INTRODUCTION

There has been a general tendency in Western music to restrict the performer's options ever more closely, and at the same time an increasing dedication to honoring the composer's intentions at the expense of the performer's creativity. Compare Bach's *Well-Tempered Clavier* (1722, 1742), which lacks any indications of tempo, dynamics, or articulation, with Debussy's *Preludes* (1910, 1913), which are full of detailed and descriptive instructions, and compare them both with the examples of integral serialism in which every note has its own dynamic marking and articulation. Though elements of chance are present in any live musical performance (after all, there is always the possibility of a mistake), the emphasis has usually been on more control, not on improvisation.

Nevertheless, an important force in music in the second half of the twentieth century has moved in just the opposite direction, toward less control by the composer and more creative responsibility for the performer. As we shall see, this new responsibility can range from making an insignificant decision to shaping all aspects of the piece. In either case, the composer deliberately leaves something unspecified, up to chance or to the whim of the performer. Two terms used for music of this sort are *indeterminacy* and *aleatory*. Though some authors attempt to make a distinction between these two terms, we will not do so in this text.

A less significant but related movement has made use of chance in the compositional process itself. If it is a good thing for the composer to be less involved in the way a piece is to be performed, then it might follow that the composer should also be less involved in the way that it is composed, and this can be accomplished by introducing elements of chance into the compositional process.
These two approaches—chance in composition and choice in performance—form the two related branches of experimental music, a term that is appropriate for any music in which the final product is deliberately kept beyond the control of the composer.

**CHANCE IN COMPOSITION**

In order to allow chance to play a part in composition, the composer must decide what aspects of the work are to be decided by chance and what the range of probabilities of each aspect should be. For example, we could compose a piece for piano without dynamics and then apply the dynamics randomly by flipping coins or rolling dice. We would still have to decide on the range of the dynamics (perhaps ppp to fff) and how often they were to change. In general, however, composers who make use of chance apply it much more broadly than this.

The most influential composer to make extensive use of chance in composition was an American, John Cage, who was mentioned in Chapter 8 in connection with Oriental philosophy (see p. 172). In a number of his chance compositions, Cage made use of procedures drawn from the I-Ching, a Chinese treatise on probabilities, making each decision by tossing a coin six times and looking up the result on a table of “hexagrams” that represent symbolically the 64 possible outcomes (that is, 2 to the 6th power) for six coin tosses.

*Imaginary Landscapes No. 4* (1951) provides an early example of Cage’s use of chance and an example of his originality as well. Presumably Cage decided without the help of chance the instrumentation of this piece (twelve radios) and the number of performers (two for each radio). The I-Ching was employed to help determine the changing dynamic levels and frequencies to which each radio would be set. All of this is notated on a twelve-stave score employing both traditional musical symbols and numbers. Even though the score is precisely notated, chance has a role in the performance as well, because the signals that the radios pick up are unpredictable and will vary with each performance. The I-Ching was also used by Cage for *Williams Mix* (see pp. 154 and 247), as well as in other works.

Composers have employed other random decision-making techniques as well, of course. Cage used imperfections in paper to determine the placement of notes in *Music for Piano* (1952–56) and astronomical maps for *Atlas Eclipticalis* (1962). The arias for his opera *Europera 1* (1987) are selected by the nineteen singers from any out-of-copyright operas, although the singers do not know until the last minute whether or when they will actually get to sing. The orchestra parts are photocopies of instrumental parts selected at random by the composer, also from out-of-copyright operas. The parts may be distributed to the players at random. Perhaps the most outlandish use of chance is *The Thousand Symphonies* (1968) by Dick Higgins, in which the “score” was produced by firing a machine gun at manuscript paper.

Computers have been used to some extent in chance composition, since they can be programmed to produce an apparently random series of numbers within a specified range and to use those numbers in decision-making processes. The speed of a computer makes practical the use of much more complex probabilistic procedures. Conditional probabilities,
for example, can vary according to one or more conditions that have been decided on previously. As a very simple example, suppose we want to generate a melody that will conform to the following rules:

1. Use only the notes C, E, and G.
2. Allow no repeated notes.
3. Use fewer G's than C's or E's.
4. Distribute the C's and E's evenly.

