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CHANCE OPERATIONS AND INDETERMINATE
PROCEDURES IN THE WORK OF JOHN CAGE
1950 - 1970

A dissertation submitted as partial fulfillment
of the Master of Arts Preliminary

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CHAPTER ONE

INTRODUCTION

Since 1950, the inclusion of chance operations and indeterminate procedures in musical compositions has brought about wide-spread dispute. The complete musical process from the composer to the listener has had to be reassessed in the light of chance and choice, freedom and control, the predictable and unpredictable. Music involving these practices to whatever degree, is mobile and flexible. Having more than one possible realisation, it challenges the finite masterpieces which have formed the basis of Western musical tradition since the Renaissance.

From the outset, the terms chance operations and indeterminate procedures require some distinction. Both terms involve a plurality of possibilities, both thereby utilizing the uncertainty of the unknown. Chance Operations are techniques which bring about a result through random means within an already established method as in the throwing of dice, the tossing of coins, the dealing of cards. As a technique, the range of possibilities is more easily predicted when the norms of that technique are known quantities. When the possibilities lie within

a fixed field, such as a series of numbers, then the outcome can be calculated through the application of probability theory.

Indeterminacy, by way of contrast, is a philosophical concept rather than a technique. Indeterminate Procedures are the means through which a state of indeterminacy is ascertained. The essential feature is that its outcome is not predictable. In a general sense, a work is said to be indeterminate if one or more of the parameters of pitch, tempo, rhythm, duration, density, timbre, dynamics has multiple potential solutions, or if the relationship of parts to the whole is unforeseeable. The word 'procedure' has been chosen to emphasize the activity required to bring about a state of indeterminacy. Where more than one alternative exists, the necessity to choose does entail some effort.

The terms should not be regarded as being mutually exclusive as both are in themselves variables. Although similar in their use of changing norms, the unknown, and their ability to solve or induce an ambivalent musical position, each chance operation and indeterminate procedure may be applied in differing ways and degrees to quite

different effects according to the situation. For the purposes to be outlined, the distinction is useful.

As a chief exponent of chance operations and indeterminate procedures, John Cage has excited both constructive and severe criticism. His commitment to these notions is unsurpassed. It is evident in his philosophical writings, his compositional techniques, his scores, performances, in fact his way of life.

It is my intention to investigate chance operations and indeterminate procedures from two perspectives simultaneously; the first is with respect to their nature as philosophical concepts at work in the musical process and the second more specifically in the works of John Cage during the years 1950 to 1970. In order to realise these objectives, a random sampling of compositions from that period will be examined. The different types of chance operations and indeterminate procedures will be identified, their position in the musical process located and the degree to which each is used in determining the nature of the piece as a whole, assessed.

One underlying assumption has perhaps been taken for granted to this point: that the works from 1950 - 1970 lie within the boundaries of contemporary music. As to

what comprises 'contemporary music' and 'music' generally varies enormously. To avoid making value judgements which could impair the range of works included in the random sample, I have chosen to subscribe to Cage's all-embracing view point. Questionable though it is from many points of view, the equality given to art, music and life in this quotation from his major collection of writings, Silence, validates the discussion of any 'experience'

When we separate music from life, what we get is art, (a compendium of masterpieces). With contemporary music, when it is actually contemporary, we have no time to make that separation (which protects us from living), and so contemporary music is not so much art as it is life and anyone making it no sooner finishes it than he begins making another just as people keep on washing dishes, brushing their teeth, getting sleepy and so on ... For any one of us contemporary music is or could be a way of living.
(Cage, 1961, pp. 44 - 45)

From this point of definition two ideas emerge which are crucial to Cage's personal philosophy. Art for Cage is an on-going process experienced in the same way that life is experienced and is therefore available to everyone. Calvin Tomkins makes the valid observation that "art and life for Cage are no longer separate entities as they have been in the past, but very nearly identical, and Cage's whole career can in fact be seen as a long

campaign to break down all demarcation between the two".¹

Cage's belief in the symbiotic relationship between art, music and life, led him to approach environmental sound with new tolerance and increased perception. Not only was he aware of the timbral possibilities of everyday domestic activities such as the rustle of paper, drinking water or blowing a child's whistle, but he envisaged outlets for the ever-increasing number of technologically produced sounds especially through the use of microphones, tape recorders and the radio. As early as 1937, Cage delivered a Credo on 'The Future of Music' in which he declared "I believe that the use of noise ... to make music ... will continue and increase until we reach a music produced through the aid of electrical instruments ... which will make available for musical purposes any and all sounds that can be heard."²

Every sound which is accessible, whether noise or music is acceptable to him. "We can compose and perform a quartet for explosive motor, wind, heartbeat, and landslide"³. A visit to an anechoic chamber in the physics

1 Calvin Tomkins. 1968. Ahead of the Game. Penguin Books Australia Ltd., p. 75.

2 John Cage. 1961. Silence. Middletown Connecticut: Wesleyan University Press, pp. 3 - 4.

3 ibid., p. 3.

laboratory at Harvard University, revealed to Cage that there was no such thing as absolute silence. In a room which was as technologically as silent as possible, he identified the high and low sounds of his respiratory and circulatory systems. From this point, the composer consciously reconsidered the role of silence and redefined it in terms of intentional and non-intentional sounds. The early fifties became an intense period for experimentation with these 'sounds not intended', and in 1952 his radical position regarding indeterminacy became consolidated with his silent piece 4'33". 'Silence' was no longer punctuating relief in a stream of sound. It became another changing and viable element in its own right, completely challenging traditional notions of music and its performance. "A cough or a baby crying will not ruin a good piece of modern music ... As contemporary music goes on changing it in the way I am changing it, what will be done is to more and more completely liberate sounds."⁴

When asked to what purpose was experimental music,

4 ibid., p. 161.

Cage replied "no purpose, just sounds"⁵. In 45' For a Speaker, he continues "the highest purpose is to have no purpose at all. This puts one in accord with nature in her manner of operation ... This seeing of cause and effect is not emphasized but instead one makes identification with what is here and now ... the relationship of things happening at the same time is spontaneous and irrepressible."⁶ It is interesting in this respect that Cage is also an expert mycologist.

The role of change in an unpredictable context is the life force of chance operations and indeterminate procedures. Cage would add, to no purpose but to exist. One logical consequence which must be faced as a result of this "purposeful purposelessness"⁷ is the decline in status given to the creator, traditionally recognized as the composer. He no longer is totally responsible or in control of the finished product. Cage, in fact, aims to abolish the overt presence and identity of a mastermind and in his own compositions takes precautions against his own tastes, imagination, preconceptions, memory and ideas

5 John Cage, 1955, The Score, 12 June, 1955, p. 68.

6 John Cage, 1961, Silence, p. 155.

7 ibid., p. 12.

to allow the sounds to be themselves. "Simply a way of waking up to the life we're living which is so excellent once one gets one's mind and one's desires out of its way and lets it act of its own accord."⁸

Such a philosophy is antagonistic to musical aestheticians and composers who value some degree of autonomy and individuality. Theoretically Cage's attitude is that powers of discrimination must be laid aside in order to fully participate. The validity of such a philosophy is not the subject of this paper. It may be rejected on personal, empirical or aesthetic grounds. But it needs to be recognized and understood as crucial to the study of the period 1950 - 1970 when chance operations and indeterminate procedures played such a dominant role. One thing is certain, something of the man and his commitment to this philosophy is intrinsic to these works.

8 ibid.

CHAPTER TWO

COMPOSITION

The phenomenon of music, the series of sounds in ontological time, is reliant upon more than one act for its existence. At the outset, there is the spark of the creator which becomes an energising stimulus for the work. This is transmitted through form and content and made audible by the skilled performer through sound waves which in turn are verified by the listener. Each part of this process is variable and bears no finite relationship or proportion ratio in order to be music. In an interview with Roger Reynolds, Cage comments,

We normally think that the composer makes something, the performer is faithful to it, and the business of the listener is to understand it. Yet the act of listening is clearly not the same as the act of performing, nor is either one of them the same as the act of composing. I have found that by saying that they have nothing to do with one another, that each one of those activities can become more centred in itself, and so more open to its natural experience. (John Cage Catalogue 1962 New York. Henmar Press Inc., p. 48.)

Chance operations and indeterminate procedures played a large part in reassessing the traditional roles and expectations of music as a compound interrelated process.

Since Greek antiquity, composers have been regarded as 'possessed' or under divine influence to account for their peculiar inspirational powers of germinating musical ideas. Through the study of the work and ideas of psychologists such as Jung and Eckhardt, Cage became concerned about the nature of subjectivity, the subconscious and irrational thought processes. They interfered with the liberation of sound, he thought which should exist for itself, for no purpose, under no influence. Chance operations provided a means through which he could abdicate from the dictates of his memory, background, taste, intellect and imagination, all factors which have fashioned throughout music history, the almost untappable compositional process.

By using the I Ching, the ancient Chinese Book of Changes (attributed to Fu Hsi 2953 - 2838 B.C.), Cage found that through the tossing of coins¹ he could arrive at an unbiased numerical solution which could be used to stimulate composition. The digits are obtained in the following way. Three coins of the same size are tossed in the air. The inscribed side of each coin counts as two, and the reverse as three. Therefore, the inscribed

1 Originally yarrow sticks or six wands were used to consult the oracle.

sides together equal six and the reverse sides together equal nine. Two inscribed sides and one reverse side equal seven while two reverse sides and one inscribed side equal eight. Sixty-four possible hexagrams can be built up from a series of broken and unbroken lines derived from the coin tossings in different combinations, which then can be identified to consult the oracle.² Cage has consulted the oracle at certain times for advice concerning compositional methods but he is more concerned with the numbers themselves as potential information in the organization of sound. They function within a field limited by the composer, bringing about specific solutions.

This is what you have to do if you are going to write by means of Chance operations. You have to envisage exactly what are the questions you ask when you write music and then toss the coins to help you to answer each question. Once I finish this, the results become a recipe for a recording to be made. (John Cage, *Silence*, p. 19)

One of the earliest examples of this practice is in Imaginary Landscape No. 4 for 12 radios, 24 players and conductor of 1951. Cage established that the first tossing would relate to superposition, that is, the number of events happening at once, and the tempo of a

2 A more detailed account of the method of consulting the I Ching accompanied by diagrams of the 64 hexagrams is available in Alfred Douglas, The Oracle of Change: How to Consult the I Ching. Gt. Britain, Penguin, 1972.

certain timing, the second tossing would relate to structure, the third to sound or silence and the fourth to dynamics. The actual tossings were 8 plus 4 plus 15, repeated 25 times, and the import of these figures in determining the musical material could really only be gauged by the composer, for in using a technique such as the I Ching, certain assumptions are made. Firstly, no tossing can be ignored or replaced by a consequent tossing. Each reading must be accurately recorded and applied to the nominated criteria. The coins used must also be unbiased so that there is equal chance of both results from each coin, yielding every combination. These factors, however trite, must be observed if there is to be a free interplay of chance.

The extent to which this chance operation is indeterminate varies according to usage. The basic numbers only being four, 6, 9, 7, 8 is not really a limitation when the diverse hexagram formation is considered and the position of the numbers in varied sequences. The numbers are rather a flexible tool reliant on the decisions formulated for their application, and the degree of consistency with which they are applied.

In Music of Changes Volumes I - IV, of 1951, the I Ching is used as a means of arriving at traditional fixed piano notation. In this work, chance works for control. Chance operations are used only to determine specific structural problems influencing the morphology of continuity. The actual musical material is rationally determined. The overall structure was built from the series of numbers 3, 5, $6\frac{3}{4}$, $6\frac{3}{4}$, 5, 3 which became the number of units within each section, and also the number of measures of $\frac{4}{4}$ within each unit. At each small structural division such as at the fourth and ninth measures, chance operations determined the stability or change of tempo for the following section. Potentially then, the temporal relationship between internal sections had more than one possible realization. The fixed result was a sliding scale ♪ = 69, ♪ = 176, ♪ = 100, ♪ = 58. However, a final toss of the coin determined the rate of tempo for the piece as a whole thus fixing its length and modifying the proportions already established. Chance operations were used side by side with rationally controlled charts derived from the Chinese Book of Changes, the outcome of which was freely applied at will. In a square chart

eight times eight used for consulting the oracle, thirty-two were sounds, thirty-two were silences. The thirty-two sounds were arranged in two squares, one above the other each four by four. All twelve tones were to be present in any four elements of a given chart, whether a line of the chart was read horizontally or vertically (see Table one).

TABLE 1
CONTROL CHART FOR PITCH RELATIONSHIPS
AND SILENCES FOR MUSIC OF CHANGES

1	34	5	26	11	9	14	43
25	51	3	27	24	42	21	17
6	40	29	4	7	59	64	47
33	62	39	52	15	53	56	31
12	16	8	23	2	20	35	45
44	32	48	18	46	57	50	28
13	55	63	22	36	37	30	49
10	54	60	41	19	61	38	58

SOUNDS

SILENCES

derived from the key to locating hexagrams for consulting the oracle as it appears in Alfred Douglas, The Oracle of Change, ~~op. cit.~~, p. 40.

Just exactly how the numbers corresponded to the twelve pitches is virtually impossible to trace in view of the lack of information given regarding the number-sound symbolism and the order and direction of readings taken. Added to this is the problem that the charts were subjected to the chance operation described by Cage as mobility-immobility and the results of this application in terms of which charts and which pitches were rendered mobile or immobile, were not given.

Twenty-four charts, eight for sounds and silences, eight for durations, eight for amplitude, were throughout each structural unit half mobile and half immobile. Cage explains that "mobile meant that once any of the elements in a chart was used, it disappeared to be replaced by a new one. Immobile meant that though an element in a chart had been used, it remained to be used again. At each unit structural point, a chance operation determined which of the charts, numbers one, three, five and seven or numbers two, four, six and eight were mobile and which of the charts were immobile - not changing."³ Once the dodecaphonic requirement was satisfied and the ~~subjected~~ charts for

3 John Cage, "Composition as Process" in Silence op. cit. p. 21.

duration and amplitude co-ordinated, Cage freely interpreted the results punctuating them with noise and repeating notes at will.

Chance operations have a minimal role to play in Music of Changes when the entire compositional process is reviewed. At a very specific level they function as a means of making decisions in the note to note compositional procedure. Through such an act, he claims, "For what happened came about only through the tossing of coins."⁴ The idealism of this statement is obvious in the light of the degree of Cage's own choices at the various stages of composition just indicated. While the composer is involved with certain relatively confined aspects of chance operations, the product of that process is a fixed blueprint for the performer. The specificity of the nature of the instructions given to the performer such as fractional durations and dynamics ranging from pppp - ffff, often juxtaposed, in Cage's terms "gives the work the alarming aspect of a Frankenstein monster".⁵ From this point onwards, Cage works towards breaking down the degree to which performers are controlled by composition thereby aiming to destroy

4 ibid. p. 22.

5 ibid. p. 36.

the concept of masterpiece which offers no scope for the performer to utilise the unpredictable.

For Williams Mix of 1952, Cage used the I Ching over a nine month period, so great were the number of decisions to be made. The piece, for magnetic tape utilising eight single tracks or four double tracks, requires over six hundred recordings to make one version; every indication for cutting and splicing being carefully controlled by chance operations. A wide array of charts each containing the sixty-four elements derived from the I Ching were used to determine all the musical elements. Sixteen charts were devised for the calculation of each of sound and silence, duration, attack and decay. The interrelationship of these parameters became more elaborate when subjected to the operation of 'mobility-immobility' which decided which of the charts would predominate. The new material was drawn from a deck of appropriate cards shuffled in the manner of Tarot giving a sound, a duration or pattern of attack or decay which had not previously occurred in the range of possibilities.

