrences of motives that are either *n* or n_1; there are also 12 perfect fifths which occur in pairs, using the pitches E - B and D - A consistently. These motives, and motives *m* and m_1, are used exclusively in bars 1-8, 16-23, and 25-27. Bar 24 echoes the fourth and fifth beats of bar 12. The middle section (bars 9-15) begins with a six-note acciaccatura figure, which consists of two statements of [0,1,6,] (see m_1). This figure is used six times, at 3 different pitch levels; the initial pitches of the original and transposed versions form the pcs [0,2,5] (see *m*).

The motive (in bar 10) of 3 sextuplets, pcs [0,2,3,6], is played a total of 5 times, although the third statement (in bar 12) has only two sextuplets. It is introduced and/or accompanied by a motive marked "staccatiss[imo]", which occurs a total of 7 times. Both these motive are used at 3 different pitch levels, and the pcs obtained from their respective opening pitches is, as before, [0,2,5]. Bars 13 and 14 consist of 7 quintuplets. The 12 notes on the lower stave of these bars contain 7 interlocking versions of pcs [0,1,6]: A - B-flat - D-sharp, A - G-sharp - D-sharp, B-flat - B - E, B-flat - A - E, C - B - F-sharp, D-sharp - E - A, and E - D-sharp - B-flat.

The relationship between the metronome mark, 72, and the time signature, 5 quaver beats per bar, is associated with pentagrams: the 5 points of a pentagram on a circumscribed circle are 72 degrees apart. "Pastorale" begins with an interval of 5 semitones, and includes 30 quintuplets; perhaps it is not coincidental that the number of bars is 27.

4. Crucifixus [SYMBOL] *Capricorn*

The obvious visual reference to the crucifixion of Christ is enhanced by the 3-part structure of the cruciform notation (marked "A", "B" and "C") and of the musical material, which relates to the Trinity. The recurrence of motives *x* and x_1 from "Primeval Sounds (Genesis I)" further enhances the religious imagery. Apart from the triads in *x* and x_1,

which each have a 3-second duration, the metronome mark for "Crucifixus" is 40. This number has great symbolic value in the Judeo-Christian tradition; it is particularly important in describing a completed period of time: "forty years" or "forty days and nights".[316] Similarly, the numbers 3 and 7 are used in conjunction with finite concepts.

Motive *x* is followed by a descending tritone, notated, in triplet rhythm, as B - F, but sounding D-sharp - A, the fifth harmonics of B and F. The subsequent trill on A and B,[317] which suggests the epithet "Devil's Trill", completes the pcs [0,2,6] and crescendos onto a chord of these 3 pitches. A 7-second fermata completes section "A", the left hand side of the cross. Section "B" begins with x_I. The tritone, C-sharp - G, is inverted and the trill is on the pitches G and F. There is another 7-second fermata.

The vertical section of the cross begins with a 3-note acciaccatura (which is semitonal with octave displacement) at the upper extreme of the piano, and a 3-note semitonal cluster, played pizzicato, at the lower extreme. (If analysed semitonally, these six pitches span a perfect fourth.) The pianist simultaneously shouts "Christe!", pauses for 7 seconds, and then plays 7 melodic fragments, consisting of 7 triplets and two quintuplets, interspersed with fermatas. This passage is another juxtaposition of pitches from the two whole-tone scales on different staves. All the chords on the lower stave are of the pcs [0,2,6], as are the first and last fragments on the upper stave. The penultimate fermata lasts for 7 seconds, the remaining 5 are of 5-second duration.

The combination of symbolic numbers in this piece is especially significant: the association of 3 with divinity, and particularly with the Christian Trinity, the representation of humanity in the number 5, and the ambiguous meaning of 7, which suggests a comparison between compositions such as Haydn's *Die sieben letzen Worte unseres Erlösers am Kreuz* and Weill's *Die sieben Todsünden der Kleinbürger*. There is also the musical analogy of the devil in the tritone.

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[316]Pertinent examples include Christ's fasting in the desert for 40 days and nights before being tempted (Matthew 4:18) and the 40 days between Christ's resurrection and ascension (Acts 1:3).

[317]All further references to pitch in "Crucifixus" indicate the sounding pitches, i.e., the harmonics.