The following table would tend to produce such a melody, although we still must specify its length and the first note. To use the table, find the most recent note on the left border. Then use the percentages shown in that row to generate some note on the top border. For instance, if C is the most recent note generated, then the next note will probably be E (75%) but might be G (25%).

<table>
<thead>
<tr>
<th></th>
<th>C</th>
<th>E</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>50%</td>
<td>50%</td>
<td>0%</td>
</tr>
<tr>
<td>E</td>
<td>75%</td>
<td>0%</td>
<td>25%</td>
</tr>
<tr>
<td>C</td>
<td>0%</td>
<td>75%</td>
<td>25%</td>
</tr>
</tbody>
</table>

Conditional probabilities can be nested to any depth, with the result that the selection of a particular event may depend upon the results of the last several decisions.

Lejaren Hiller is a composer whose name is often associated with computer composition. Together with Leonard Isaacson, he composed the first serious computer piece, the Iliac Suite for String Quartet, in 1957. Though the Iliac Suite was somewhat tentative creatively, the Computer Cantata (1963), by Hiller and Robert Baker, is a more substantial composition and explores conditional probabilities systematically. Other composers associated with this technique include Iannis Xenakis, who calls his computer music "stochastic music," Larry Austin, whose Canadian Coastlines (1981) is a complex eight-part canon for instruments and tape, and Barry Vercoe, whose Synapse for Viola and Computer-Synthesized Tape is a serial work in which many of the details were decided by a computer.

Computers have also been used for many years in an attempt to create new music in the style of some composer of the past, such studies typically concentrating either upon the compositional process or upon how a musical style is defined. Important work in the latter area has been done in recent years by the composer David Cope.

**CHOICE IN PERFORMANCE**

Aleatory in performance can range all the way from the most insignificant detail to the entire shape of the piece. On the one hand are works in which the indeterminate elements may be so unimportant that any two performances of the piece will be very similar; on the other hand are pieces that are totally improvised and will vary greatly from one perfor-
mance to the next. The elements of composition that may be left up to the performer include the following:

- Medium (instrumentation)
- Expression (dynamics, etc.)
- Duration (rhythm and tempo)
- Pitch
- Form

In practice, these categories often appear in combination, but it will be useful to discuss them briefly individually, after which we will consider some examples from the literature.

Leaving the performing medium unspecified is not a practice unique to the twentieth century—Bach’s Art of Fugue (1750) is a famous eighteenth-century example—but it is a practice that had been largely abandoned for some time. Nevertheless, a number of twentieth-century works leave open either the performing medium or the number of performers, or both.

Expression, including everything from dynamics and articulation to the most subtle nuance, has been of increasing concern to most composers. Even from Mozart to Beethoven we see development in this area, and much more from Beethoven to Debussy. However, composers interested in allowing the performer to have more freedom frequently omit expression marks, although the usual practice is not to do so unless other aspects of the piece are also indeterminate.

Indeterminacy in duration can be handled in a number of ways. Tempos can be “as fast as possible” or “as slow as possible.” Rhythm can be left open by providing noteheads on the staff while leaving the durations completely up to the performer. The composer can exercise more control by the use of proportional notation, in which the spacing of the notes on the page indicates their approximate durations, as in Example 6–9 (p. 125).

A simple example of pitch indeterminacy is the instruction “as high as possible.” More extended examples often show the general contour, while leaving the precise pitches up to the performer. An instance of this was encountered in Example 6–10 on p. 126. Here the flutes are given apparently random contours to follow repetitively for eighteen seconds, after which all are to begin at a fairly low pitch and work their way upward. A composer may choose not to provide even a contour, in which case the choice of pitch and register is entirely up to the performer.

The usual method of leaving the form of a work unspecified, short of total improvisation, is to allow the performer or conductor to choose the order in which the sections of a piece will be performed, how often they will be performed, and even whether they will be performed at all. This approach to form is sometimes called open form or mobile form.