The series of pieces Music for Piano I (1952), 2, 3, 20, 4 - 19 (1953), 21 - 36, 37 - 52 (1955) and 69 - 84 (1956) are unlike Williams Mix and Music of Changes in

that Cage renounces any control over duration. The pieces have no finite structure, the notation being in whole notes which are to be freely interpreted according to their position in time-space and their relationship with other tones. The compositional procedure for each was similar in that the chance operation involving the study of imperfections in a piece of paper was used in conjunction with the I Ching. The composer's detailed account of the methods used for the composition of Music for Piano 21 - 52 appears in an article published in Die Reihe.⁶ Briefly, the I Ching was employed to determine the density of sounds per page. The position of these sounds on the page was ascertained through the study of pointal imperfections in a blank sheet of transparent paper and these were marked on to the transparent master score in pencil according to the number predicted by the I Ching. The master sheet containing widely separated staves to allow for extreme ranges at any pitch, and complex timbral indications, was superimposed and the pitches that lay within the staves were inked in using whole notes. To some extent, these had to be approximated spatially as to their final position because the

6 John Cage: "To Describe the Process of Composition Used in 'Music for Piano 21 - 52' ", in German Die Reihe, 3 1957. Reprinted in English translation in the American edition Die Reihe, 3. New York, Theodore Presser, 1959.

overlays could not be guaranteed to exactly intersect. Whether the clefs were to be bass or treble was reliant upon eight single coin tosses. The pitches therefore, were the result of three chance operations working in combination; the I Ching determined the number of pitches and the type of clef, the imperfections, their spatial distribution, and the overlay of transparencies, their final articulation. The overlays also provided for the notation of noises produced by hand or beater upon the interior or exterior of the piano construction. This came about because of the straight line which bisected the area between the two staves. Pitches falling above that line were to be played on the interior, those below, on the exterior.

The sixty-four possibilities of the I Ching were divided into three groups to establish timbre; the piano could be muted or plucked on the strings, or played normally. Cage cites an example in applying the I Ching to these three categories. If 6 and 44 are the numbers tossed, then 1 to 5 will be normal, 6 - 43 muted and 44 - 64 plucked, always being applied in that order. The weight of probability varies with each tossing. In this case, muted and plucked strings would predominate. The letters P M are the symbols

to be used on the score but no method of applying them is given. A similarly indecisive method is used for determining accidentals.

While several chance operations have been used simultaneously to articulate certain limitations in the parameters of pitch and timbre, they have not been applied with a view to rigorous definition. The chance operations then in this case, work towards freedom and flexibility within certain limits, thus contributing to the degree of indeterminacy present in the score which will be discussed in Chapter three.

The idea of using the imperfections in a sheet of paper to generate sound material was intended, like the 'I Ching', to free the sounds from the influence of memory, taste and background. Like the Rorschach tests of psychology, the particular piece of paper in question contains all the information required. The immediacy of the situation deems all past influences as irrelevant. As a result of this, greater stress is placed upon the particular piece of paper as it has a more definitive role to play than it had formerly. Each sheet is recognized as having an identity of its own, yielding different unpredictable imperfections. To invest commonplace objects and activities with new meaning, is an integral part of Cage's philosophy of music and art generally.

Consider the practice of superimposing two transparent sheets. Cage uses this simple procedure consciously utilizing the never ending array of possibilities contingent upon the position of marks on the sheets, and the angles at which they are placed to intersect.

Of the four pieces composed for Church Carillon dedicated to Mary Carolyn Richards, the first three composed before 1954, employ chance operations which can be seen as an extension of the previous two, pointal imperfections and transparent overlays. In Music for Carillon No. 1 of 1952, differently shaped scraps of paper were folded and small holes cut into the folds. These were unfolded and used as stencils inserted at structural points of the traditional notation determined by the 'I Ching'. For the second and third pieces, the third being an inverted retrograde reading of the second by placing the score upside down, imperfections were studied on a piece of cardboard and then punched through with a pin.

Maps, graphs, templates and overlays of all descriptions have been used to stimulate specific questions arising from problems associated with the unknowns particular to each. In some cases they provide a means to more finite

information for the composer such as in Atlas Eclipticalis and Music For Carillon No. 4 both of 1961, while others represent the end of the compositional process by the composer. In the latter case, the templates and overlays are presented as a type of 'kit' from which the performer interprets the sound. Pieces of this type, in which John Cage seems to have almost entirely abdicated as composer, (such as Music For Amplified Toy Piano and the six pieces in the Variations series,) will be discussed at greater length in Chapter four under 'Performance'.

Perhaps the most complex example of overlays is used in the piece for magnetic tape or any other instrument or device, Fontana Mix 1958. It comprises ten transparent sheets with points, ten drawings having six differentiated curved lines, a graph having one hundred units horizontally and twenty vertically and a straight line. When superimposed, the straight line is used to connect a point within the graph with the outside. A series of measurements can be taken to determine the musical elements such as changes of amplitude, frequency, overtone structure. Once Cage had collated the specific information to be recorded in his version for magnetic tape, he took subsequent readings to isolate the position and length of tape loops, splicing,

editing, and the distribution of the sound in space. As the composition was an ongoing process because the composer was the performer, the chance operations were consistently applied at a number of levels, helping to fashion the sound product to a considerable degree.

The diversity of the material used in superimposed scores, places the composer in the position of a scientific discoverer whose task it is to solve problems in a delineated field. Atlas Eclipticalis, Music For Carillon No. 4 and Variations IV are particularly interesting in this respect as they all employ the use of maps. In the first two works mentioned, pages of an astronomical atlas are the basis for a series of transparent overlays upon which the desired stars are encircled. In 'Atlas', Cage used this method for triggering the musical material for each of the eighty-six orchestral parts (no strings). The large battery of decisions in interpreting the stars into notes was not finished for twelve months. The decisions made resulted in a mixture of traditional and graphic fragments placed in unusual relationships to each other. They may be read vertically or horizontally in places indicated by a complex series of arrows.⁷ It is interesting that the spatial

7 John Cage, Atlas Eclipticalis, New York. Henmar Press, 1961, pp. 245, 309, 15. (horn and percussion parts)

complexity in the score came about through the use of an elaborate circular map. As late as 1969, John Cage chose to work from the basis of an astronomical atlas in his piece Atlas Borealis to be performed simultaneously with the Ten Thunderclaps. In Variations IV, a map of the performance area was integral to the chance operation of superimposition. This is just one example of the diverse application possible with such a technique in the compositional process.

Cage's experimentation with Chance Operations extends well beyond these introductory examples. From 1950 onwards, Cage sought the advice of the 'I Ching' more and more to aid compositional decisions. It is applied to nearly every parameter in diverse ways peculiar to specific works. The two Pastorales of 1951 for prepared piano, the vocal piece Solo for Voice I of 1958, the seven Haiku's of 1952, and the audio-visual piece Water Music of that same year, are only a few examples. In Water Music, the 'I Ching' was used to co-ordinate activities as bizarre as pouring water from one container to another, blowing a whistle and rifling a pack of playing cards. The 'I Ching' became a constant compositional tool and is present in some capacity in the majority of works composed over this twenty year period.

Similarly, the imperfections in paper were applied in varied ways to contrasting ends. The fixed graphic scores which resulted from this method in works like 26'1499 for a string player and 27'10.554 for a percussionist of the mid fifties, can be compared with the changing densities and flexible time-space of Winter Music of 1957. The random aspects of this technique continued to influence Cage for many years, but perhaps in that the operation was most commonly used to determine pitch, requiring only one application per piece, its scope appears more limited than that of the I Ching. In 45' For a Speaker, Cage described, "I am still thoroughly puzzled by this way of composing by observing imperfections in paper. It is this being thoroughly puzzled that makes it possible for me to work."⁸ The importance of this method like that of the overlays, is in triggering off the initial energy to drive a piece to its aural conclusion. It sets the careful note by note procedure in motion. The concept of 'immobility-mobility' grew less in consequence as time proceeded.

Chance operations can be both agents for and solutions

8 John Cage, Silence, op. cit. p. 165.

to unknown quantities. The puzzle is in the working out of the various possibilities in order to arrive at a solution. No one solution is correct, the act of making choices about the way to proceed is crucial to composition. Chance operations provide a proving ground for those decisions. It is the responsibility of the composer to carry through the limits formed by decisions in a consistent way. Cage often queries the 'anything will do' method, as he himself consciously admits that dedication is necessary. This attitudinal involvement is embodied in the effort made in making choices. It is particularly evident in many of the instances cited. If it is not exerted, then plausible rather than possible aspects of the free interplay of chance will only be explored.

The freedom-control dichotomy is implicit in chance operations where limits are self-imposed. Cage's increasing concern with this ambivalence, coupled with his intrigue for measurement, led to his one and only computer composition HPSCHD 1967 - 68 in collaboration with Lejardin Hiller.

It is significant that Cage uses the computer, a machine requiring complete determination, for every stage of a decision must be carefully articulated and sequenced if it is to be accepted for processing. In no sense can

an idea, which may seem logical through implication from preceding material, be assumed. It must be translated precisely into computer language. If not, it will be rejected as "fatal-error" or "non-fatal error". The computer will not function until the error has been removed.

This physical requirement casts new light on the way composers think and choose in making a piece of music. Suddenly a consciously admitted program of thoughts must be obviated. Since the writings of Plato, the compositional process has been considered unreachable. Even as late as 1947, Stravinsky writes in Poetics of Music, "It is impossible to observe the inner workings of the process from the outside."⁹ In the case of the computer, this is demanded. Cage remarks, "This is the first time in history that we have in any way been able to say with accuracy what it was that was thought in order to bring about the thing that eventually took place in all the details of the logic of the thought processes."¹⁰

It was twenty months before Cage and Hiller could realize their decisions through the computer. Each note of the fifty-eight channels of sound represents a mutually

9 Igor Stravinsky. Poetics of Music. New York, Random House. Reprinted Harvard University Press, 1947 p. 50.

10 Larry Austin. "HPSCHD", Source, II/2, 1968, p. 10.

acceptable decision. Certain problems idiomatic to the computer made the formerly straightforward use of the 'I Ching', a major task. It took six weeks of solid work to program a subroutine 'I Ching', the chance operation being a contrivance when compared with the facility of random number sequences and operations built into the computer.

The piece has seven written out keyboard versions, the first of which is taken from Mozart's Musical Dice Game K294d. realized twenty times, with a computer realization sixty-four bars in length over the duration of a minute. The 'I Ching' was then used to designate which bars of the piece were to be replaced with other music in subsequent versions. Two sets of compositions were selected as replacement material, mainly drawn from Mozart, Beethoven, Chopin, Schumann, Busoni, Cage, Hiller, Gottschalk and Ives. Cage went through the standard edition with the 'I Ching' choosing the sonata, the movement, each minute of duration and labelled it Replacement music 1, Replacement music 2, and so on. If the I Ching subroutine supplied the integer 20, bar 20 of the Musical Dice Game would be replaced by Replacement music 1. If by chance an integer was repeated in a set of twenty values,

then Replacement 1 was bypassed and Replacement 2 inserted in its place. An elaborate flow chart was set up to account for all the desired musical material in computer terms, GAMUT for scales, DEVIA for inflection, ICTUS for the number of events, TICTUS combining the number and type of notes and DURAT the time in milliseconds. The 'I Ching' plays a part in determining the number of events for a particular DEVIA, and the numerical value between 1 and 16 assigned to the TICTUS counters.¹¹ Three dynamic ranges pp, mf, ff were established and applied according to the proportions supplied by the I Ching. The result from the numbers 1 - 16 - 61 - 64 was that mf was to dominate, and ff rarely occurred.

The I Ching generated a number between one and sixty-four which set a process in motion which decided whether the timbre of a note should be altered or not. The number is divided by eight to produce a dividend and a remainder. The dividend is interpreted as a value amplitude scale and the remainder as the value on the scale. If either is equal to zero, or if the sum of the two numbers is greater than eight, then the process is recycled. If it is equal

11 For a detailed account and diagram of this program see Larry Austin: Source, Music of the Avant Garde, Vol. V, Davis California, 1968, pp. 17 - 21.

to eight, an inflection point is not to be generated in the curve. If the value is less than eight, an inflection point is to be generated. The chance of generating a straight decay slope rather than a curve, is only one in four. Thus the probability is weighted towards inflection.

The 'I Ching' is only one random subroutine in the work and it requires a great deal of programming. The binary choice random operation using 0 or 1, basic components of computer programming, was used to decide which of the Cage or Hiller pieces would be used for a particular measure. The result of the procedure was a partial mixture of the two compositions and residual material.

The random number generator is another chance operation implicit in the computer. Five thousand one hundred and sixty integers for this work were stored in random sequence, each number being generated only once. Ternary choices made by the computer in the subroutine CHOOSE define pitches and the style of melodic writing from step-wise chromatic, ordinary diatonic or arpeggiated chords.

Because the compositional process is so elaborate and the number of decisions made so manifold, it is difficult to describe and assess the extent to which chance operations are involved in this work. It must suffice to

say that they play a large part in the superimposition of sound sources, the possible pitches, attack and decay, the dynamics, melodic curve, and diatonic chromatic or chordal modes. Each chance operation in each subroutine has a specific role to play. Random features exist alongside carefully defined programmes or decisions which gear the probability factors to a desired effect. What is obvious is the care and exactitude required in working with such a medium. The necessity to proceed through a consciously worked out logical course of action places the use of chance operations in quite a different context from earlier uses. Yet they are still potentially active means for making decisions within the peculiar set of limits of a compositional process.

Each of the chance operations used has an identity of its own through its particular relationship to the field of chance and unknown. This, however, is not always given free interplay because of the diverse functions and treatments each has been seen to have, even in the few works mentioned. Chance operations may be used to stimulate the composer, to direct the note by note process, or to provide specific content in one or more parameters. Their essential feature is that they are variable tools which work within

a plurality of possibilities. As changing idioms in themselves, they provide flexible alternatives which can be applied to numerous compositional models. By intensifying the role of choice by using Chance Operations, Cage is ensuring that all of the essential questions be postulated and all the possible alternatives regarding pitch relationships, tone quality, shape, contour, intensity, dimension and design, are pondered. It is one way of urging the composer to "wake up to the life we're living", to approach the particular problems with a freshness engendered by the newness and the immediacy of the situation. Chance operations offer practical problems which must be solved in a practical way and this emphasis on the musical material directs the creative imagination immediately towards it.

CHAPTER THREE

SCORES

The study of chance operations in Chapter two has revealed the diversity of the compositional process in both content and method. To a large extent the effect of these operations is modified according to the medium through which they are expressed. It is the purpose of this Chapter to study the scores and notation systems, the end products of the compositional processes, with a view to assessing their role in harbouring chance operations and indeterminate procedures.

Traditionally, the score as a product of musical composition has had an extremely important role to fulfill. In the main, it has represented a body of information so tightly organized that the minutest detail of the composer's conception of the piece, the potential music, can be communicated through a recognized set of symbols. As a body of information, it can define the length of the piece, the overall architecture, and the relationship of parts to each other. More specifically, it records the pitch relationships, their distribution in time-space, the vertical intersection of sound, harmony, tonality, dynamics, instrumentation, timbre, texture, syntax, in short

the morphology of continuity. The score then, has become a visual record of an aural phenomenon used to communicate the composer's particular selection of sounds in time. Each score is a law unto itself although certain ideas, techniques, styles and symbols have satisfied the tastes of different periods in the history of music.

John Cage challenges the notions of closely defined detailed information in conventional notation common to traditional scores. He prefers alternatives which do not require such narrow limits and permanence. From the earlier pre-1950 works, which in the main utilize quasi-traditional scores, Cage branched out to a whole gamut of open-ended styles such as graphic scores, charts, approximated notation or in some cases, no score at all.

The extent to which each score involves indeterminate elements is contingent upon the information given, both in terms of the work as a whole and calligraphic details. On the basis of individual examples, consideration will be given to Cage's conscious and unconscious use of decision making as source material for the event of the work.

To a degree, every score requires basic decisions to be made, often on the basis of assumed background information. If the score is conventional, clefs, pitch, dynamic

symbols and so forth can only be interpreted when a thorough knowledge of the symbols is applied with interest. This is especially true when the symbols involve changes within themselves such as *ritenuto*, *calando*, *rubato*, *tremolo*, *vibrato* or ornamentation. The art of interpretation surely involves numerous decisions to be made from musical and attitudinal perspectives. To avoid pedantry, an arbitrary line has been drawn to distinguish the overt decision making which defines the indeterminate aspects in scores.

In Chapter two, Music of Changes Vols. I - IV was called a Frankenstein monster because of the way chance operations were used to the end of fixed notation. The indeterminate features in this work are composed into the score in specific terms, the choices offered being very limited. In the Preface to the score, some of these features are accounted for. "It will be found in many places that the notation is irrational; in such instances the performer is to use his own discretion."¹ This irrationality arises from the specificity of detail as well as the omission of information usually associated with indeterminate elements. Strings are to be struck

1 John Cage. Music of Changes Vols. I - IV, Peters, 1958.

with the fingers or with a timpani stick, the effect changing according to the position on the string which is chosen. Keys are to be depressed without sounding. Many rests are assumed and sharply contrasting dynamics on the one beat in fast tempi are approximated. Yet these features are slight indeed and there is no doubt that two performances would resemble one another very closely.