The performance instruction for the final section is "serene, transcendental", and the first, second, fourth and seventh fragments end on B, making it a point of resolution. It is noteworthy that in *Vox Balaenae*, the concluding "Sea-Nocturne (..for the end of time)", marked "serene, pure, transfigured" is in B major. Another indication of the connotations that B, and B major, seem to have for Crumb can be found in *Black Angels*. The tenth image, "God-music", is written with a B major key signature, and the cello, designated "Vox Dei", has the resolution B - C-sharp - D-sharp.

5. The Phantom Gondolier *Scorpio*

This is the first piece in Part Two, and it makes use of material from the first piece in *Makrokosmos I*, including the A - D-sharp string glissandos, of which there are 7 in "The Phantom Gondolier". These are played with the fingertip, as they are in "Primeval Sounds (Genesis I)"; 3 are played simultaneously with thimble glissandos from E-flat - A (lines four and five).

A tenth glissando, from C-sharp - B, occurs at the beginning of a descending semitonal trill on the strings, from B - C-sharp (at the same registral level), which lasts for 7 seconds. There are a further 4 instances of glissandos along the lengths of two strings, while the pianist plays trills on these strings and half-sings 4 nonsense syllables, or hisses. The pianist is also required to sing 8 (4 X 2) descending semitonal triplets [0,1,2], beginning on either A or E-flat.

Crumb differentiates between trills on different strings (i.e., different pitches) and unison trills (on the same pitch). He uses the pcs [0,1,2] for 20 (4 X 5) triplets of unison trills; 3 of these triplets are preceded by unison trills on G, and there are 7 unison trills on single, isolated pitches.

The other vocal effect is glissando humming. A succession of perfect fifth simultaneities begins immediately before each of the first 3 hums.

> Each statement ... consists of three pairs of tritone-related perfect-fifth simultaneities and contains ten pcs in all. Within statements, the transpositional levels are arranged so that the linear tritone formed by the upper pcs of the first pair of fifths (B-F in the first statement) recurs as the lowest pcs in the third pair. The pcs omitted from the first statement (A and E-flat) are the ones duplicated through

registral exchange in the second statement, and so on, producing a cycle of aggregate completions.[318]

The third pair of perfect fifths in the third statement is repeated, resulting in a succession of 20 (4 X 5) dyads. An echo of these statements is heard at the end of the piece, consisting of only 4 simultaneities, and inverting the tritone relationship between each pair.

Formally, the piece is constructed from variations on two motivic sections. Section *A*, ending with the A - D-sharp glissando, is based on the interval of the tritone; *B* contains the perfect fifth simultaneities and triplet groups of unison trills. *B* is followed by an intensification of *A*, with glissandos on two strings, A and B-flat, and 14 D-sharps. The second statement of *B* has few added notes, but the dynamic marking for the fifths is changed from *pianissimo* to *mezzo-piano*, and the pianist's hum is marked "a more intense groaning".

The third statement of *A* emphasises the tritone C-sharp - G, and the following variation on *B* is extended by a pair of dyads, and intensified with vocal echoes of the descending semitonal triplets.[319] Elements from *A* and *B* (tritone glissandos and triplets) are combined in the section starting with the first double glissando. After the 7-second descending trill, there is a fragment of *A*, and two pairs of fifths from *B*. The final hum, which closes the piece, starts on the fourth dyad and lasts for 5 seconds. Each of the first 3 hums has a 4-second duration; the metronome mark is 60 (3 X 4 X 5.)

6. Night Spell I *Sagittarius*

The opening motive, *p*, consists of 3 notes which descend by perfect fourths, pcs [0,2,7]. This motive is accompanied by 5 articulations on E (the fifth is extended by a unison trill) which makes the complete pcs [0,2,3,7]. There are 4 statements of *p*, making up 3 phrases, followed by *q*, which consists of 4 pitches, also related to each other by

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[318]Richard Bass, "Sets, Scales, and Symmetries: The Pitch-Structural Basis of George Crumb's *Makrokosmos* I and II", *Music Theory Spectrum* 13 (1991): 3.
[319]The number of [0,1,2] triplets in each successive statement of *B* is 2, 3 and 10, excluding those that are sung.

fourths, pcs [0,2,5,7], but arranged as a descending perfect fifth and two major seconds. The 3-second fermata is the first of 10 (5 X 2) which create 12 (3 X 4) separate sections.[320]

The second section consists of 4 rhythmic patterns, in triplet, quintuplet and septuplet groups, played on the soundboard (SB) and crossbeams (CB) of the piano. A descending perfect fourth is repeated 3 times, *r*, in the third section (which, like the fourth, is in 3 sub-sections, delineated by commas). The warbling effect ("like a Monteverdi trill"), after the triplet rhythm on the CB and SB, is notated as 5 grace notes repeating each of the 3 pitches, pcs [0,2,6]; the 10 (5 X 2) notes in the fifth section produce a conventional trill.