Free improvisation, where nothing is specified, can be exhilarating for the performer, but it never seemed to catch on and was largely a phenomenon of the 1970s. More structured improvisation has had followers since at least the 1960s, and it is still flourishing under the guidance of composer-performers like John Zorn.
 SOME EXAMPLES OF PERFORMER INDETERMINACY

Stockhausen’s *Piano Piece XI (Klavierstück XI)* (1956) was one of the first European works to employ open form. The score, a single page roughly 21 × 37 inches, consists of nineteen precisely notated segments of varying lengths, the proportions being governed by a Fibonacci series. The segments are played in any order, and the performer is instructed to choose the order randomly without intentionally linking one to another. If a segment is played a second time, instructions in parentheses such as 8va may allow some variation. When a segment is “arrived at for the third time,” the piece is over, even though some segments may not have been played at all. Each segment is followed by symbols that specify tempo, dynamics, and mode of attack, and these are to be applied to the next segment in each case (the performer chooses the tempo, dynamics, and mode of attack for the first segment that is performed).

Cornelius Cardew’s *Octet 61 for Jasper Johns* (1961) is a free-form composition “not necessarily for piano.” The score consists of sixty “signs” that are to be interpreted cyclically—that is, sign 60 is followed by sign 1. The performer may begin anywhere and end anywhere, and the signs may be taken in reverse order if desired. An additional wildcard sign is provided for use “anywhere and as often as desired.” The first six signs are shown in Example 14–1. Notice that sign 1 includes the Arabic numerals 6 and 7, sign 3 contains 3 and 5, and sign 6 contains 1, 6, and 7. Cardew provides hints for interpreting some of the symbols used in the signs, but the instructions emphasize creativity and interpretation rather than conformity. As an illustration of one of the many ways of interpreting signs 1–6, Cardew provides the illustration seen in Example 14–2. His key to the illustration follows the example.


1. Seven taken literally as a configuration in musical space. Six Cs, one added to each of the first six signs.
2. Add E flats.
3. Three As. Five A flats. Three sustained notes forte; the others piano or pianissimo. Five-note cluster-type chord.
4. Two chords piano following the dot-dash rhythm of the Gs in 3.
5. Slide from E down towards B.
6. Six different registers for D (colour pitch). Seven described as in 1. One described as subsequent cluster. One C at given pitch—longer duration.

Stockhausen's Piano Piece X (Klavierstück X) (1961) calls for a tempo “as fast as possible.” Macro-durations are indicated above the staff, as in Example 14–3. Here the durations above the staff are a quarter-note, a double whole-note tied to an eighth-note, an eighth-note, and so on. The pitches on the staff are to be played within the given duration, with ascending and descending beams indicating accelerando and ritardando. The long slurs that join some stems (for instance, the F#4–G4 in the right hand near the beginning) call for the first note to be sustained until the second one is reached. The visual attractiveness of Piano Piece X is part of its appeal, and the same is true of many works composed in the second half of the century. Perhaps more than in any other period, it is helpful for the contemporary composer to be competent at drafting or in the use of notational software.

Klavierstück X  

Karlheinz Stockhausen

dicke Noten bremsen (ppp oder mf)  mff
The Roles of Chance and Choice in Twentieth-Century Music

Morton Feldman's *The Straits of Magellan* (1962), for seven instruments, is a good example of controlled ensemble improvisation. Each box in Example 14–4 represents a unit of the basic tempo, M.M. 88. An empty box stands for silence. The other boxes are to be realized by improvisation, except that the symbol in each box restricts what the performer can do:

*Arabic numeral:* Play that many notes in succession, except for the pianist, who should play them as a chord.

*Roman numeral:* Play that many notes as a chord.

*F:* Flutter-tongue one tone.

*T:* Double-tongue one tone.

*Diamond:* Play as a harmonic.

The dynamics are specified as “very low throughout,” and “all sounds are to be played with a minimum of attack.”

**EXAMPLE 14–4** Feldman: *The Straits of Magellan* (1962), first 20 boxes on p. 1
(C) 1962 by C. F. Peters Corporation. Used by permission.