Indeterminate features are more easily identifiable where certain parameters are not indicated in the score. In Music for Piano No. 1 1952, duration is not only approximated by uniformly long notes but rests; rhythmic build up or release are left to the performer. Thus, the length of the sounds and their relationships to each other are indeterminate, and consequently the length of the piece as a whole. Space in the score suggests unmeasured time having no fixed proportional value and this is further complicated by the fact that the score may be performed and interpreted simultaneously by more than one pianist. The score is only a preliminary guide when the complex vertical intersection of parts is considered. Music's essential feature is the passage of sounds in time and when this becomes indeterminate with respect to rhythm, tempo, metre, the identity of the piece is affected to

a much greater extent than instances met with so far, particularly when this is coupled with approximated pitch and timbre. Plucked and muted tones as a result of chance operations, have already been shown to be freely interpreted, and noises produced on the interior and exterior of the piano are also indicated.

In subsequent pieces of Music For Piano, tempo and dynamics are omitted so that a minimal amount of instruction is given. The assembly of pieces played continuously can be varied. Of the later pieces, No. 21 - 52, may be played continuously, with or without Music For Piano 4 - 19, individually, or in groups. If desired, the transition from one piece to the next may be separated by silence or two consecutive pieces may be overlapped, a secondary consideration affecting the length of each piece. The pieces themselves may be played in part or in their entirety. Thus both the external and internal 'forms' remain indeterminate.

Winter Music, of 1957, also for piano, is similar in that the score, arrived at through the use of the 'I Ching' and the study of imperfections in paper, reveals indeterminate features both in overall formal scheme and the internal content. The piece consists of twenty pages which may be used in whole or part by one pianist or shared

by two to twenty to provide a program of an agreed-upon length. The notation in space may be freely interpreted as to time, and the length of individual notes or clusters may be free. Overlappings and interpenetrations of material are at the discretion of the performer. The single staff has two clef signs not necessarily in their traditional positions. For instance, two bass clefs may appear at a given moment, one above the stave and the other below. This results in varying degrees of ambiguity according to the choice and position of the clef and Cage expresses the proportion of ambiguity in two numbers notated above sound aggregates, the first applying to the clef above the staff. An inked in rectangle above a pair of notes indicates a chromatic tone cluster. Pitch then, to some degree must be approximated within the field of information given requiring a flexibility of interpretation. Dynamics are also free. It is obvious in this piece that the greater number of norms specified in the score, involve unknown quantities. Thus the score becomes a body of source material from which the performer may select or mould the initial building blocks.

In the given illustrations, decisions have been made

concerning the definition or flexibility of certain parameters during the course of each piece; the norms set, remaining consistent throughout. For instance, if duration is not articulated, then Cage does not suddenly revert to metric and tempo measurements. However, in Concerto For Prepared Piano and Orchestra of 1951, the changing degrees of indeterminacy become the life force of the composition.

Cage makes this comment in connection with the first movement. "I let the pianist express the opinion that music should be improvised or felt, while the orchestra expressed only the chart with no personal taste involved."² In the second movement, large concentric moves on the chart for both pianist and orchestra precipitated the gradual submission of the soloist. In the third movement, the pianist and the orchestra share common material in the score instead of remaining on individual continuums so there is greater fusion between the many silences.

The format and calligraphy of Cage's scores are very much at the service of the needs of the particular work. Although the composer often uses traditional notation symbols, they do not always have the same connotation.

2 John Cage, Commentary on Concerto for Prepared Piano and Orchestra in 3 parts, 1951. Nonesuch, 71202.

A careful study of the score of Atlas Eclipticalis will show that notes written without accidentals are microtones and the intensity of the note is in proportion to its size. In other cases a traditional symbol may be invested with more than one new value from which some ambiguity arises. The size of the note in Concert for Piano and Orchestra 1958 may refer to duration or amplitude. The role of indeterminate features in relation to traditional symbols, is beguiling because the traditional masks have finite associations. These scores pose the problems of accepting old symbols in new ways, modified determinacy, or alternatively, the necessity to choose between possible solutions, indeterminacy.

The visual configurations in the graphic scores of Earle Brown and Morton Feldman are indicative of an entirely different musical way of thinking. For Cage, this method of scoring provided wider scope for the inclusion of indeterminate aspects, despite the fact that it could also be explicit. In graphic scores, time is usually approximated spatially, on the horizontal axis reading from left to right, while pitch most often bears some relationship to the vertical position on the page. The manner in which time is approximated varies according to whether scales of

measurement are imposed or not. But the major consequence of this method of scoring was the eradication of metrical pulse as an implied norm for organising sounds in favour of a direct concern for proportion within a more expansive conceptual framework.³ Their synaesthetic qualities are capable of stimulating a wide range of performer impressions compared with the detailed blueprints of traditional scores. In using diverse combinations of these styles, Cage escapes the role expectations which usually accompany familiar and finite idioms.

The score of 34'46.776" for a Pianist of 1954 may be read in any focus, as many or as few aspects as desired, being acted upon. The notation is distributed in space time, pitch being partially indeterminate due to the absence of clefs and the intensely blocked out clusters. Various ways of using the strings, such as mutes, plucking and preparations, are specified but appropriated at the performer's discretion, as are harmonics and the use of the pedals.

The graphic representation of 59½ for a String Player, (1953), is more specifically delineated. Unlike the piano

3 Admittedly there is traditional notation without pulse such as MENSURAL notation but the concept of time-space in graphic scores is potentially much more liberating.

piece, the metronome indication, 2 cms = ♩, is given, and this is subsequently altered during the course of the piece. The qualities of the sound receive more detail in the score than the quantities in terms of pitch and duration. Tone production is separately graphed for each of the four strings, the range of each being determined by the player. Indications are given for the direction and place of bowing, the degree of pressure, as well as conventional symbols for changes from hair to wood. Dynamics are free.

In setting up fixed and non-fixed elements, Cage is presenting a complex image of the piece, an image which provokes the performer to inquire into the nature of that which exists and to establish the unknowns. The ambivalence between the two states, as it is contained in the score, becomes the catalyst in realising the works' many possibilities. Cage varies the combinations of the non-determined elements from work to work yet even when similar elements are left non-determined, the scores retain considerably different identities due to the particular treatment of those parameters in the context of the peculiar fixed criteria.

Concert for Piano and Orchestra most accurately clinches Cage's approach to indeterminate notation with

particular reference to graphic scores. Plurality is the key in motive, style, content and potential. "My intention in this piece is to hold extreme disparities together much as one finds them held together in the material world as for instance in a forest or on a city street."⁴ The work comprises eighty-four compositions arranged on large cards containing extremely diverse notation schemes ranging from the most traditional to the minimally suggestive. There is no master score. In the preface to the piano score, the work as a totality is indicated:

Each page is one system for a single pianist to be played with or without any or all parts written for orchestral instruments. The whole is to be taken as a body of material presentable at any point between the minimum (nothing played) and the maximum (everything played): both horizontally and vertically: a program made within a determined length of time to be altered by a conductor (when there is one) may involve any reading, i.e. any sequence of parts or parts thereof. (New York, Henmar Press, 1958.)

The notation systems are not only varied in style and musical detail but also in the degree to which each is indeterminate. A sharp degree of insight and adaptability from the performers is required if each composition

4 Kostelanetz, R. John Cage, New York 1968, reprinted 1970. p. 130.

is to be fully appreciated, if not realised. The potential number of realisations in view of the preface and the plastic nature of each of the eighty-four pieces, is infinite. Several of the frames, A, J, G, (alphabetically corresponding to compositions 1 - 84), explore reading the score both backwards and forwards, while others, through a series of arrows, make use of vertical as well as horizontal space. In many instances, these arrows are merely suggestions for the performer; others are finite. Frame K contains the instruction "disregard time". Notes as they occur within the piece, may mean duration, amplitude or pitches, according to their immediate context. Pitch, frequency of occurrence, and dynamics may also be determined by number systems distributed in vertical space. For instance, in frame AC, the higher the position of the note vertically on the card, the louder it is, the lower, the softer. Clef signs are usually placed strategically to indicate which hand plays which material. They are most often devoid of their traditional pitch fixing qualities even when used on traditional staves and many contain the ambiguities already discussed in connexion with Winter Music (see frame BH). Lines are used to separate pitch areas graphically, to indicate single tones, or to divide temporal sections. They may also

indicate the boundaries of frequency, durations and amplitude. Timbral indications range from overtone structure, (BJ), harmonics (D), pizzicato, muted strings, or percussive use of instruments. There is obviously little, if no uniformity, and much of the score is obscurely suggestive. A description of such specifications is fruitless unless it is perceived from two points of view. Firstly, the extent to which each of the eighty-four compositions is indeterminate and secondly, the possible interaction between the parts with respect to the performers and the conductor. It is beyond this sample to account for the degree to which each of the eighty-four pieces is indeterminate, even at face value, and it must suffice to say that they are varying in quality ranging from those like B, and D where most of the determining factors are carefully indicated to those like AR which are almost totally left to chance, "play in any way that is suggested by the drawing". Several sections have similar sets of limits; AT resembles AE, AW is like AD, CF is similar to BZ but the apparent identity of any of the eighty-four pieces is at the mercy of the total conception of the piece.

The concept of order in a piece of music, the

assembly of notes in their respective relationships, is flexibly adapted in new ways by the composer. The open ended nature of the last piece, Concert, is only one example. In keeping with this are the simultaneous performances of such compatible works as Atlas Eclipticalis with Winter Music and/or Cartridge Music, or the Solos for Voice with WBALK, Aria and Fontana Mix. When instructions such as these are contained within the score, then all the remaining contents of that score take on a more fragile position.

One way in which Cage was able to emphasize the idea of plastic form was to compose scores which consisted of the overlay of more than one page such as those cited in Chapter two, which meant that the score was physically changeable in terms of its perimeter and the contents. The overlay of transparent sheets gave him visually exciting and changing forms as a stimulus for the performer. The transparent sheets were significant in that they confirmed the notion of not saying something, not only practically, but philosophically. The importance of art is what is left unsaid according to Cage, it must be experienced. "I have nothing to say and I am saying it and that is poetry."⁵

5 John Cage, 'Lecture on Nothing', Silence, op. cit p. 109.

Certainly there is less musical information given in overlaid scores; they are just building materials. In Variations I - IV, VI, different overlays containing basic geometric patterns such as triangles, squares, dots, perpendiculars and semicircles, are all to be arranged by chance and measured to supply the musical information. Instructions for formulating the parameters of music such as amplitude, frequency, duration point of occurrence, appear as limiting factors, but they are just really flexible unknowns stimulating problems to be solved through individual schemes of notation or performance practice. Variations V is interesting in that there are no such symbols. The score is purely literary and is subtitled "37 Remarks Re an Audio-Visual Performance." Cage explains the changing role of the score in Conversation with Richard Kostelanetz by referring to the fact that the score for this work was a posteriori rather than a priori. The remarks reported a performance of the work at the Lincoln Centre in 1965 and according to Cage they are explanatory, enabling subsequent performances to take place. There are remarks about using film and dance and although exact performing companies are cited, others could be substituted. The limitations of performance are

utilized by Cage in the piece, "accept leakage feedback", "turn off amplifiers if, due to leakage, necessary". The obscurity of the cliches and phrases used, necessitates interpretation, and the unknown features are manifold just as in the musically-oriented indeterminate scores.

As Cage relied more heavily upon multi-media and action-theatre as elements of his works, the scores became less informative giving greater opportunity for unrestrained spontaneity. A few verbal remarks and some interesting visual and sound-producing objects were all that became necessary to stimulate the performance into its passage throughout time. Like life, it could be changing; scores needed to be relatively unplanned. "Really in space, in time, you'll never be able to repeat it. We don't know precisely what we're going to say, but the moment we've said it, you've even got it fixed on your tape."⁶ This belief in the validity of experience for its own sake is particularly evident in the piece 4'33" of 1952. The verbal instruction is kept to the minimum although the score is considerably priced; "a piece of three movements during which no sounds are

6 Kostelanetz, R. op. cit. p. 22.

intentionally produced"⁷. Utilizing the unpredictable to such a degree in score emphasizes the importance of the immediacy of the situation. Leaving behind notated masterpieces is not the motive behind indeterminate works.

Scores may indicate absolute ideas, they may cause problems essential to ~~the~~^{those} ~~problems~~ inherent ⁱⁿ ~~to~~ musical creation, or they may exist in flexible or finite forms. They may be pertinent to performer, or conductor, or the composer himself as performer. Each individual score represents a unique approach to the sound environment, a set of limits which needs to be assessed in its own terms. Most of all, scores of indeterminate works challenge the performer into a more aggressive role, demanding the commitment and effort which is necessary for any good performance, but more particularly, a performance of an indeterminate work.

7 John Cage, 4'33" New York, Henmar Press. Peters Catalogue 6777.

CHAPTER FOUR

PERFORMANCE

The role of the performer of music has been to translate as perfectly and authentically as possible, the composer's intention, through the acquisition of a good instrumental technique and the careful study and respectful adherence to the score, complemented by a thorough knowledge of the idiom and stylistic background. Throughout the history of music, great treatises have been written concerning these matters and elaborate notation systems have been designed to indicate the slightest nuance and the most detailed ornaments, all to assist the performer, in every conceivable respect.

In the preceding Chapter, it was noted that almost without exception, Cage's indeterminate scores do not instruct the performer in every conceivable respect. There are calculated omissions in the information given, entire musical features overlooked by one or two constants throughout. Where the musical material is complete, such as in traditional works, the aim of the composer in musical terms is clear, the identity of the piece articulated,

and the outcome relatively predictable. Indeterminate works give no such security, the elements being in a state of flux, to be fathomed by the performer. The division of labour between composer and performer is no longer clear. The performer, once a skilled technician, is now required to become a designer, intimately associated with the raw materials of the sounds and their potential arrangements. His own decisions as well as those of the composer, will be responsible for the musical product. These new powers threaten the established composer and performer roles. The degree to which the performer is required to take the initiative, varies in each work, as has been indicated from the wide variety of limits established in scores mentioned in Chapter three. When an increasing number of decisions are made about the piece by the performer, his right of ownership to that piece becomes imminent, precluding John Cage. However, Cage is not interested in claiming products, but rather setting up experiences, "I consider my music, once it has left my desk, to be what in Buddhism would be called a non-sentient being...if they picked my music, or cut it out...or something like that, then who am I to complain?"¹ Cage is insistent upon experience

1 John Cage in interview with Ilhan Mimaroghe, Discoteca Milan, 1958.

for its own sake, urging greater performer participation in every respect. This is ensured in two ways. Firstly, the performer must be adept in interpreting scores (as was illustrated in Chapter three), and secondly, the performer's relationship to sound sources, ranging from traditional instruments, to electronic sound generators can no longer be taken for granted. From a timbral point of view, new techniques often incur indeterminate elements. Cage scores for the interior and the exterior of the piano in addition to the keyboard, hitting the body percussively with hands or beaters to secure new sounds. Since Bacehanale of 1938, he experimented with the 'prepared piano' by inserting all sorts of foreign matter between the strings, pie plates, nails, screws, nuts, bolts, rubber, pieces of wood, which resulted in a wide palette of minuscule timbres, perverting the instrument's natural sounds in a minimally random way. The position on the string and type of mute to be inserted was established by chance and aural discrimination. Two grand pianos do not necessarily yield the same results even with the same preparation. After 1950, the piano preparations could be determined by the performer rather than the composer and preparations could be altered during the course of a performance as in 34'46.776" for a Pianist. In Cage's

vocal works, non-musical vocal sounds are included and auxiliary effects may often be chosen by the performer. In the piece Aria of 1958, the performer is to establish eight different singing styles suggested by eight different colours included in the score. The performer is also to incorporate at will, vowels and consonants of at least five foreign languages.

In works like Cartridge Music and Imaginary Landscape, No. 4, the performer is required to work with non-determined sounds formerly rejected such as the scraping of the stylus over the surface of a disc in motion, speaker hum, white noise and feedback. In the former piece, various suitable objects like toothpicks, wires, feathers, are inserted into phonograph pickups at the instigation of the performer. A wide variety of sound sources employed are, in themselves, capable of yielding unpredictable results. Reunion, of 1968, for instance, comprises two performers playing a game of chess and the movements they create become magnified sounds by passing through an electronic filter.

In these instances, performer activity is the essential component in dealing with indeterminate procedures often employing indefinite sound sources. Yet in 4'33,

Cage elects total anarchy which divests the performer of this activity, the indeterminacy resulting from a minimal amount of performer projection. The performer's role is also reassessed in works which are fully reliant upon the playing of tapes; a technician rather than a performing musician being warranted.