The sixth section contains two motives constructed from ascending perfect fourths (separated by semitones or minor thirds). Each motive ends with a "Monteverdi trill", played on the keyboard. In the seventh section, the pianist plays a transposition (down a semitone) of *r*. After another triplet rhythm on the CB and SB, the "Nightbird's Song" resumes, using two transpositions of the pcs [0,2,6] for the eighth section, which includes a triplet and a quintuplet.

The ninth section is a truncated version of *r*, transposed up a semitone from its original pitch and with only 3 fourths. Similarly, the tenth transposes a part of section eight. The eleventh section repeats the first, at the same pitch, but with only 3 statements of *p*, and without two of the left hand pizzicatos; therefore, the trill occurs relatively earlier.

"Night-Spell I" is rather unusual, especially within the context of *Makrokosmos I.* The interval of a perfect fourth is a basic structural unit in this piece; tritones substitute for perfect fourths and fifths in most instances elsewhere in the volume. Furthermore, although Crumb frequently juxtaposes different pentatonic or whole-tone scales, the coda of "Night-Spell I" is truly polytonal, recalling the music of Ives.

The lowest stave contains two sustained F minor chords; the first phrase on the stave above contains the pitches of an F-sharp major chord, with an added fourth, pcs [0,2,3,7]. These 4 pitches are the tritone transposition of *p* and its accompanying note. The third stave uses the pcs [0,2,5,7], transposed down 4 semitones from *q*, arranged to sound like an incomplete pentatonic scale on D; the fragments of "Will There Be Any Stars In My

[320]The coda is not preceded by a fermata, but is clearly a separate section, since it has a time signature and bar lines.

Crown?" are in D-flat major. (Only one pitch, the G-flat in the second fragment, does not belong to the pentatonic scale on D-flat.)

The whistled phrases are also in a different metre to those played on the piano: 3 two-bars phrases, in common time, are heard against 7 statements of the pcs [0,1,5], syncopated in a $^{6}_{4}$ metre, and, on the third stave, 3 statements (the third is incomplete) of a phrase that effectively lasts for 15 (3 X 5) crotchet beats.

7. Music of Shadows (for Aeolian Harp) *Libra*

Crumb uses 3 distinct methods of producing sound in this piece. The "Aeolian Harp" effect is created by strumming the strings "in a circular manner: •"; the symbol which illustrates this motion is used in mathematics to indicate infinity, of which the eighth piece in *Makrokosmos I* is the "Magic Circle". There are 5 instances of this strumming, 3 of which are immediately followed by 4 ascending glissandos. Apart from these 12, there are 28 (4 X 7) ascending glissandos that occur throughout the piece. (The pitches at the extremities of all these glissandos are approximate.)

There are 25 (5 X 5) chords which are enclosed in boxes and are to be depressed silently and sustained, thus altering the sounds of the glissandos. Five of the 5-note chords (the first three and last two) are whole-tone, the remaining nine are notated as diminished sevenths with the tone above added, pcs [0,1,3,6,9]. The 4-note chord consists of two tritone intervals, pcs [0,1,6,7], and the 10 six-note chords have the pcs [0,1,3,6,7,9], which contains both the pcs mentioned above as subsets.

Sounding pitches are played pizzicato with the fingertip. After the only 5-second fermata in the piece (the other six pauses are 3 seconds long), there is a motive which consists of 5 groups of [0,1,2], alternately descending and ascending. In addition to this motive, there are 15 pizzicato notes, all written as the final semiquaver in a triplet figure. The first of these pitches is D-sharp, the eighth (central) and highest pitch is A, which is also preceded by a D-sharp. The metronome mark is 54 (3^3 X 2).