<table>
<thead>
<tr>
<th>FL.</th>
<th>SORD.</th>
<th>HN.</th>
<th>SORD.</th>
<th>TRP.</th>
<th>GT.</th>
<th>HP.</th>
<th>PN.</th>
<th>CB.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>5</td>
<td></td>
<td>1</td>
<td>7</td>
<td>2</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>7</td>
<td></td>
<td>3</td>
<td>III</td>
<td></td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
<td>IX</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>F</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>4</td>
<td></td>
<td>1</td>
<td>1</td>
<td>V</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>F</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

The third movement of Lukas Foss's *Baroque Variations* (1967) is titled “On a Bach Prelude (Phorion)” and is based on the Prelude to Bach’s Partita in E Major for solo violin (an example of quotation music—see Chapter 8). This orchestral work requires a number of choices on the part of both the conductor and the performers. For example, at rehearsal no. 2 in the score, a section that “should last circa 2 minutes,” the conductor chooses from four groups of instrumentalists, cueing first one, then another, with only general instructions
in the score concerning which groups to favor and which to neglect. At 3, five soloists play passages they have selected independently from the “Bach sheet” provided with the score, while at 5 the woodwinds are provided with noteheads and the instruction to “place anywhere within bar, unevenly. Vary placement.” Similar techniques are used throughout the movement, with nearly all of the pitch material being derived from the Bach work.

Foss’s Thirteen Ways of Looking at a Blackbird (1978) uses a number of interesting techniques, including tape delay and pitch indeterminacy. The tenth song begins with a 30-second improvised duet for flute and percussion, the percussionist playing on the strings of a piano with tape-covered triangle beaters. Example 14–5 shows the composer’s instructions for this duet along with a sample beginning. Note especially the instruction to “Use all twelve notes.” The effect desired here, as in most improvisations, is one of free atonality, not serialism, and certainly not diatonicism.

EXAMPLE 14–5 Foss: Thirteen Ways of Looking at a Blackbird (1978), X, instructions and first system (Copyright © 1979 by Pembrooke Music Co., Inc. Reprinted by permission.)

Flute/Percussion Duet (30′)

Use all twelve notes, all registers. Mix these:

Use \( p/mf/f \). Pauses \( \frac{1}{2} \) to \( 1 \frac{1}{2} \). Sometimes omit \( \cdot \) (no pause)

Flute “Percussion (throughout X) only a sample

 improvise a similar texture

Flute

Perc.

30°

pitches not notated because the percussionist is hitting the strings at random. He can however control direction and rhythm. Triangle beaters on piano strings.

The single movement of Witold Lutosławski’s Symphony No. 3 (1983) contains a number of \emph{ad libitum} passages, most of them involving a kind of uncontrolled imitation. In Example 14–6 the conductor provides cues at nine points (see the arrows above the score) but otherwise does not conduct. The winds play their repeated patterns at a fast tempo, essentially in an uncoordinated fashion, until the conductor cues a change of pattern (the last arrow) or begins a conducted section. Notice that each group (piccolo/flutes, oboes, and horns) has its own pitch material and that the patterns within each choir are somewhat similar, resulting in uncontrolled imitation within each group. (In this excerpt, all of the instruments except the piccolo sound as written, and an accidental applies only to the note it precedes.) Other composers have sought simpler solutions to this problem. Einojuhani Rautavaara in his Symphony No. 5 (1985) uses a performance direction of “independently,” while John Corigliano in his Symphony No. 1 specifies “unaligned,” both of which result in a similar kind of uncontrolled imitation.
EXAMPLE 14-6   Lutoslawski: Symphony No. 3 (1903), pp. 1–2 (winds only)  
(Reprinted by permission of G. Schirmer, Inc. (ASCAP) All rights reserved.)
A graphic score is one in which conventional musical notation has been abandoned in favor of geometric shapes and designs that suggest more or less clearly how the music is to be performed. The Feldman excerpt (Example 14-4) is an example of one approach to graphic notation. Whereas Feldman provides fairly specific guidance for his performers, Martin Bartlett provides much less for the unspecified ensemble that is to perform the second movement of *Lines from Chuang-Tzu* (1973). In this movement, shown in its entirety in Example 14-7, dynamics are indicated by the size of the dots. Nothing else is specified.
EXAMPLE 14-7  Bartlett: Lines from Chuang-Tzu (1973), II  (Reprinted from SOURCE: Music of the Avant Garde, Issue 11, 1972, with permission from Composer/Performer Edition, 2109 Woodbrook, Denton, TX 76205.)