In the main, the opportunity to choose the type and number of instruments to be used is a major indeterminate procedure confronting the performer. Not only does this decision limit the timbral possibilities, but it directly affects the musical material. The performer needs to consider the physical and acoustic properties of the sound sources, their compatibility and blending potential in terms of timbre and the possibility of doubling instruments for the purpose of thickening the texture or biasing the timbre in a particular direction. The choice of instrumentation in these respects can fundamentally change a piece, and in this knowledge, Cage scores a great number of pieces, (4'33', Variations I) "for any type and number of instruments".

The effect of the score as a conditioning factor, must also be considered in relation to the performer's role in negotiating indeterminate music. In particular,

the number of performers specified in the score, and their individual relationship to their respective parts, is worthy of note. Where one set of musical material contained in the score is simultaneously interpreted by different performers (as in Variations III), the performing situation is more pliable than in a piece where each performer has a particular part to play, (Imaginary Landscape No. 3). Cage uses dynamic relationships between the performers to ensure that indeterminacy is constantly being enacted. In an interview with Roger Reynolds, this view is expressed:

RR: The notion of causality has been much too simple in the past, there is such a multitude of causes and effects, and their interrelationships are so complex...

JC: That is the real situation: that everything causes everything else. In other words, it is much more complicated than our scientists like to admit.²

This state of flux is even more acute when each of the performers prepares his own score, so that very little intentional co-operation results between parts. In Atlas Eclipticalis the assistant to the conductor prepares his part from Cartridge Music. The conductor's

2 John Cage. 'Interview with Roger Reynolds', The John Cage Catalogue, New York, Peters 1969, p. 50.

part is not a master score but it does give some information as to the details of the composition. Needless to say, uniformity is not the objective.

When the number of performers is indeterminate as well as the musical material in score and the number and type of instruments, the number of possible facets of one work, becomes countless. In Cage's later indeterminate works, problems seem to be posed in all the factors influencing their performance, so that a complex degree of indeterminacy results. All of these problems have solutions which are contingent upon one common denominator, the ability to choose. Choices concerning the type and number of instruments, the number of performers, the length of the piece, the timbral details, the overall plan, the relationship of internal parts, the dynamics, are only a few of the more overt problems. Decision-making is a selecting phenomena, the selection criteria varying according to the individual work and the performer making the choices.

Although it is impossible to account for every determining factor which conditions a decision, some consideration must be given to the basis for selection because Cage consciously monopolises it as a functional

means of realizing sound. Just how does a performer go about making the decisions which are prompted by indeterminate compositions? This question is vital to the nature of the compositions themselves, yet it is never clarified by the composer. This may be accounted for by the fact that Cage is pre-occupied with presenting the actual stimulus which creates the problems rather than formulating the guidelines for solutions or reflections on the nature of the process. Considering that the role of decision making is of paramount importance in performing indeterminate compositions, some statement seems necessary.

The difficulty in making decisions is in proportion to the degree of information given. The performer must familiarise himself with the terms of the piece both generally and in detail so that the criteria involved ^{are} ~~is~~ isolated. With a knowledge of the work, an appropriate solution would normally present itself. If the decision requires more than the information contained in the score, then the performer is required to draw something new or original from his own resources. He will rely on the melting pot of his own technical skill and training assimilated through the conditions peculiar to his own life-style and experience.

In this respect, the depth and scope of the performer's musical understanding can affect the type and style of ideas generated. For instance, if the performer has a narrow frame of reference in all but contemporary music, his ideas are more likely to be influenced by contemporary musical idioms which may be contrasted with those likely to be produced by a performer who is well acquainted with non-western music.

The third factor which could influence performer's selection, is the total image held by the performer of a particular piece. If there seems to be no established idea behind the piece, it may be left to the performer to create one, even if it is in fact the fusion of several ideas, or the lack of any dominating idea in keeping with Cage's music, to no purpose at all. Traditional objectives such as fusion, coherence and continuity are often irrelevant particularly when the total number of performers prepare their own parts. Similarly, it is not suggested that the total concept be absolute or finite, but rather that certain qualities be nurtured and played out infusing identity into the piece. It is possible that such a mental recognition could be responsible for conditioning a reflex chain of decisions into some shape or consistency.

This is closely connected to the fourth and most difficult aspect with which to come to terms, much less define: the role of value-judgments and the performer's own attitude towards performance standards. If the performer has solidified prefabricated opinions as to how a certain piece should be played, then that performer has a yardstick with which to measure the quality of decisions made. He is more likely to consider the decisions which lead towards his image of the piece as better than those that do not. By the same token, the performer who values his own skill as a virtuoso performer is more likely to select the more difficult and brilliant alternative. Value judgments intersect the free-play of ideas in totally different ways with different performers, but if Cage's philosophy as outlined in Chapter one is considered, they must be seen as distorting the central idea of chance and indeterminacy. No solution is of greater or lesser value ideally, but merely one result of one decision in one approach. He urges the performer to arrive at unbiased decisions, not conditioned or manipulated in any way, so that the concentration and energy is always concentrated on the sounds themselves.³

3 It is idealistic to aim to escape from value judgments, this being a human limitation. Cage's idea contains value in itself.

Standards of value and authenticity are redundant if imposed. In the light of Cage's stand, the performer is released from the pressures of performance style and interpretation. Originality and imagination are given free reign, the only discipline being self imposed.

The performer's choices outlined to this point have been ^{choices made prior to} a priori of the performance. The choice of instruments and score preparations required in so many works composed in the period 1950 - 1970, necessitate definition and arrangement beforehand. But there are also choices which must be made during the course of the performance and these cannot always be prepared in advance. This is particularly the case where the problems are reliant upon temporal space such as duration. This ensures that the performer is consciously seeking change from the predictable to the spontaneous. The effort required to sustain immediate responses throughout a piece is much more demanding in that the commitment to a certain choice is reliant upon aural memory in a unique instant. There is no time for premeditation or the reworking of ideas.

It is difficult to tap the extent to which decisions are formulated before or during performance time. In this respect, the term Improvisation, often used, or abused, to

account for many procedures through which sounds are produced, can be seen to fluctuate. By far the best and most recent work in this area has been completed by Bruno Nettl.

The relationship of improvisation to composition and notation is a complex one on which there is no general agreement. Specifically or implicitly accepted in all the general discussions is the suddenness of the creative impulse. The improviser makes unpremeditated spur of the moment decisions and because they are not thought out, their individual importance, if not their collective significance, is sometimes denied. (Musical Quarterly LX, 1974. p. 3).

He identifies different types of improvisation distinguishing between that in which notation is omitted, forcing the performer to stage linking passages or alternatively, a notation system from which the performer departs. The degree to which each is indeterminate depends upon the behaviour of the performer in respect to the unpredictable. Some performers draw heavily from various models relating to harmony, formal structure, and intervallic patterns so that two renditions of the work may resemble each other closely. John Cage provides opportunity for improvisation at a compositional level, in particular, the compositional models being contained within each performer's musical circumference.

It is almost impossible to isolate the instances where the varying degrees of improvisation are utilized in realising indeterminate compositions. Taking into account the number of approaches and attitudes held by performers, it seems likely that in works where there is a skeletal score or where large sections are left to the performer, that they are inserted through some form of improvisation.

The performance of indeterminate compositions involves a wide gamut of highly conditioned decisions and responses from the performer. As such, it is a very delicate and subjective event, a unique event which may push the creative act through the actual performance time. The freedom to choose between unlimited factors and the ability to cope with changing degrees of involvement secures the ever-changing candour of every indeterminate work. It takes different personalities to reveal all of the potential facets.

In order to investigate the chameleon aspect of indeterminacy, I have chosen to include two realisations of the piece Variations II, 1961, for any number of players and any sound producing means. As well as revealing the potential change in this indeterminate work, in specific terms, I will try to isolate the role of decision making

in the composition of the two versions.

This piece was chosen because it provided the opportunity to decide the type and number of instruments as well as all the musical material. The stimulus is a series of six transparent sheets containing straight lines and five containing dots from which certain measurements can be taken when superimposed. The preface to the score states -

The sheets are to be superimposed partially or wholly separated on a suitable surface. Drop perpendiculars from the points to the lines, (where necessary to extensions of the lines). Measure the perpendiculars by means of any rule, obtaining readings thereby for (1) Frequency, (2) Amplitude, (3) Timbre, (4) Duration, (5) Point of occurrence in an established period of time, (6) Structure of event (number of sounds making up an aggregate or constellation). A single use of all the sheets yields thirty determinations. When due to (6) more are necessary, change the position of the sheets with respect to one another before making them. Any number of readings may be used to provide a program of any length. If to determine this number a question arises, or if questions arise regarding other matters or details (e.g. is one of the parts of a constellation itself, a constellation, or aggregate?) put the question in such a way that it can be answered by measurement of a dropped perpendicular. (New York, Henmar Press, 1961).

Cage's only prerequisite in this piece is that the composer works from a series of measurements; six numbers for each parameter, five of those sets being derived from

a common superimposition of transparencies. This chance technique is itself a method involving endless possibilities, particularly when subjected to the modification of subsequent readings and interpretation by the composer. For Realization I, the following preliminary readings were taken in centimetres, in random sequence.

TABLE 2
MATRIX I

	FIRST READING			REALIZATION ONE		
	Pitch	Dynamics	Timbre	Duration	Range	Rests
1	4	3	5	1	$2\frac{1}{4}$	2
2	7	1	6	3	5	9
3	10	2	7	4	$4\frac{1}{2}$	7
4	1	4	1	6	$1\frac{3}{4}$	1
5	12	5	2	7	2	$\frac{1}{4}$
6	6	2	0	2	3	$8\frac{1}{2}$

The identity of the realization is dependent upon the composer's imagination and skill in constructing a suitable framework from the numbers. The precision and consistency with which the number systems are applied determines its quality.⁴ If the numbers are applied

4 This notion theoretically is diametrically opposed to Cage's stand, although there are certain problems associated with his point of view that are very obvious even in his own work. See Chapter six.

mechanically and statistically with little thought to unity and variety, then the musical product is likely to sound perfunctory. If the numbers are imaginatively combined to get maximum musical effect, then the result is likely to be opposite. The performer must be a composer. No application is right or wrong, but the decisions made should be acknowledged, explained and justified.

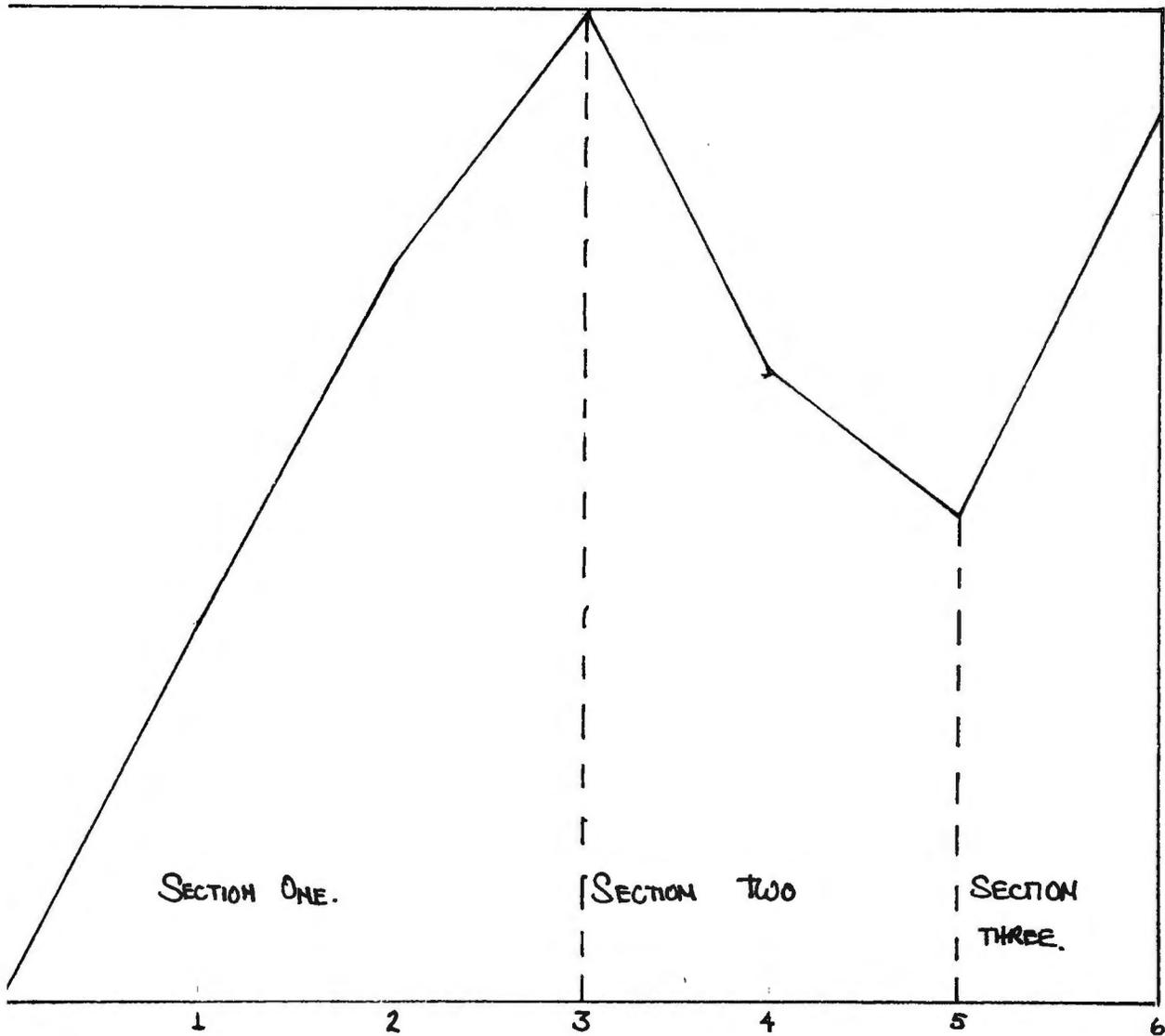
The basic problem in this manner of composition is how to derive musical material from the numerical series. At the purely mathematical level, the ways of interpreting numbers are as manifold as the creative talents manipulating them. Four main types are: the quantitative where the actual numerical amount has a content value, (which may differ according to the frame of reference against which it is measured); the relative where numbers are viewed as bearing certain primary, secondary and supplementary relationships to each other; the rhetoric establishing a body of rules or terms calculated to persuade the remaining material (such as formulaic or logarithmic powers) and finally, the symbolic where a particular number serves to represent another body of material. All of these methods to some degree have been used in these realizations, if not apparent in this short description, in the experimenta-

tion with the different possible means of interpretation at the outset. With each statistical number game or system, it became evident that patterns and forms recurred.

Before the numbers from MATRIX I could be applied, certain self imposed limits had to be established. I decided that the piece would be for flute or any other solo instrument. This automatically limited the texture to monody, and the range to three octaves above middle C. If the piece were to be adapted to other solo instruments, general features of articulation, rather than those particularly idiomatic to the flute, were more practical. The decision to account for every parameter in the detailed terms of traditional notation (excluding barlines) was made. It was motivated by the desire to show how that which seems to be complete indeterminacy on the face value of Cage's score, can work within accepted norms bordering on total control.

From the outset, a dramatic form was suggested by a graph derived from the numbers of a supplementary reading of perpendiculars. This served as a blueprint for threading the unknowns together. The numbers were plotted in the sequence in which they were measured from the perpendiculars.

TABLE 3
 GRAPH OF FORM: REALIZATION ONE



From this graph, it was decided that the piece would have three sections, the second of which was more compressed, in length and style, (shorter notes, faster speed and louder dynamics), and the third a compression of the first two. This was visually suggested by the shape and the gradients stimulating a subjective response

involving musical ideas. In view of the fact that the piece was to be quite short in length, the sections would be continuous, unless subsequent decisions were made by further measurements.

The material in MATRIX I was to be used for the first section, a subsequent set of readings, MATRIX II, was taken for the second.

TABLE 4
MATRIX II

SECOND READING, SECOND SECTION, REALIZATION ONE

	Pitch	Dynamics	Timbre	Duration	Range	Rests
1	5	3	3	5	4	1
2	8	5	4	8	2½	½
3	11	6	1	9	6½	¾
4	3	7	7	4	3	9½
5	9	4	5	10	8	29
6	2	6	6	3	7¾	6½

The same procedures were used to interpret the number sequences into relevant musical information according to each parameter. For pitch, the sequence of twelve semitones was written out corresponding to consecutive numbers, the initial point of correlation being determined by a perpendicular -

C C# D D# E F F# G G# A A# B
4 5 6 7 8 9 10 11 12 1 2 3

(These were then applied according to the number charts). Similar methods were devised for the other parameters, range and rests being interpreted instead of point of occurrence, and structure of event. The following musical material for each section was determined.