8. The Magic Circle of Infinity (Moto Perpetuo) [SYMBOL] *Leo*

Section "A" is divided into two motives, each consisting of 3 pairs of six-note chords, followed by a 4-second fermata. The second statement is the inversion of the first, in augmentation, beginning a semitone lower. Differences in dynamics and articulation, and the effect of the sustaining pedal, create an illusion of bells ringing and echoing. Perhaps this is suggested because it makes an appropriate introduction to the "B" section, which should be played "Joyously, like a cosmic clock-work...".

Each six-note chord contains the notes of a whole-tone scale, and each acciaccatura is followed by a semiquaver or quaver chord consisting of the notes of the other whole-tone scale. The juxtaposition of different whole-tone scales occurs fairly frequently in *Makrokosmos I*, but it is particularly appropriate in this piece: it is the most 'circular' scale, since it has the same quality from any initial pitch, it has no different modes, nor any recognisable tonic.

Isolating the 3 pitches which occupy the same relative position in successive chords of the same length (for example, the first 3 acciaccaturas) gives the pcs [0,2,6].
The same pcs is used for the 12 notes marked "*ffffz*", prominently visible on the outside of the magic circle. These 3 pitches (B, A and F) are each sounded 4 times to complete the circle. However, playing $3^{1}/_{3}$ revolutions of the circle would result in 39 (3 X 13) of these notes. The metronome marks in this piece are 156 (39 X 4 or 12 X 13) and 226 (2 X 113). Crumb, like Berg, indicates numbers which do not appear on Maelzel's metronome; in fact, 226 is beyond the calibration of most modern metronomes.

There are 3 passages using the pcs [0,2,6] as a group of 3 notes played against rhythmic groups of two.[321] In the first two passages, the pcs obtained from selecting every third note on the upper stave (for example, the first in each group of 3) is also [0,2,6]. The first passage is followed by a motive, *t*, which is stated twice after both the second and third passages, always at the same pitch. This makes 5 statements, 16 (4 X 4) during a

[321]Each pair of semiquavers consists of a dyad and a single note; the pcs [0,1,6] is prominent in "Pastorale".

performance of the piece. The motive consists of two dyads (G - B and F - A), each followed by a single note (B-flat and G-sharp); i.e., two statements of [0,1,4].[322]

The motive immediately after the double bar (at "Fine") contains nine notes, divided into two halves, with an extra pitch making the fifth articulation a dyad. Each half is a subset of the different whole-tone scales, and each begins with a tritone, although the melodic tritone in the second is obscured by the extra pitch. The motive occurs 3 times (nine in performance); the transpositions are such that the initial pitches of the 3 statements produce the pcs [0,2,6].

9. The Abyss of Time *Virgo*

This is the first piece in Part Three and begins with the third appearance of *x*, again associated with the pitches A and D-sharp. The metal winding of the A string is scraped (with a plectrum) for 4 seconds; the D-sharp, a fingertip pizzicato, is part of a triplet figure that includes the pitches A-sharp, B and C, played as harmonics. This motive, *s*, consists of the pcs [0,1,2,3,6].

The arrangement of the triplet, a single quaver and a 3-note semiquaver chord, could be a representation of 13 which, in this piece, may have a significance apart from its association with the devil and the tritone. The initials "A.S." at the end of the piece are for Arnold Schoenberg, for whom 13 was a fateful number. If Crumb's A - D-sharp tritone is written as A - E-flat, the pitches are the same as those Schoenberg used in his compositions to refer to himself: E-flat is "Es" in German. The harmonics can also be written as letters in Schoenberg's name: "B", "H" and "C".

The pitches from this semitonal chord are used in the subsequent passage of 7 quintuplets, which are divided into 4 + 3: the first 4 quintuplets have only single notes, the remaining 3 all begin with a dyad. Pauses of 3 seconds precede and follow this passage, and the duration of the 7 harmonics, sounded by scraping a plectrum over the strings, is also 3 seconds. The pcs for these harmonics is [0,2,4,6,8,10]; the pitches are ordered as

[322]See bars 2, 19, 25, and 40 in "Proteus". Although the notes on each stave represent a different whole-tone scale, the separation of black and white notes appears to be more important in this instance. The latter differentiation is extremely important in "Spring-Fire".

tritone-related pairs. Five seconds of "wind sound" lead into x_1, with s transposed down 7 semitones, and a 5-second fermata.