"a path is made by people walking on it"

Made Bartlett '73
Even less information is given by Robin Morton in Very Circular Pieces (1970). In the movement shown in Example 14–8, “Repeat” is the only performance instruction.


A text score is one that consists only of words. The text usually provides instructions for an improvisation, but it may do little more than set a mood. Three examples will suffice as models. Christian Wolff’s “Play,” from the Prose Collection (1969), is fairly specific in its instructions. The beginning is shown in Example 14–9.

**EXAMPLE 14–9** Wolff: Prose Collection, “Play,” first forty-six words *(Copyright © G. Schirmer, Inc. (ASCAP) International copyright secured. All rights reserved. Used by permission.)*

Play, make sounds, in short bursts,
Clear in outline for the most part;
quiet; two or three times more towards
as loud as possible, but as soon as you
cannot hear yourself or another player
stop directly. Allow various spaces
between playing (2.5 seconds, indefinite), . . .

The second example, Stockhausen’s For Times to Come (1970) (Example 14–10), is a composition for an unspecified ensemble, and it illustrates what Stockhausen calls “intuitive music.”

**EXAMPLE 14–10** Stockhausen: For Times to Come (1970), “Waves” *(Reprinted with permission of Stockhausen-Verlag, 5067 Kuerten, West Germany.)*

Overtake the others
Hold the lead
Allow yourself to be overtaken
Less often

The third example, Stephen Montague’s Quintet (1978), instructs the performer to record four interpretations of “a famous work” on the four tracks of a tape. The tape is then to be played while the musician performs yet another interpretation, so that the audience hears the five versions simultaneously, each with its own tempos, dynamics, and so forth.
MUSIC ON THE FRINGE

In the 1960s and 1970s especially, a number of composers wrote pieces that seem to many musicians to push the limits of what can be called "music." Traditional definitions of music often include references to organized sound and to the expression of ideas and emotions, but some works challenge these notions. One example is the last movement of Dick Higgins's *Constellations for the Theater* (Number X) (1965), a text score given in its entirety as Example 14-11.

**EXAMPLE 14-11 Higgins: Constellations for the Theatre (Number X) (1965), "A Winter Carol"** From Constellations and Contributions by Dick Higgins. (Copyright © 1961 by Richard C. Higgins. All rights reserved. Reprinted by permission.)

Any number of people may perform this composition. They do so by agreeing in advance on a duration for the composition, then by going out to listen in the falling snow.

This is not the only work to concentrate the attention of the audience on the natural sounds that exist in the environment. Pauline Oliveros's *Bonfire* (1976) is an environmental theater piece that uses an entire city or university as its performance stage. All of the normal activities that take place in the environment are part of the performance, but there are also a large number of specialized performers—actors, groups of musicians, picketers carrying blank signs, and so on. In addition, there are a number of "costumed guardians" who stand near the sources of everyday environmental sounds (motors, practice rooms, traffic) and point them out to people who pass by. The piece ends with a "final ritual" in which the performers move in a circle around a bonfire chanting "Feier" (the German word for a celebration or festival) "until each person can no longer participate."²³

A famous work that often outrages audiences new to it is Cage's 4'33" (1952), for any instrument or combination of instruments. It consists of three movements, each of which consists only of the direction "Tacet," the durations of the three movements adding up to 4'33". While usually performed at the piano, it can be effective as an ensemble piece as well.