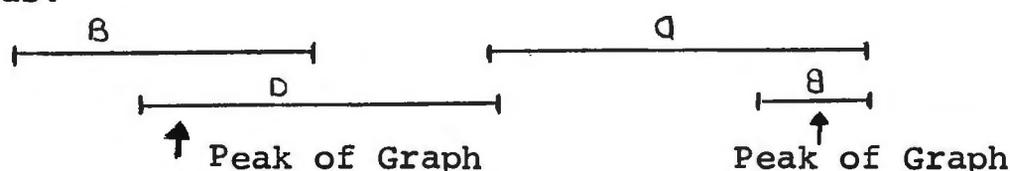
TABLE 5
NUMERICALLY DERIVED MUSICAL
MATERIAL FOR REALIZATION ONE

	Pitch	Dynamics	Timbre	Duration	Range	Rests
<u>SECTION ONE</u>	C	p			2 1/4	
	E ^b	ppp			1	x
	F#	pp			2 1/4	x
	A	mp			1 3/4	
	G#	mf	tr		2	
	D	pp	x		1	x
<u>SECTION TWO</u>	C#	p			1	
	E	mf			2 1/4	
	G	f			3 1/2	
	B	ff			3	x
	F	mp			2	x
	B ^b	f			1 3/4	x

x = musical material not appropriated.

By far the most demanding problem was the distribution of this material in time-space. The possibilities were endless even if at first, six numbers for each parameter seemed a limiting factor. This was overcome

As the last section indicated on the graph was to be a greater compression of both the first two, the note values were halved and the interlocking of material from B and D operated at a very intense level, often note by note. The third section shows a more overt use of palindromes in the overall sequence of sections, which may be represented thus: -



The dynamics were applied in the order established by the random number series in conjunction with the matrices, their actual position being reliant to some extent on the phrasing which made the most musical sense.

From these processes the score finally emerged (see Appendix IA). The beginning of section D is immediately obvious at MUCH FASTER and the palindrome of the D section begins with the F E F, F E F on the second page. As this particular aural realisation is for guitar, the application of harmonics was left to the performer (see Appendix IIA).

Thus while some personal consideration was given to the overall formal design, the numbers were applied systematically and consistently throughout the piece.

The direct implications of this were that the palindromes were predictable in the course of composition once the rhythmic progression was established but that the content of those palindromes was completely due to the interaction of the number pieces.

The oscillation between freedom and control is hard to measure in this realisation. Even when the source material is a synthesis of chance techniques and random procedures, the points of reference, the sequential arrangement of sound, its distribution and integration require an immense number of decisions to be made. A simple factor such as the inclusion of zero as the first of every number series, would yield totally different sound results, even if the remaining norms were preserved.

The impact of decision making in this realisation cannot be over-emphasized. Although Cage suggests that perpendiculars should be dropped to solve consequential problems for each perpendicular, a new set of criteria must be established by the composer, criteria which in ^{themselves} ~~itself~~ may be problematic. In any creative act it is impossible to forfeit processes of selection and rejection. The end product is certainly evidence of the decision to compose a controlled finite piece of music.

Realisation II (see appendix IB and IIB) was a completely different attempt at composition although the same stimulus method was employed. I decided that from the six sets of numbers derived in the same way as that explained for Realisation I, the six readings taken for one parameter would dominate the others. The tension which arose from this would form the life-force of the piece. By the dropping of a perpendicular, it was decided that point of occurrence, the sixth parameter would be the dominant strain. As the piece was to be scored for flute and synthesizer, the interaction between them was the prime factor. From the numbers 6 1 3 4 5 6 which were derived in that random sequence from the overlays, six different levels of interaction were established ranging from complete chaos to complete harmony.

TABLE 8

TABLE OF INTEGRATION LEVELS, REALISATION II

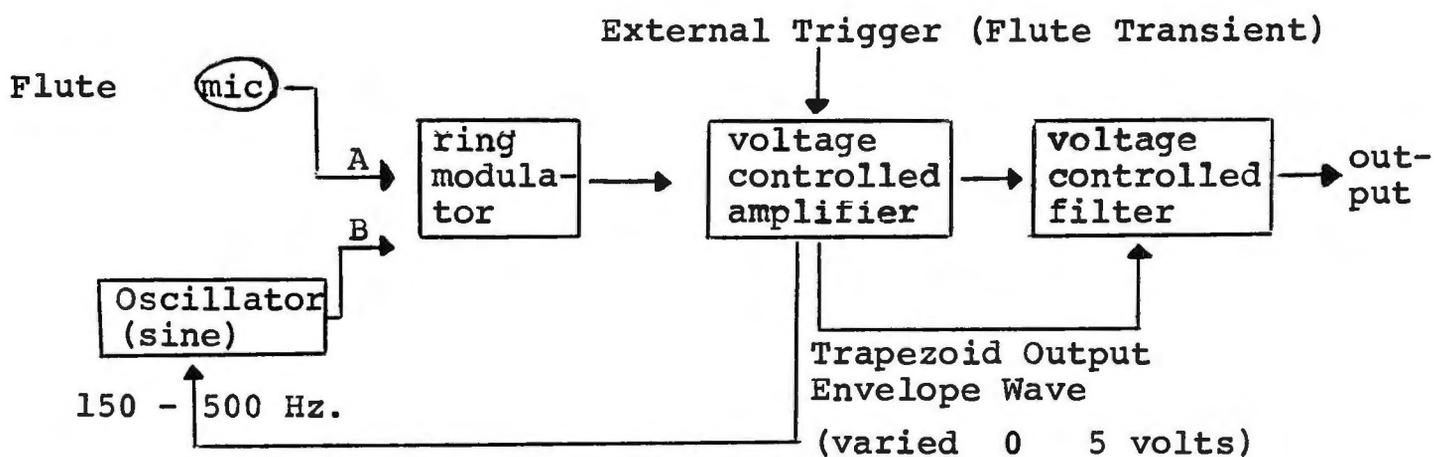
	<u>Numbers</u>	<u>Category</u>
DISINTEGRATION	1	Extreme conflict
	2	Antagonism
	3	Synthesizer dominates
	4	Flute dominates
	5	Neutral Apathy
INTEGRATION	6	Mutual support harmony

The levels were applied in corresponding order to the random sequence, 6 1 3 4 5 6, to give the overall scheme

of continuity. As the piece is conceptually rather than specifically conceived, a graphic score was a viable means of expression. These six categories can be seen at a glance in the score (see appendix IIB). The various linear patterns, conjunct and disjunct relationships, the crisp cells or the dense webs, are triggers for the performers rather than having any specific meaning in themselves. For instance, the vertical position on the page is not necessarily indicative of pitch relationships; it may connote amplitude or texture according to the performer. Nor are there constants in terms of musical norms. The interpretation of certain graphic elements may change during the course of the piece. Duration is left to the performer as is the bridge from one section to the next. The length of each section is not necessarily in proportion to the spatial approximations on the graph. In this recorded realisation for flute and synthesizer (see appendix IIB), the performance time was irrationally conceived and the main source of integration was sensitivity to timbre. The timbral limits for each instrument were pre-set beforehand, and the settings remained fairly constant throughout. The flute was ring modulated with varied decay time through the EMS AKS synthesizer.

TABLE 9

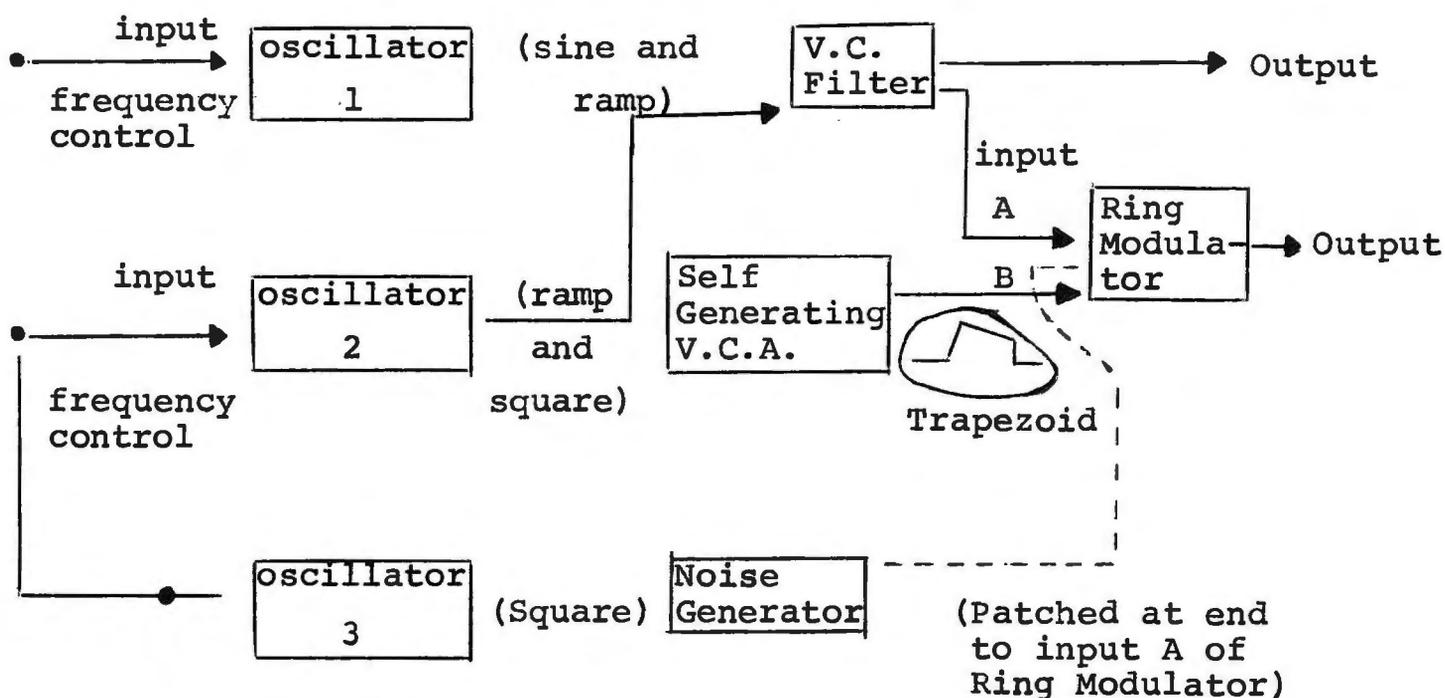
FLUTE TIMBRE: REALIZATION II



The improvised patch of the synthesizer may be represented: -

TABLE 10

SYNTHESIZER PATCH: REALIZATION II



Oscillators 1 and 2 were tuned in octaves at about 1 KHz and oscillator 3 was running between 2 and 3 Hz.

All the oscillators were controlled in parallel with the 'stick' or keyboard. The 'decay' time of the V.C.A. was varied, the outputs were switched and panned, and the volumes were varied.

The energy needed to propel the different levels of interactions throughout the piece, was reliant upon each of the performer's improvisatory skill, their subjective perceptions of the score and their individual spontaneous responses. In this second realization, it is noteworthy that the number series have not only been valuable for their quantitative value and their sequential relationships, but they have become versatile symbols, stimulating socially-oriented musical norms. With such heavy reliance upon performer interaction, the background and tastes of each of the performers must play an integral role, and the problem of conditioned irrational responses, rises to the fore. Just how Cage views the problem of group composition in the light of his philosophy is hard to say. He once said that his problems were social problems rather than musical ones.

From the two realizations, the plurality of the one piece, Variations II, can be seen even within the limits of one composer. Consider the difference between realisa-

tions between different performers and their choice of instruments, skill, musical taste. The amateur as well as such famed composer-performers as David Tudor ~~and~~ Max Nehaus ^{and} Ger Zacher have the right to 'compose' a John Cage piece. This expertise or lack of it must play a crucial part in determining each rendition. In 45' for a Speaker Cage says "spots are spots and skill is needed to turn them to the point of practicality".⁵ It is not surprising that Cage takes no responsibility for the end product when the degree of indeterminacy is as great as this. The piece purely belongs to the composer-performer and it exists as one plausible solution to the total identity of the work.

Yet the indeterminacy does not stop at the level of composer and performer. A finite piece may be altered during performance time in numerous ways, (see Chapter 5), or it may be superimposed upon itself or played simultaneously with another piece. Cartridge Music consists of more than one realization of the piece made by the same composer-performers John Cage and David Tudor, played simultaneously or combined with live performance. Aria may be played with Fontana Mix and/or Solo for Voice I, Atlas Eclipticalis with

5 John Cage, op. cit. p.161

Winter Music. A piece for electronic tape WBALK was actually composed specifically for the purpose of simultaneous performances. The interaction of two pieces, both having indeterminate elements, means that the total degree of indeterminacy becomes much greater.

It is for the listener to verify the extent to which each performance resembles another. In some works the degree of indeterminacy will be apparent in score or in the performer preparations while in others, only the composer-performer can know who is responsible for the decisions made in performance time. Whatever the case, the role of the performer is ever-changing, both in terms of the rudimentary compositional method, and the execution of sound. With such demands, it is not surprising that many works are tailor made to suit those particular performers with whom Cage has worked and achieved satisfactory results.

CHAPTER FIVE

THE LISTENER: THE SOUND EXPERIENCES

Just as John Cage has regarded Composition, Notation and Performance as suitable vehicles for implementing new ideas, particularly with respect to indeterminacy, the actual experience and verification of the sound event has also provided fertile ground for the reworking of accepted norms. This entailed an intensive enquiry into the physical limitations of performance, the venue and time of performance, the acoustical and visual possibilities, and the role of the audience.

In specific ways, unique to certain works, these aspects have been exploited to intensify the unknown, and the unpredictable qualities of sound as it is experienced. Cage has definite ideas about the way the sound product should be approached. Music is happening all the time, "For in this new music nothing takes place but sounds; those that are notated and those that are not...There is no such thing as an empty space or an empty time. There is always something to see, something to hear¹". Later in the same lecture on experimental music he outlines a

1 John Cage, op. cit. p.78

new way of listening "new music, new listening. Not an attempt to understand something that is being said, the sounds would be given the shapes of words. Just an attention to the activity of sounds...not informed, empty, non expectant, non conditional but open to the totality of possibility...It sees things directly as they are: impermanently involved in an infinite play of interpretations."² This attitude towards listening which gravitated towards flexibility, openness, and spontaneity was without doubt an important stimulus in the exploration of new possibilities for the reception of the musical product.

The idea of performed music in a traditional concert-hall atmosphere was questioned from the outset. In an interview, Cage has remarked:

Why do you speak of holding an audience? I think that these notions imply dropping the idea of controlling the audience for one thing..so in the case of a performance, we would think of it, wouldn't we, as a celebration of some kind, and we would certainly not think of holding those people to us. If somehow they weren't enjoying the situation or consuming it, then would we be more pleased if they left? Not that we want them to go, but we don't want them to stay either. We have a certain freedom at the same time that we question the notion of freedom; this is very curious. (Richard Kostelanetz, "Conversation with John Cage", John Cage, op. cit. p. 29)

2 ibid., p.12

The audience no longer is considered an important determinant of taste and expertise. New roles are required of them in new pieces. At the extreme, they too become musical source material. New venues were sought in the form of art galleries, sports pavilions, stock yards, regimental armory, stadiums, and public city squares, sonic environments which harboured the integration of the audience with the greater acoustical and spatial possibilities for the distribution of sound. Consider the difference between two performances of Variations IV, the first in a concert hall, the second in a clearing in the woods. As the composition of the piece solely depends upon the map of the performance area, as only the place and direction of the sound is ascertained, the nature of that performing area is of crucial importance. The acoustical properties of an enclosed space are quite different from those of the open air. All of the sound producing means are those available, preferably, but not necessarily electronic. In works where the sounds of the performance environment are to be used, (for example, Cage placed a microphone outside the Los Angeles art gallery for a 1964 performance in order to catch the sounds of the city street), indeterminacy will be involved at two

levels. Firstly, if the audience or passers-by are included as part of the piece, then the performance is reliant upon the peculiarities of that particular group of people. It is unlikely that any two performances would resemble one another. Secondly, the piece is indeterminate in that given the same set of sounds produced by the same people with the same audience, a different environment would alter the result considerably. Not only would the sound be physically altered but the psychological attitude and response stimuli would change. These distinctions can considerably change the identity of a known set of sounds in their final processing throughout time. But when the sounds are solely dependent upon the changing indeterminate norms outlined in Variations IV, the full extent of indeterminacy can be projected and the chameleon-like nature of Cage's compositions, fully realised.