The tempo changes to 40 for the section consisting of 7 bars, each of 3 (quaver) beats. These numbers symbolise completeness in a biblical context, and provide another link with the pieces in which x and x_1 appear, particularly to "Crucifixus". Every bar except the seventh contains a motive derived from s: semitonal chords with fingertip pizzicatos and plectrum scrapes over the strings. The pcs of bar 1 is [0,1,2,6], a subset of that used for s. There are also 5 string glissandos (including one in the seventh bar) from A to B-flat, an interval of 13 semitones. Each glissando is the third quaver in a triplet figure.

All the pauses are either 3, 4, or 5 seconds long. The initial metronome mark of 60 (3 X 4 X 5) is regained during a second passage of 7 quintuplets, which begins after a 5-second fermata and is a tritone transposition of the original, in inversion. The dynamic and tempo changes are also reversed.

While playing x_1, and again in bars 3 - 7, the pianist whispers or shouts 4 words: "tempus", "animus", "veritas", and "mors". These rather enigmatic words can be understood if they are linked to the symbolism in "Primeval Sounds (Genesis I)": the beginning of time, the creation of life, the moment of truth, and spiritual death.

10. Spring-Fire *Aries*

Debussy's *Feux d'artifice* apparently provided a model for this piece. An obvious similarity exists between the sextuplet passage in bars 20-24 of *Feux d'artifice*, and the 15 (3 X 5) sextuplets in "Spring-Fire", which are grouped to make 5 separate appearances. The climactic section of Crumb's piece (marked "furioso!" and "with bravura!") has 5 glissandos (on the keys); bars 61-64 of Debussy's prelude contain 4 glissandos, and there is a double glissando in bar 87.

More general similarities include dividing the black and white notes between the hands. (See the first 16 bars of *Feux d'artifice*.) This can be analysed as a juxtaposition of subsets of the two whole-tone scales, although many of the pitches in both works seem to

have been determined by the pattern of black and white notes on the keyboard rather than their association with specific scales or pitch class sets.

The sextuplets can be seen as successive elaborations of the motive *t* in "The Magic Circle of Infinity", which has a white-note dyad on the upper stave and a single black note on the lower, as have the first two sextuplet passages in "Spring-Fire". The third passage adds a note to each stave, the fourth has 4-notes simultaneities on each stave. It is in the fifth passage that the pattern is made clear: the notes on each stave are adjacent black or white notes, the pitch content of the simultaneities is relatively unimportant.

There are 10 (5 X 2) passages consisting of either 3, 7, or 10 repeated statements of *v*: a semiquaver followed by 4 grace notes, descending when played with the right hand and ascending with the left. Of the 3 left hand passages, two are whole-tone and one is semitonal; 3 of the right hand passages have the pcs [0,1,4,6,7], the pitch content of the remaining 4 is varied. All versions of this basic cell lie under the hand and, despite the differences in pitch content, will be designated *v(X)*, with the parenthetical letter indicating the pitch of the semiquaver. These are played with the right hand unless stated otherwise.

In line one, there are 10 statements of *v(B)*, with a fingernail scrape over the metal windings of the strings at the start of the seventh statement. Ten statements of *v(D)* follow the first motive of sextuplets, with the fingernail scrape in the same position. Seven statements of *v(G)* overlap with 7 of *v(F)* in the left hand, which in turn overlap with 7 of *v(A)*. A similar set of 3 overlapping statements—7 each of *v(D)*, *v(E)* in the left hand, and *v(F)*—is introduced by 3 statements of *v(D-sharp)* in the left hand; 3 statements of *v(B)* interrupt the melismatic passage in the preceding line.

The overlapping of passages results in 5 separate sections in "Spring-Fire" based on *v*, as there are 5 passages of septuplets. A hybrid of these two ideas first appears at the end of the seventh line: a two- or three-note semiquaver (black notes) followed by 3 or 5 grace notes (white notes). This hybrid occurs 3 times, the final version extending the original succession of 3 semiquavers to 5. The opening gesture, a pair of forearm clusters, is played a total of 10 times during the piece (using the same pitches); the first and last pair are each

sustained for 5 seconds. These pairs of clusters also have black and white notes on separate staves.