The insistence on acoustical space and the dimension of sound as a fundamental component in composition, is not peculiar only to Variations IV. As far back as 1939 in Imaginary Landscape, Cage was experimenting with electronics. The concern for shape, contour, and direction of sound, became intrinsic to his approach. From the fifties onwards,

Cage subjected such notions to work for indeterminacy in varying degrees. He was quick to realise that the separation of sound and the direction of sound waves could be appreciated by the audience from many points of view by channelling the sound through an intricate set of speaker systems placed strategically around or throughout the audience. The perception of the sounds would vary according to the proximity of the perceiver to the speakers in a more overt way than was formerly common. Thus the sound object is viewed rather like an Alexander Calder mobile, from many possible planes, according to the angles of intersection. Cage comments on the intimacy of this experience for the listener.

Many of the American works envisage audition as central, so that the physical circumstances of a concert do not oppose audience to performers, but dispose the latter around and among the former bringing a unique acoustical experience to each pair of ears, admittedly a situation of this complexity is beyond control, yet it resembles a listener's situation before and after a concert - daily experience that is. It appears such a continuum...it dissolves the difference between 'art' and 'life'.
(John Cage 'Composition as Process', Silence op. cit. p.53.)

In Music for Piano 1-52, Cage declares that in those instances where more than one pianist is involved, that the

performers be separated as far from each other as is practicable. The interaction of an unspecified number of players spaced around the hall would affect each rendition of this work considerably, quite apart from the musical material. Thus the piece can be delivered in extremely diverse volatile ways. It is as if to crystallize all the indeterminate features in the work, from the inception of the creative idea, to the acceptance by the listener.

The spatial relationship between performers has always concerned musicians for a variety of reasons, but since the development of live electronics and complex systems of amplification, new means for exploiting space have emerged. Sounds formerly unsuitable for public performance, such as toy pianos, or clocks ticking, can now be employed and be heard (as in the case of Cage's Music for Amplified Toy Pianos of 1960). Cartridge Music is also scored "for amplified small sounds". The piece is an excellent example of the use of amplification to induce a situation in which any of the determinations made by the performers would not necessarily be heard. This happens in the event of one performer executing such a degree of amplification that it renders another performer's sound inaudible. This is more than indeterminate music. The

performance is of itself, indeterminate. Thus the performers interact radically; the loudspeakers, amplifiers and live musicians enacting a performance at once combining mystery, theatre and music. More specifically in this work, the position of microphones on the instruments may also contribute to the indeterminate elements. From the transparent overlays and graphic charts which comprise the score, readings are taken to decide where the microphone will be placed on the various performer chosen objects. These objects may include such items as waste paper baskets, slinkies, feathers, phonograph pickups. The measurements also decided the course and direction of movement from one object to another.

By far the most radical approach to space is in those works which could be described as 'audio-visual' in that they rely heavily on visual materials co-ordinated with sound. Cage consciously integrates these seemingly disparate elements, in a way which is reflective of his attitude towards performance and listening as the on-going of life; indeterminacy, choice, chance and activity being the essential characteristics. While these audio-visual works were the logical outcome of his attitude towards sound, they provoked the audience into new liberal roles,

new expectations and new responses, challenging them to question the inclusion of 'extra-musical' aspects. In the greater number of audio-visual works, there is no score or when there is, such as in the case of Music Walk of 1958, transparent overlays are used to create "any sound or any action". The degree of indeterminacy is great, not only in the extent to which the performer must impose his own limits, but in the interaction between the audio and visual activities. In most cases flexible, graphic guidelines are models for the approximation of sound and spontaneity. Water Music, of 1952, and Music Walk of 1958 employ the use of a stopwatch to regulate the performance. In the former work a large poster score is mounted in the performance area to regulate the pouring of water from a full container to an empty one, the blowing of whistles, the entries of the pianist and radio and the rifling of a pack of cards. As most of these activities are indeterminate in themselves, their relationship to each other is approximated.

It is common in such indeterminate works that little attempt be made to co-ordinate the various activities. The dramatic excitement arises from the performers having to choose their individual courses simultaneously during the actual performance time. Each performer makes certain

choices from the gamut of activities, the indeterminate aspects arising from the peculiar distribution of these choices in time. Given the same indeterminate procedure to perform, it is doubtful if two performers could interpret it in exactly the same way. In Musicircus, of 1967, those performing the actions are also making the sounds, so that the indeterminacy results from the performers' interaction between movement and sound. This may be contrasted with Music Walk (1958) and Theatre Piece (1960), where the dislocation between the audio and visual material provides the conflict in unpredictable terms. In Music Walk, the plethora of physical actions may be substituted for randomly activated sound generating procedures, if chosen by the performers.

Cage's own performances of these works cannot be overlooked with respect to charisma. It is in Cage's particularly idiosyncratic energy and drive, his ability to be utterly committed during performance time, that the impact of his own philosophy can be regarded to the best advantage; as he lives and plays it out.

In Indeterminacy, David Tudor selected and assembled any material from the solo part from Concert for Piano and Orchestra while John Cage simultaneously chose which of

the ninety unrelated stories he would recite over the course of a minute's duration. In his notes accompanying the Folkways recording FT3704, Cage describes the proceeding. "There was no rehearsal beforehand involving both the reading and the music, for in my recent music, there are parts but no score. Each one of us rehearsed alone and employed a stop watch during the actual recording session. Each did what he had to do, bringing about a situation which neither had foreseen." The actual performance time as it is experienced by the performer and listener becomes a rigid control in shaping the nature and quality of the performance. In this piece each story, with its peculiar linguistic content and length, is modified when recited for the period of one minute. The density, speed, clarity and intonation patterns may all be affected and they are just as valid source material for indeterminacy, as the random interactions between musical sounds and verbalized words.

In 1959, Cage performed Water Walk for the Italian television program, 'Lascia o Raddoppia' setting the performance time at three minutes. Cage chose several

objects with which he wanted to be associated, a bathtub, a pressure cooker, a siphon, a Waring blender, a vase of roses, a watering can, a large rubber fish and several other objects which could be associated with water in some way. He prepared a running score from transparencies which he rehearsed until he was letter perfect. A great many actions were crowded into a split second. It began with the rubber fish inside the piano, its tail flopping against the strings and ended with the fish in the bathtub swimming around the vase of flowers which Cage watered from a pedestal, while the pressure cooker let off jets of steam.

Theatre Piece of 1960, is also based on an everchanging scheme of incoherent actions and happenings performed simultaneously. In the performance by David Tudor, Cage, Merce Cunningham, soloists, and dances which was staged at the 'Circle on the Square' Theatre in New York, the march from 'Tannhäuser' emanated from loudspeakers, a contralto sang the French popular song of the 1920's 'Parlez-moi d'amour', while other performers shot at balloons, and another had a shave. Cage stood in the corner counting from one to twenty-three. The exuberance of this affair approached the temper of a circus fairground, the visual elements in particular revolting against the sobriety of

most traditional music-theatre performances. In Cage's terms sights are just as valid as sounds. "The world is teeming: anything can happen, sound, movement. Activities which are different happen in a time which is a space: are each central, original...each now is the time, the space, are eyes open? ears?"³

As early as 1952, Cage experimented with an audio-visual happening for sound and dancers at Black Mountain. The work was unpublished and without title, symbolizing the 'once-only' quality of indeterminate works, works without solid and lasting identities. The emphasis on movement and the flexibility of the performance situation at Black Mountain was extended to include the audience. Cups were placed on each seat so that the audience had something to cope with when they arrived at their places. Coffee was served at the end of the piece. In 4'33" of the same year, the audience provided the greater part of all the musical material whether they wanted to or not, a total situation reminiscent of the post-war Dadaist activities.

The concert held at the Rose Art Museum in 1965,

3 John Cage "122 Words on Music and Dance" op. cit. p.97

Rozart Mix, was to begin without the audience realizing it. Tape loops from thirteen machines were placed all over the building, some being forty-five feet long. When they became tangled up with themselves, the result was to be included as part of the piece. If the loop broke, one of the six performers was to fix it immediately, and replace it with a new one. The conclusion of the work was reliant upon the audience. When twelve people remained, refreshments were served and all those people had a party. The indeterminate procedures of this piece are derived from the position of the tape recorders throughout the building, the nature and order of tape replacements (determined by particular performance-time), as well as the audience reaction.

During the late 1960's, Cage continued to be intimately concerned with new ways in which the audience could determine the musical product and many of the works composed in this period concentrate on giving the audience a chance to interact more overtly. This subjects the composition of the work to interference which can be predicted neither in quality or motive. The risk element is extremely high, and Cage consciously allowed for it.

Musicircus was just such a work. In the middle of

the pavilion was a large metallic construction upon which the audience could make noises at their leisure while large numbers of composers and performers engaged in their own performances simultaneously from their respective platforms around the pavilion. The performances included piano recitals, improvisation groups, jazz bands, vocal recitals, dancers, mime, experimental electronics, a light show and a play of film slides and balloons. These sound producing means were connected to loudspeakers fixed on the walls around the perimeter, so that the five thousand who attended, experienced their own collage of sound. It is not surprising that Richard Kostelanetz calls this an 'environmental extravaganza' when all of the possible unpredictable elements are projected.

In 1968, HPSCHD was presented in a similarly complex way, involving multi-media including mirrored spinning balls, superimposed images projected onto enormous screens, light beams and filters. At least forty-eight performers participated. The audience was free to wander around the hall to experience the interrelationships as they desired. Sound was produced from fifty-eight sound tapes. Fifty-one channels were generated by the computer on different scales and the remaining seven were from live performers.

In an interview for the 'New York Times' Cage reflects, "It may be in a sense of quantity rather than quality that we have our hope. When you use the word chaos, it means there is no chaos because everything is equally related - there is an extremely complex interpenetration of an unknowable number of centres". He later comments about the role of the audience "the situation relates to individuals differently because attention isn't focused in one direction. Freedom of movement you see is basic to both this art and society. With all those parts and no conductor, you can see that even this populous a society can function without a conductor."⁴

In a sense this 'chaotic art' spread over a large performance area is like a microcosm of the universe. The situation is not threatening to Cage. Few other composers have ventured as far in expansiveness and audience contact. Another particularly important aspect of HPSCHD appears in the post-performance recording on Nonesuch, a polished version of three of the harpsichord parts. A computer programmed instruction sheet informs the listener how to operate the volume and control knobs of the turntable in order to listen to the piece. No two sheets are

4 John Cage in Richard Kostelanetz, John Cage op. cit. p.175

the same, so that the listener's final opinion of the performance disc would be unique. It is therefore possible to listen to portions of the piece by eliminating certain tracks at certain moments. The program sheet called KNOBS devised in conjunction with Lejaren Heller, is really a break-through in the concept of home-listening. The participation and effort demanded from the listener becomes part of the piece.

In this Chapter the role and function of the actual performance time as incorporated in some of John Cage's compositions, has revealed new vistas for indeterminate procedures. By uniting sound sources with visual phenomena, new combinations have emerged in conjunct and disjunct ways. The distribution of sound throughout the audience has brought the listener into closer contact with the performers and the on-going processes, thus encouraging increased individual awareness and perception. Not only is the listener's motive and behaviour changed to meet the changing physical circumstances of the performance, but his status is augmented to participant, performer and finally selector.

It is clear that in its diverse fields of application, the transmission of sound is a vast area for the inclusion of indeterminate procedures and chance operations, shaping

in a very real and immediate way, the ideas and performance into a reality not to be repeated. It is a reality reliant on a particular number of people responding to, and participating in the indeterminate procedures.

CHAPTER SIX

CONCLUSIONS

The purpose of this thesis has been to identify and locate chance operations and indeterminate procedures with specific reference to the random sample of representative works from the period 1950 to 1970. On the basis of the previous discussion it is possible to draw some conclusions about the nature and extent of these processes within individual works and the composer's output as a whole. In addition it is my intention to make a personal assessment of the significance of Cage's contribution in this field of contemporary music in the light of foundation work by other composers, the influences Cage himself assimilated, and the impact of his own work on that of others. In this way it is hoped that a more realistic perspective for viewing the work of John Cage will be revealed, a perspective in which the advantages and the problems can be seen against the wider musical background.

In Chapter two, five main types of chance techniques were identified in the compositional procedures of specific works; the I Ching involving the tossing of coins, the study of imperfections in a piece of paper, the mobility-

immobility concept involving a deck of cards, the overlaying of transparencies and templates, and the computer programmed random sequences. While each of these techniques is employed with the common purpose of providing a mechanical rather than an inspirational guide, each has its peculiar relationship to the unpredictable. Each technique has its own set of limits according to the particular criteria involved and this in itself can influence the potential of that technique for inducing chance results. A technique such as overlaid transparencies can provide a field of alternatives and patterns for inspiration compared with a solution between two options derived from the binary choice operation on the computer. When viewed as ends in themselves, chance techniques do have identifiable properties. These of course must be recognised and adhered to if chance is to have free reign, and the techniques are to be valid. For instance in the tossing of coins it is necessary for each coin to be unbiased if the number of odds is to be unpredictable. Equal probability only exists when the choices are finite as they are in this case, each coin having two sides, each of which is mutually exclusive. If there is no independence between tosses and the choices are reliant on the interference or association of other

tosses, then the free interplay of chance as the determining factor is minimised through calculation or manipulation of that chance operation.

Although the inherent qualities basic to each technique are important, their effectiveness is contingent upon the way they are used and the purpose to which they are directed. As a trigger for composition they can have value invested in them or they can be altered by subsequent creative action or subverted by chance. On the basis of the preceding study, the listed chance techniques have their own life-force, their identifiable properties being applied in ways indicative of Cage's own attitude towards chance, indeterminacy and music.

The I Ching is a valuable field of numerical terms but it is also a very convenient basis for selection between options and Cage uses it for this purpose at many stages of the musical process in addition to its function as stimulating ideas. Examples have been cited where the I Ching has been used to establish the superposition of sound events, tempo, structure, rests, dynamics, pitch, rhythmic structure, the duration of the piece, indications for the editing and splicing of tape, spatial elements of the performance, as well as the content

material for audio-visual ~~material~~ Works.

By way of contrast the mobility-immobility duality, involving a deck of cards with supplementary material is a much less widely applied technique and it really exists in ancillary capacity to the I Ching. It is used almost exclusively to stimulate the flow of progression in a composition by providing objective and random material for either new ideas or retracking. Thus it functions really as a guideline for the temporal succession of ideas, thereby influencing the continuity of the piece in terms of unity and variety of material.

In obvious terms the study of imperfections in a sheet of paper accentuates the unique experience of every creative act. No two pieces of paper have the same imperfections which ensures different sets of conditions. Cage is consciously utilizing this method to emphasize both the motive and the process, the commitment and the reality involved in composing each new piece. In practical terms, the spatial distribution of the pointal imperfections most often became the position of pitches, their numbers, their relationship to each other, their density and range. In the main this afforded single sounds, wide ranges, sparse textures, reflecting the emphasis on spatial dimen-

sion of the individual sound preferred in his earlier works. The reliance on the unknown at the outset and the visual analogy of sounds in space became a suitable vehicle for expressing his philosophy.

The predilection for visual aspects of chance techniques continued in the use of transparencies, overlays, templates, graphs, maps and geometric shapes. In some cases, the work could be envisaged as a whole from one set of stimuli, helping the composer to postulate and solve the musical problems. Frequently the overlays provided specific information in the form of measurements for defined parameters such as timbre, pitch, duration, instrumentation and the spatial distribution of sound. As we have seen, it is common for the same technique to offer minimal information or direction at the initial compositional level, thus giving enormous latitude to the performer as composer.

Of incidental importance as a chance technique is the generation of the random number series from the computer and the various binary and ternary choice subroutines. Explicit understanding of computer technology aided by Lerajen Hiller was necessary in order to program the computer to enact a simple process like the I Ching, and the length of time, the difficulties of translation

and inconvenience involved, led Cage to prefer the simpler more straight-forward chance operations.