The other material in the piece consists of melismatic passages. Each phrase begins semitonally; those in the first seven lines that do not end semitonally use the pcs [0,1,6,7], except for the second and third complete phrases in the sixth line, which end with [0,1,3,4] and [0,1,4,5], respectively. The first phrase in the eighth line ends [0,1,3,4]; the final phrase of the piece ends semitonally, but includes a section of [0,1,3,5,6]; the remaining phrases in the last four lines end with [0,1,3,6,7], or semitonally.

11. Dream Images (Love-Death Music) *Gemini*

This opens with a series of 4 chords, alternately B and F-sharp major, each sustained for 3 seconds and followed by a version of motive *w*. The basic form of *w* is [0,2,4]; the first pitch is repeated twice, with the third note tied onto the first of a triplet of quavers, concluding with a triplet of crotchets. Thus, it is a motive of 3 pitches, written in 3 rhythmically different sections.[323]

The variant w_1, which occurs after the F-sharp major chords, omits the first note and adds a 3-note semitonal acciaccatura before the third section. This also contains an extra quaver as part of a triplet; the lower dyad of the acciaccatura is tied onto the first beat of the triplet. The melodic leap in w_1 is down a perfect fourth rather than a major third as in *w*; the pcs of w_1 is [0,1,2,3,6,7,8]; and the second statement transposed down a tone.

A fifth major chord is sustained for 5 seconds and followed by w_2 (which is *w* preceded by semitonal acciaccaturas), and 3 fragments from the end of w_1, with the accompaniment (left hand) replaced by the beginning of the first quotation of Chopin's *Fantaisie-Impromptu.* There are 3 extracts from this work, written within quotation marks; the relevant section of the *Fantaisie-Impromptu* has a key signature of 5 flats, a time signature of 4 beats in each bar and consistent triplets in the left hand. A statement of w_2, with the acciaccaturas preceding the third pitch, occurs at the end of the second line.

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[323]Each section also contains 3 written notes, but the first note in the middle section is not sounded because of the tie.

The second Chopin quotation is preceded by w_3, a further variation which has 25 sounding notes, divided by a rest into 9 + 16. This is a musical analogy of the Pythagorean right-angled triangle. The theorem that the square of the hypotenuse is equal to the sum of the squares of the other two sides is illustrated most simply using the numbers 3, 4 and 5: $3^2 + 4^2 = 9 + 16 = 25 = 5^2$.

Since the first quotation is 5 bars long, and the second 4 bars, the third should consist of 3 bars, not two. This inconsistency is partially obscured by a difference in tempo. Each beat in the final quotation lasts for 1.25 seconds, making the approximate duration of these two bars 10 seconds; 3 bars in the tempo of the previous quotations would have lasted 12 seconds.[324]All the quotations are followed by a B major chord, with a 5-second fermata in the first two instances, but a two-second fermata after the two-bar quotation. (This is the only two-second fermata in *Makrokosmos I.*)

The A, F and E-flat major chords before the first tempo change have pauses of 3, 4 and 7 seconds, respectively. (There are 14 long pauses in the entire piece.) The roots of these chords are of the pcs [0,2,6], as are the pitches on the lower stave of the first phrase in the *un poco più animato* section. These 5 crotchets are played against 4 crotchet triplets on the upper stave, the combination of pitches making up [0,1,2,3,4,6,7,8], which equals that of w_1 with an added pitch.

Extracting the pitches B, A and F (a third [0,2,6] pcs) from this set leaves [0,2,4,6,8], which is an incomplete whole-tone scale. The juxtaposition of the whole-tone scales on A and B-flat, preceded by trills on these two pitches, is succeeded by a motive containing 4 ascending perfect fourths.[325] The pitches in this motive can be arranged as two 4-note semitonal clusters, below A (G-sharp - F) and above B-flat (B - D). The subsequent D-sharp, notated in triplet rhythm, creates a tritone with the A; the string glissando in the next phrase begins and ends on E, which creates a tritone with the B-flat.

The end of this glissando coincides with the end of a 12-tone "row". (Until the start of the glissando, there is octave displacement of the pitches which belong to different

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[324]Since each extract ends with "*molto rit[ard].*", it does not affect the relative durations significantly.
[325]This motive, pcs [0,1,2,3,6,7,8,9], occurs twice in "Night-Spell I".

whole-tone scales.) The remaining 7 pitches in this motive of 4 quintuplets make the pcs [0,1,2,3,4,6,8], which can be seen as another modification of the pcs of w_1. The pitches used to conclude this section are a transposition of the motive of perfect fourths, arranged to emphasise tritone relationships, using 3 quintuplets and 5 triplets as well as groupings of 4 notes.

An interesting relationship exists between the 3 metronome marks: 60 is the product of 3, 4 and 5; the difference between 72 and 60, and between 60 and 48, is 12, which is 3 + 4 + 5. There are also 12 sustained major chords in "Dream Images".

12. Spiral Galaxy [SYMBOL] *Aquarius*

The opening phrase, *z*, consists of a series of 7 perfect fifths, with the final pitch repeated 13 times. This is an oblique reference to *x* (the 7 minor chords used in "Primeval Sounds", "Crucifixus" and "The Abyss of Time"): the duration of the quaver in "Spiral Galaxy" is 3 seconds, the interval between the first and seventh pitches in *z* is a tritone, and the second phrase is a tritone transposition of the first. The tritone glissando associated with *x* has analogies in the 3 glissandos in *z*, and in the number of repeated notes: 13, like the tritone, has acquired evil connotations. This group of 13 notes lasts for approximately 4 seconds, and is followed by a 5-second fermata.

The first 4 quaver beats of *z* form a Pythagorean *tetraktys*, which is an equilateral triangle constructed from the first 4 natural numbers, with 1 at its apex and 4 at its base. (It symbolised for the Pythagoreans the mysterious progression from the unity of one to the unity of the sacred number 10.) Crumb's musical *tetraktys* has, successively, 1, 2, 3 and 4 notes, accumulating in perfect fifths. The 3 harmonics that follow continue in ascending perfect fifths, so that the 7 pitches in the first phrase constitute the notes of E major, and those in the second phrase, B-flat major.

Legend attributes to Pythagoras the discovery that pitch depends on the relative lengths of vibrating strings, and that ratios of 1:2, 2:3 and 3:4 produce intervals of an octave, a perfect fifth and a perfect fourth, respectively. A cycle of twelve perfect fifths produces a pitch that, when transposed down 7 octaves, differs from the original pitch by

the ratio of 80:81. This ratio is known as the ditonic, or Pythagorean, comma. The "circle of fifths" is a misnomer; it is a spiral of fifths, perhaps another Pythagorean allusion in "Spiral Galaxy".

The piece is in 5 sections, the second being the tritone transposition of the first, and the third consisting of 3 phrases of quintuplets (white notes) played against triplets (black notes), using the pcs [0,1,2,3,5,6,7,8]. The fourth section is derived from *z*. Each of the 7 simultaneities contains all 12 chromatic pitches, divided between the staves as semitonal clusters. The clusters on the lower stave rise by perfect fourths, while those on the upper fall by perfect fifths, so that they converge and are adjacent at the seventh simultaneity. The pitches occupying the same relative position in each simultaneity produce a particular major scale. Unfolding the pitches of a major scale by means of ascending perfect fifths, as in *z*, is inverted in this section, and expanded to include all the major scales.

The semitonal clusters spiral into each other as if into a vortex, and the calligraphy of this piece illustrates this image, yet it does not seem to be a musical analogy for the big crunch, the singularity at the end of the universe, nor for T. S. Eliot's morbid description of the way the world ends: "Not with a bang but a whimper."[326] This music transcends the limits of time and space, emerging from a "Vast, lonely, timeless" place, and ending "*quasi niente*", as if continuing beyond the threshold of hearing. The final section, written as 5 phrases, thus becomes an infinite extension of the second, and the pcs [0,1,2,3,5,6,7,8] is transposed up a perfect fourth, not a tritone.

The numbers 7, 12 and 40 (the metronome mark) are all present in the penultimate section, and "Spiral Galaxy" concludes with groups of 3 and 5. The tritones which occur so frequently throughout *Makrokosmos I* are finally resolved by perfect fourths and fifths, restoring the Pythagorean ideal of the Harmony of the Spheres.

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[326]T. S. Eliot, "The Hollow Men", in *Collected Poems: 1909-1935* (London: Faber & Faber, 1936), 90.

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