In Chapter three, greater stress was placed upon scores as agents for indeterminate procedures in four ways. Firstly, decisions may be warranted because of certain conflicting calligraphic details where the notation becomes as Cage describes, "irrational". More overtly, the score may instruct the performer to make formulating musical decisions such as the number and type instrument to be used, the length of the piece or the timbral details. Thirdly, many scores are devised in such a way that their information content serves as a model rather than as a definitive product. For example, graphic scores usually present a spatial approximation of time in which rhythm, metre, rests, duration of sound and silence, and the speed of attack and decay are at the interpretation of the performer. The shape, size, layout, calligraphy, and colour of scores varies enormously in Cage's works of this period each presenting a particular approach to his compound attitude towards scores and performer choices. By far the greatest and most obvious feature of Cage's indeterminate scores is the omission of information in one or more parameters of the sound, which

forces the performer to ask specific questions, thus coming to terms with those aspects more intimately. It is this procedure which is monopolised in those works approaching total chance, where the score consists of only a few remarks either informative or non-sensical, or where there is no score at all.

Chance operations and indeterminate procedures identified at the embryonic levels of compositional procedure and scores have been shown to be potentially capable of provoking multiple choice situations for the musical event. Their effectualness depends upon the consequent application and activity in the work as a whole. For instance, when they are used in combination with each other it is possible that the scope for each in determining musical aspects, is modified by their interplay. At a basic level they may complement each other or veto each other from existence. Subsequent actions by the performer may reject in part, or entirely, the musical decisions derived through chance techniques or on the other hand, they may augment their status through repetition, growth, amplification or spatial distribution. In Chapters four and five it was shown that the inclusion of extra-musical material such as

recitation, dance, drama, film and lighting has offered scope for indeterminacy on a more expansive scale than an essentially musical one. Indeterminacy and chance can operate at manifold levels in the light of the reassessed role of the performer, (who may be required to be composer and technician as well) and the listener. While it is essential to identify and locate the different types of operations at specific positions in the musical process, it is impossible to gauge their impact both as individual techniques and as a corporate body of procedures even within one work without considering their total interaction at every stage. Neither is it possible to analyse the extent to which a work is indeterminate if only one or two levels of the finished product are accounted for. It is pertinent only to make certain comparisons on the detailed study of individual works, for I have tried to show that each piece has its own blueprint and field of activity in regard to indeterminacy.

In works like Music for Piano, three chance operations are used to define certain parameters, others being left to the performer. In addition the piece may be interpreted simultaneously by any number of players and may not necessarily be played in entirety. In Winter Music, it

is the length of the piece as well as dynamics and duration that are left to the performer. In terms of content, perhaps the greatest diversity of indeterminate procedures is to be found in Concert for Piano and Orchestra where the content of each section is varied in parameter definition, the degree of information given, the type of notation, the sequence, the length and form. The role of the performer must be dynamic to cope with the varied changes. The margin for the unpredictable tends to be greater where the number of levels at which indeterminate procedures are engaged, increases. A piece such as Concert sets a precedent for understanding the field of possibilities connected with the life of one indeterminate piece.

Where less information is given, there is a greater reliance upon the performer as a composer. In the works using templates or overlays as the mainspring of the piece, the range of possibilities lies within the performer's decision making capacity, rather than as a gamut from which to choose in the score. The performer's field of activity must be guided by the individual piece situation and he is not always able to prepare himself or understand the range of possibilities until the actual performance time. This is particularly common where the sounds emanate from radios

or a game of chess, and it is likely that the totally spontaneous performer choices made will have a less dominating role in determining the nature of the musical material. The sounds may not reach their fruition in a straight-forward conventional manner particularly if the sound is to be electronically processed during the performance, or if it is juxtaposed to another recording or performance. The total effect can subsequently be minimised, or enhanced by the interaction of visual and dramatic arts. It is conceivable in the happening situation where there is an exposed fusion of the acts, that non-musical performers create all the sound through even non-musical means and such physical properties as the length and speed of physical movement, lighting and the position of microphones in the performing area.

A piece like HPSCHD has indeterminate procedures and chance operations at both compositional and performance levels in both conservative and drastic ways. In the laboratory, chance operations were used to finite ends, leaving nothing to the performer. The multi-fixed tapes, and the live performers had no predictable relationship to each other in terms of the aural phenomenon. There were kaleidoscopic changes from one to the other and the multi-media happenings rendered the piece extravagant.

Collectively, the type and location of chance techniques and indeterminate procedures vary with each piece and this coupled with the essential differences between every performer have bearing on the extent to which a piece may be classed 'indeterminate'. The essence of an indeterminate piece is in dynamic change, the dependence upon the unpredictable giving it an essentially plastic quality. In this respect it is futile to try to assess the extent of indeterminacy in a piece except on the basis of one acknowledged performance. To realise a piece's potential for change is quite different from coming to generalizations and value judgements in quantitative terms. I have tried to concentrate on the sources through which this potential exists with specific reference to particular works in the random sample.

In the light of the two realization of Variations II discussed in Chapter four, I think it is obvious that the one set of criteria can prompt a performer to induce varied situations, still in the name of one piece. In Realisation I, something approaching complete determinacy resulted in a traditional performance with closely defined parameters fused into quasi-conventional notation. For

Realisation II, a graphic score served as a model for interpretation and improvisation for two performers. The extent of indeterminacy for the two pieces can be compared by isolating the areas of freedom and control. A contributing factor to the increased indeterminacy in the latter example was the difference between two different performers' conception of the piece. Their adaptation to the respective instruments, their ability to respond to the graph and to each other and their sensitivity to time space were all factors which influenced the translation of the score into sound. A greater degree of effort and commitment is required and performer musicianship becomes ranked with personality and emotional energy as dynamic forces driving home the piece's identity. The importance of this performer activity and effort cannot be over estimated in coming to terms with the difference between individual realizations of an indeterminate work.

Perhaps the degree of change is even more noticeable when realizations are attempted by different people, unlike the above comparison. In the case of Fontana Mix, four quite different versions have been attempted. In 1958 Cage recorded the sound material for magnetic tape while David Tudor has made a version for electronically-amplified

piano, Max Nehaus one for percussion instruments and feedback, and Cornelius Cardew one for guitar. Despite the limitations and possibilities, idiomatic to the chosen instruments, each performer seizes on particular ideas, sounds and performance styles which gives to each realization an identity of its own. In the case of the Nehaus version called Feed, the feedback channels are set up by resting contact microphones on various percussion instruments and standing them in front of the loudspeakers. The microphones are made to move around the hall by the vibrations. The piece is quite a long succession of sustained feedback sounds with little variation in pitch, but concentrating on the direction from which the sound comes. By way of contrast the piece for magnetic tape alone is a dislocated collage of distorted, superimposed spliced sounds and silences. Perhaps the most interesting version is that done by Cage with Cathy Berberian's version of Aria, 1958. Another interesting consequence of indeterminacy which arises from these works, is the question of identity of a piece of music. Aria may also be sung as a part of the Piano Concert, and Fontana Mix was initially composed from one of the autonomized procedures of the 84 notations used for the solo part of Concert. Thus within the range of

possibilities of Concert, both Aria and Fontana Mix can theoretically exist and could even possibly occur.

Considering the prolific and diverse nature of the works involving chance operations and indeterminate procedures, discussed even in this random sampling, it is not surprising that they comprise the greater part of Cage's output between 1950 - 1970. From a historical point of view it is possible to make some observations about the composer's engagement with such notions. From the early fifties, Cage firmly cemented all the experimentation with electronic sounds, indeterminate pitch and timbre, microtones, his constant concern for sonority of the individual sound, attack and decay, and a willingness to let sounds 'happen' in their own time not necessarily in fixed relationship to each other. The year 1950 was an open door to a host of practical solutions to make his ideas reality. The I Ching gained a strong footing from the outset lasting through the twenty years and beyond in the work Cheap Imitation of 1969-1973. Perhaps because of its simple dualism, Cage denounced the immobility-mobility technique as early as 1954 in his lecture '45' for a Speaker' in which he says "You can read about mobility and immobility. To repeat, I am no longer interested in it. I am interested

in assymetry".¹ By 1952 Cage had explored the imperfections in paper and it is possible that the puzzling pointillism of this technique lead him to search for other visually exciting mediums such as graphics, ~~and~~ overlays^{and} transparencies which gained such a stronghold in the late fifties and early sixties. The concern for measurement associated with many of the chance techniques is an extension of the pre-indeterminate works, involving complex numerical rhythmic and formal schemes as well as reflecting a basic interest in the shape and dimension of sound. The late sixties were devoted to computer composition which according to Cage would not be attempted again. The audio-visual happenings were as avant-garde and explosive in the early fifties as in the late sixties. Rather than seeing any continuum it is perhaps more pertinent to conclude that 1950 to 1970 was an intense period for working a flood of ideas into new musical idioms. Cage's own statement can well be applied to an overview of this period, "I find that it is important to take a multiplicity of steps."² At times social and financial pressures reduced the continuing prolific nature of his output to some degree, but the

1 Cage, Silence op. cit. p.190

2 ibid., p. 189

early fifties, particularly 1950, 1952, 1958 were fertile years.

If Cage's achievements in this period are to be regarded as in any way significant, ^{they} ~~it~~ should be seen in the context of antecedent and consequent musical thinking. A brief survey must suffice to represent this comprehensive field.

Indeterminate procedures and chance operations are not new. J.S. Bach's 'Die Kunst der Fuge', is indeterminate in respect that dynamics and timbre are not given. In 1751 William Hayes', The Art of Composing Music by a Method Entirely New, Suited to the Meanest Capacity, describes a technique of composition involving spattering notes onto the page from a stiff inked brush. Mozart's well known Musical Dice Game (K.294d), utilizes the throwing of dice. Other instances of chance techniques can be found as far back as the eleventh and twelfth centuries but none of these early examples involve the intensity and commitment to indeterminacy which came into the foreground in post world war Dadaist activities. The general trend towards anti-art as it was directed in musical channels can be seen in Satie's Vexations and the work of I.A. McKenzie, both of whom helped to pioneer a sociological and emotional

climate which could harbour such ideas.

Cage does not claim exclusive rights to indeterminate procedures and chance operations. In his essay the 'History of Experimental Music in the United States', of 1958 he acknowledges Debussy, Varése and Henry Cowell for their unbiased experimentation with sonority, Stravinsky and Schoenberg, as well as his contemporaries, Christian Wolff, Earle Brown and Morton Feldman. The three latter composers according to Henry Cowell, shared with Cage the interest of 'getting rid of the glue'. Wolff very early on wrote scores to be played from left to right, or from top to bottom, while Feldman divided pitch into three areas, high, middle and low. Brant spatially separated ensembles and Partch created novel and microtonal instruments. The catalogue is much larger but definite comparisons can be made even from this short list.³ As Cage's interests are not only musical ones, mention must be made of a wide range of thinkers whose influence can easily be perceived in helping to shape Cage's philosophy.

René Char, Gertrude Stein, Buckminster Fuller, Marshall McLuhan, Guy Nearing, and particularly exponents

3 For a more comprehensive list see the aforementioned lecture in Silence, op. cit. p. 67 ff.

of eastern philosophies such as Gita Sarabhai, and Daisetz Suzuki are amongst the most dominant. In the light of these influences the nature of Cage's philosophy may be seen as drawing from a wide range of musical and non-musical information and attitude. They are fused through the elusive components of the human personality in a certain environment thus making it.

It is impossible to pinpoint where the preoccupation with indeterminacy originally began or the extent to which Cage's ideas were new even in his own eyes. It is rather more pertinent to see them as a unique and diverse body of musical ideas and procedures which have stimulated similar interests in the younger composers. Dick Higgin's Thousand Symphonies involves the machine gunning of one thousand blank pages of manuscript and the English school including Cornelius Cardew's Octet 61 for Jasper Johns and the work of David Bedford and Brian Tilbury can be seen in direct succession. By far the greatest influence has been upon George Brecht, La Monte Young and the younger Japanese composers.

Music in which the commitment to a notion becomes more important than the sounds, coined by David Cope, 'anti-music' has been taken up by a wide range of composers

ranging from Harold Budd to David Lentz. The idea of minimal art exemplified in the use of transparent sheets and everyday objects is used by Dick Higgins in his Boredom and Danger. Composing-performing groups such as the David Tudor, Berio, Merce Cunningham, Cathy Berberian, John Cage association, have been established by other American composers, The Lukas Foss Improvisation Ensemble, the Once Group and Fluxus Groups.

As early as 1934, I.A. McKenzie had experimented with the possibility of not having audiences at all and his musical ideas normally give instructions primarily about the environmental situation.

In Europe quite a different approach to chance and indeterminacy has been taken. The vested interest in tradition and control for the most part has clashed with the more flexible spontaneous approach offered by Cage. Confrontation with composers like Hindemith and Boulez has not been beneficial to Cage's reputation, but this is due not only to the clash between radicalism and conservatism, freedom and control. There are great problems associated with Cage's philosophy which do have tremendous repercussions on the nature and validity of his work. Many of these problems are derived from conflicting

philosophical and aesthetic values and to explore them fully is beyond the task of this study, yet basic problems must be at least acknowledged.

The first main problem concerns the idealism of Cage's philosophy particularly concerning the matter of taste. Admittedly chance techniques are employed to aid the composer in making unbiased choices, but the decision to decry taste is itself a decision conditioned by personal preference. In instances where techniques are employed to minimise the involvement of taste at one level, the taste of the performer or listener at subsequent levels may completely submerge the attempt made. The problem of taste is really part of a deeper problem which entails Cage's intention to side-step all value judgments. Ideally every sound is as valid as the next one. For Cage, measurements of good or bad are irrelevant. Theoretically the logical extension of this is that every realisation irrespective of its quality has the right to exist, sounds are merely sounds whether they are created by the novice or professional and should exist in their own right. Yet the performers he himself engages for public performances are of outstanding merit both as musicians and composers. It is difficult to conceive of Cage's indeterminate

compositions without David Tudor, Cathy Berberian, or Merce Cunningham.

In the foreward^o to Richard Bungsar's The Well Prepared Piano of 1973, Cage derides a poor performance of The Perilous Night and despite the motives intended, some standard is implicit in the remark. If every sound has a right to exist, then the 'mistake syndrome' no longer is valid and it is this point that has excited the most severe criticism. To those who fear the absence of 'quality' as the primary motive for a piece of music, Cage's stand provides the easy way out, and few traditional musicians are prepared or likely to rethink the entire role of the creative process within artistic achievement.

There are also problems where fragile situations are incurred due to the high degree of irrationality in the works. The satirical performance In Homage to John Cage by Nam June Paik in which Cage's necktie was cut off and a bottle of shampoo poured over his head, has led the composer to some self criticism and bitterness. The importance of sympathetic performers and listeners was obvious at the first performance of Atlas Eclipticalis with Winter Music by the New York Philharmonic at the Lincoln Centre. Unfortunately despite the efforts of

both Leonard Bernstein and the composer, the performers were unable to take the work seriously and they engaged in destructive activities. However, according to Calvin Tomkins, Cage commented "even when Atlas is performed badly, it still sounds interesting,"⁴ and he continued to make the point that "even a bad performance may help to educate musicians and listeners to the possibilities of this new work and stretch their capacities to be interested in their experiences."⁵

Yet despite some slight disillusionment and some admitted problems, Cage's contribution demands recognition from several points of view. Firstly, by concentrating the use of chance and indeterminacy at the different levels of the musical process, the role of each part in relation to the other has been questioned and traditional norms expanded. Essential differences between creating, performing or listening to music have become more pressing and the understanding of what each entails even at basic and often assumed levels, is made more immediate.

The investment in measurement and control in self imposed terms is valid criteria for making the creative

4, 5 Calvin Tomkins, op. cit. p. 137.

act a conscious chain of decisions. The greater the number of decisions, the greater the effort. The seriousness with which Cage approaches this decision-making and his willingness to leave the options open, shows the sincerity of a man committed to the task. His thoroughness and gift in examining a particular problem is obvious in this comment concerning the necessary conditions for indeterminacy. "To ensure indeterminacy with respect to its performance a composition must be determinate of itself. If this indeterminacy is to have a non dualistic nature each element of the notation must have a single interpretation rather than a plurality of interpretations which coming from a single source, fall into relation."⁶ The unique and unpredictable nature of indeterminate compositions cannot be repeatedly grasped, only the knowledge that something has happened. Cage realised that this placed increased expedience on the listener to sharpen his aural perceptions in order to absorb as much as possible from one performance. This is what he really meant in saying that we need to wake up to the very life we're living.

6 John Cage, op. cit., p. 39

His observations about the nature of silence and the distinction made between intentional and non-intended sounds has made the point that in the greater sonic environment the familiar and unfamiliar are constantly exchanged in a three dimensional field.

The positive utilization of performer differences, spontaneous response ability, improvisation, and individual decision-making impinge on those irrational qualities of the performer which have been evaded, consciously eliminated, or redirected for centuries. The risk involved in including such notions when regarded from a point outside the 'nothingness' and 'non-sentient' world, is courageous.

What is obvious from this study is that John Cage's use of indeterminate procedures and chance operations in the period 1950 to 1970 is copious, diverse and intense. His insight into all aspects of chance and indeterminacy and his critical awareness of the possibilities and potential of the unpredictable are unique. His work presents an equally original synthesis of philosophical concepts and musical means. John Cage has devoted himself to avant-garde and experimental musical thought in a manner which has made many reassess the basis of accepted musical practice.

BIBLIOGRAPHY

I REFERENCES

1. Dictionnaire de la Musique Contemporaine, Claude Rostand (ed.), Paris Librairie Larousse, 1970.
2. Groves Dictionary of Music and Musicians, 9 vols., Eric Blom (ed.), 5th edition, London, 1954.
3. The Harvard Dictionary of Music, W.Apel (ed.), 20th printing, London, 1968.
4. Die Musik in Geschichte und Gegenwart, Friedrich Blume (ed.), 15 vols., Kassel, 1949.
5. The New Oxford History of Music, Eric Westreys (ed.), London, 1957.

II PRIMARY SOURCES

BOOKS

1. The John Cage Catalogue, ed. Robert Dunn, New York: C.F. Peters Co., 1962.
2. M. Writings 1967 - 1972, Middletown, Conn.: Wesleyan University Press, 1973.
3. Notations, (in collaboration with Alison Knowles), New York: Something Else Press, 1969.
4. Silence, Middletown, Conn.: Wesleyan University Press, 1961.
5. A Year From Monday, Middletown, Conn.: Wesleyan University Press, 1967.

SHORTER ITEMS

6. 'Experimental Music', The Score, 12 June 1955, pp. 65 - 68, reprinted in Gilbert Chase (ed.), The American Composer Speaks, Baton Rouge: Louisiana State Press, 1966.
7. 'The Future of Music: Credo' 1937 published 1958 in the Avakian Recording Booklet, reprinted in Silence, 1961, pp. 3 - 6.
8. 'For More New Sounds', Modern Music, XIX /4 (May - June, 1942), pp. 243 - 245.
9. 'History of Experimental Music in the United States' Darmstädter Beiträge zur Neuen Musik, II, (1959), pp. 46 - 53.
10. 'Lecture 30'00, Die Reihe 5, (American edition) (1961), pp. 115 - 120.
11. Notes to Indeterminacy, Folkways Records FT3704.
12. 'Soixante réponses à trente questions de Daniel Charles', Revue d'Esthétique 21, (Paris, 1968), pp. 9 - 21.

13. 'To Describe the Process of Composition Used in "Music for Piano 21-52"' (in German), Die Reihe 3, (1957), reprinted in English translation in the American edition, New York: Theodore Presser, (1959), p. 43.
14. 'To Describe the Process of Composition used in "Not Wanting to Say Anything About Marcel"', Cincinnati: Eye Editions, 1969.
15. Cage, John and Lejaren Hiller, 'HPSCHD' Source: Music of the Avant-Garde II /2, (1968), pp. 10 - 19.
16. Cage, John and Calvin Sumsion, Not Wanting to Say Anything about Marcel, Source: Music of the Avant-Garde 7, (1970), pp.1 - 21.

III SECONDARY SOURCES

BOOKS

1. Anon., Huang-Po Doctrine of the Universal Mind, London: The Buddhist Society, 1947, reprinted in America as The Zen Teaching of Huang Po, translated by John Blofeld. New York: Grove, 1959.
2. Ames, Van Meter, Zen and American Thought, Honolulu: University of Hawaii, 1962.
3. Austin, William, W. Music in the Twentieth Century, New York: W.W. Norton, 1966.
4. Bartolozzi, Bruno, New Sounds for Woodwind, O.U.P., 1967.
5. ^kBecwith, John and Ugo Kasemets, (eds.), The Modern Composer and His World, Toronto: University of Toronto Press, 1961.
6. Boehmer, Konrad, Zur Theorie der offenen Form in der Neuen Musik, Darmstadt, Tonos, 1967.
7. Bunker, Richard, The Well-Prepared Piano, Colorado Springs, 1973.
8. Chase, Gilbert, America's Music, 2nd. rev. ed. New York: McGraw - Hill, 1966.
9. Copland, Aaron, Copland on Music, New York: Doubleday, 1960.
10. Cope, David, New Directions in Music, Ohio: Cleveland Institute Press, 1971, reprinted 1973.
11. Cowell, Henry (ed.) American Composers on American Music, Stanford 1933, reprinted New York, 1962.
12. idem: New Musical Resources, New York: Something Else Press, 1969.

13. Deri, Otto Exploring Twentieth Century Music, New York: Holt, Rhinehart and Winston, 1968.
14. Edmunds, John, and Gordon Boelzner, (eds.), Some Twentieth Century Composers, New York: New York Public Library, 1959.
15. Ewen, David, David Ewen Introduces Modern Music, Philadelphia: Chilton, 1962.
16. idem: Composers of Tomorrow's Music, New York: Dodd, Mead, 1971.
17. Fuller, R. Buckminster, Ideas and Integrities, N.J: Prentice - Hall, 1963.
18. idem: Nine Chains to the Moon, Philadelphia: Lippincott, 1938.
19. Greer, Thomas, Music and Its Relation to Futurism, Cubism, Dadaism and Surrealism, 1905-1950, Denton, Texas, Dissertation, North Texas University, University Microfilms, 1969.
20. Hansen, Peter S. An Introduction to Twentieth Century Music, Boston: Allyn and Bacon, 2nd edition, 1967.
21. Hiller, Lejaren A., and Leonard M. Isaacson, Experimental Music, New York: McGraw - Hill, 1959.
22. Hitchcock, H., Wiley, Music in the United States: A Historical Introduction, N.J: Prentice - Hall, 1969.
23. Karkoschka, Erhard, Notation in New Music, translated from the German by Ruth Koenig, London: Universal Edition, 1972.
24. Kostelanetz, Richard, John Cage, New York: Praeger Publications, 1970.
25. idem: Master Minds, New York: Macmillan, 1969.

26. Meyer, Leonard B., Music, the Arts and Ideas, Chicago: University of Chicago Press, 1967.
27. Moles, Abraham A., Les Musiques Experimentales: Revue d'une tendance importante de la musique contemporaine, Edition du cercle d'Art contemporain, 1960, Precis and English translation Jean-Charles François, Melbourne, 1970.
28. Salzman, Eric, Twentieth Century Music: An Introduction, N.J: Prentice - Hall, 1968.
29. Schaeffer Pierre, La Musique Concrète, Paris: Presses Universitaires, 1967.
30. Schwartz, Elliot and Barney Childs, (eds.), Contemporary Composers on Contemporary Music, New York: Holt, Rhinehart and Winston, 1967.
31. Slonimsky, Nicolas Lexicon of Musical Invective, 2nd edition, New York: Coleman - Ross, 1965.
32. Stravinsky, Igor, Poetics of Music, Cambridge, Mass., 1947.
33. Thomson, Virgil, Music Right and Left, New York: Holt, 1951.
34. Tomkins, Calvin, The Bride and the Bachelors, New York: Viking, 1965 Rev. ed, 1968 republished as Ahead of the Game.
35. Watts, Alan, W. Beat Zen Square Zen and Zen, San Fransisco: City Lights, 1959.
36. Wilhelm, Richard, (ed.) The I Ching, or Book of of Changes, translated by Cary F. Baynes, New York: Bollinger, 1950.

ARTICLES

1. Ayer, A.J., 'Chance', Mathematics in the Modern World, Readings from Scientific American, U.S.A:

2. Behrman, David, 'What Indeterminate Notation Determines', Perspectives of New Music, III, 2 (Spring, 1964), pp. 58 - 73.
3. Berard, Carol 'Recorded Noises, Tomorrow's Instrumentation', Modern Music VI, (Jan. - Feb., 1929) pp. 26 - 29.
4. Boulez, - Pierre 'Alea', Perspectives of New Music, III/I (Fall-Winter, 1964) pp. 42 - 53.
5. Boretz, Benjamin, 'Music', The Nation, CXCV (February 3, 1962) pp. 107 - 8.
6. Cardew, Cornelius, 'Notation - Interpretation', Tempo 58 (Summer, 1961), pp. 21 - 33.
7. Charles, Daniel 'Entr'acte: "Formal" or "Informal" Music?', Contemporary Music in Europe, Paul Henry Lang and Nathan Broder (eds.), New York: Schirmer, 1965, pp. 144 - 165.
8. idem: 'L'Esthetique du 'non finito' chez John Cage' Revue d'Esthetique 21, 2-4 (1968) pp. 23 - 26.
9. Childs, Barney, 'Indeterminacy and Theory: Some Notes', The Composer, I, I (June, 1969), pp. 15 - 34.
10. Cope, David, 'Chronicles of a Cause: I.A. MacKenzie', The Composer, I, I (June, 1969) pp. 35 - 42
11. Copland, Aaron 'The Music of Chance', The New Music - 1900 - 1960 New York: W.W. Norton, 1968, pp. 177 - 182.
12. Cowell, Henry, 'Current Chronicle', The Musical Quarterly XXXVIII (October, 1952), pp. 595 - 600.
13. idem: 'The Joys of Noise' The New Republic LIX July 31, 1929 pp. 297 - 298.
14. Cross, Anthony, 'The Significance of Aleatoricism in Twentieth Century Music', The Music Review 29, (November, 1968), pp. 305 - 322.

15. Dinwiddie, John, '"Mewantemooseicday": John Cage in Davis 1969', Source: Music of the Avant-Garde, 7, (1970) pp. 22 - 25.
16. Eimert, Herbert, 'The Composer's Freedom of Choice', Die Reihe, 3, (1957), pp. 1 - 5.
17. Feldman, Morton, 'Conversations Without Stravinsky', Source: Music of the Avant-Garde, I, 2 (July, 1967), p. 43.
18. Foss, Lukas, 'The Changing Composer-Performer Relationship, a Monologue and a Dialogue', Perspectives of New Music I, 2, (Spring, 1963), pp. 62 - 64.
19. Gehlhaar, Rolf, 'Zur Komposition Ensemble', Darmstädter Beiträge zur Neuen Musik, XI, (1967), English version, pp. 43 - 76.
20. Haubenstock - Ramati, Roman, 'Notation, Material and Form', Perspectives of New Music, (Spring/Summer, 1965), pp. 43 - 44.
21. Helms, Hans G., 'John Cage's Lecture Indeterminacy', Die Reihe 5, (1961), pp. 83 - 120.
22. Hollander, John, Review of Silence, Perspectives of New Music, I/2 (Spring, 1963) pp. 137 - 141.
23. Hopkins, Bill 'Stockhausen and Others', Tempo 98, (1972), p. 32.
24. Jacobson, Bernard, 'Notes to Concerto for Prepared Piano and Chamber Orchestra', Nonesuch H71202.
25. Krenek, Ernst, 'Tradition in Perspective', Perspectives of New Music I, 2 (Fall, 1962), pp. 27 - 38.
26. Layton, Billy Jim, 'The New Liberalism' Perspectives of New Music III, 2, (Spring, 1964), pp. 137 - 142.
27. Lutoslawski, Witold, 'On the Element of Chance in Music', Three Aspects of New Music, Stockholm: Noroiska Musikförlaget, 1968, pp. 47 - 53.

28. Maren, Roger, 'Review of A Year From Monday'
Perspectives of New Music VI, 2 (Spring/Summer,
1968), pp. 182 - 184.
29. Nettle, Bruno 'Thoughts on Improvisation: A
Comparative Approach', The Musical Quarterly
LX, No. 1, (January, 1974) pp.1 - 19.
30. New Music Ensemble, Once Group, Sonic Arts, Group
and Musica Electronica Viva, 'Groups', Source:
Music of the Avant-Garde II, (January, 1968),
pp. 14 - 27.
31. Nono, Luigi, 'The Historical Reality of Music Today',
The Score 27, (July, 1960), pp. 41 - 45.
32. Nyman, Michael 'Cage and Satie', Musical Times
(December, 1973) pp. 1227 - 1228.
33. Perkins, J.M. 'Note-Values' Perspectives of New
Music (Spring/Summer, 1965), pp. 47 - 57.
34. Reynolds, Roger, 'Indeterminacy: Some Considerations',
Perspectives of New Music, IV,1 (Fall Winter, 1965),
pp. 136 - 140.
35. Riley, Howard, 'Aleatoric Procedures in Contemporary
Piano Music', Musical Times (April, 1966) pp. 311 -
312.
36. Rochberg, George 'Indeterminacy in the New Music',
The Score 26, (January, 1960), pp. 9 - 21.
37. Scarr, Kathleen M., 'John Cage and 'Prepared Music'',
Canon 8/10 (May, 1955) pp. 393 - 395.
38. Stein, Leonard, 'The Performer's Point of View',
Perspectives of New Music, (1963), p. 62.
39. Stockhausen, Karlheinz, 'Musik und Graphik',
Darmstädter Beiträge zur Neuen Musik III,
(1960), pp. 5 - 25.
40. Stone, K., 'Problems and Methods of Notation',
Perspectives of New Music, (Spring, 1963),
pp. 9 - 31.

41. Stuckenschmidt, H, 'Contemporary Techniques in Music' The Musical Quarterly XLIX (January, 1963) pp. 1 - 16.
42. Yates, Peter 'An Introduction to John Cage', Twentieth Century Music, New York: Pantheon, 1967, pp. 303 - 313, also 327 - 345.

APPENDIX

JOHN CAGE: VARIATIONS II

IA REALIZATION ONE . ANY SOLO INSTRUMENT

IB REALIZATION TWO . FLUTE AND SYNTHESIZER

IIA & B RECORDINGS OF REALIZATIONS ONE AND

TWO

VARIATIONS II

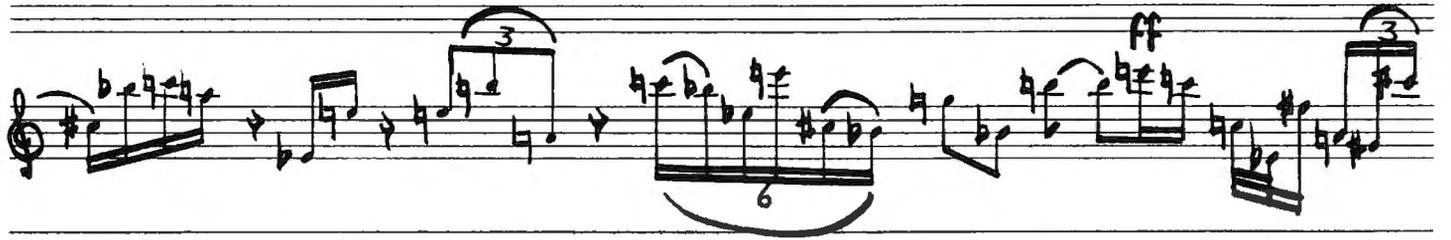
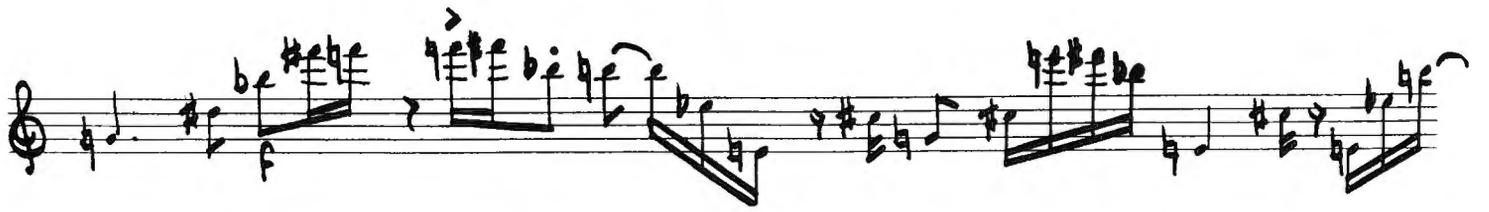
REALIZATION I . BY ROS BANDT . FOR ANY SOLO INSTRUMENT . OCT. 1974.

$\text{♩} = c. 70$

ppp pp mp mf *para accel.* p f

$\text{♩} = c. 126$

f ff



VARIATIONS II 2ND REALIZATION BY ROS BANDT FOR FLUTE AND SYNTHESIZER