Other works seem at first to be hopelessly absurd, but the underlying purpose may still be serious. A movement of Mortimore’s *Very Circular Pieces* (1970) contains the performance instruction "Play until 2000 A.D." What are we to do with this? Does it mean the piece is not to be performed at all? Or were we to keep it in our minds until the year 2000? Or was the purpose to encourage us to meditate on the coming millennium? And what about Paul Ignace’s *Symphonie Fantastique* No. 2, a duplication of the Berlioz work sprung upon an unsuspecting concert audience, many of whom had heard the Berlioz the previous night? Is the purpose here humor, surprise, or, as the composer suggests, to get people to listen to the music in a new way?²⁴

The list of musics "on the fringe" goes on and on. There is, for example, "biofeedback music," in which the performers control the sounds by means of changing the alpha-wave output from their brains. More sinister is a category that David Cope calls "danger music."²⁵ Some of it suggests self-directed violence, as in Takehisa Kosugi’s *Music for a Revolution*, which begins, "Scoop out one of your eyes five years from now;"²⁶ while others, such as Philip Corner’s *One Antipersonnel-Type CBU Bomb Will Be Thrown into the Audience*, are more threatening to the audience.
Lively accounts of these and other "fringe" movements can be found in the books by Cope and Michael Nyman listed at the end of this chapter.

**SUMMARY**

Experimental music, in which the composer consciously abdicates control over the compositional process or the performance, or both, has been an important element of music in the second half of the twentieth century. Chance in composition has involved the use of a number of decision-making techniques, including the I-Ching, while the computer has made practicable aleatoric compositions that are much more complex. The element of chance (or, from the performer’s viewpoint, choice) has been even more influential in the performance of music than in composition. The improvised portions of a score may be insignificant, or improvisation may be the major element of interest in the work. New notations have been devised for indeterminate music, including proportional and graphic notation; text scores dispense with notation entirely. Finally, a number of “fringe” movements have ranged from the absurd to the violent, calling into question our notion of what music really is.

**NOTES**

1. Do not make the all-too-common error of confusing computer sound synthesis (see Chapter 12) with computer composition. Either or both may be employed in a particular composition.
3. Oliveros, Bonn Feier.

**EXERCISES**

**Part A: Analysis**

1. Study the pitch material in each of the three choirs in Example 14–6, remembering that the score is written at concert pitch and that an accidental applies only to the note it precedes.

   (a) What is similar about the pitch material in the three choirs?
(b) Analyze the pitch-class set types found in each choir.
(c) Do the pitch classes used in the winds complete an aggregate?
(d) How does the pitch material in the three choirs relate to the E’s that open the movement?

2. Look up the word “music” in at least two dictionaries, and copy out the main (first) definitions. (Use standard dictionaries—“music” is not defined in The New Harvard Dictionary of Music.) Then relate those definitions to the kinds of works discussed in this chapter. Do some of the works lie outside the definitions, and if so, should the definitions be changed? Are the definitions even too restrictive for more conservative twentieth-century music? Can you suggest a better definition for “music,” or a term for the kinds of pieces that you feel are not really music?

Part B: Composition and Performance

1. Compose and rehearse an improvisatory piece for ensemble. Try to restrict the choices of the performers so that the piece will have the same basic shape each time it is performed. Explain how your controls will satisfy the assignment. Then perform it twice for the class.

2. Compose a graphic score to be performed by a soloist (unspecified medium), with few instructions. Explain (to your instructor) how you decided on the arrangement of the graphic symbols and how they might be interpreted. Have it performed by a volunteer from your class.

3. Compose a short piece for some instrument in your class in which some of the compositional decisions are made by random choice (flipping coins, etc.), and explain how you composed it. Make two versions of the piece, and have both performed for the class.

FURTHER READING

Batesman, Wayne. Introduction to Computer Music. See Chapter 11, Composition with the Computer.
Brindle, Reginald Smith. The New Music. See Chapter 8, Indeterminacy, Chance, and Aleatory Music; Chapter 9, Improvisation–Graphic Scores–Text Scores; and Chapter 12, Cage and Other Americans.
———. Experiments in Musical Intelligence.
———. New Directions in Music. See Chapter 5, Indeterminacy; Chapter 6, Experimentalism; and Chapter 10, Automated Music.
Dallin, Leon. Techniques of Twentieth Century Composition. See Chapter 18, Indeterminate Procedures.
DODGE, CHARLES, AND THOMAS A. JERSE. Computer Music. See Chapter 8, Composition with Computers.


———. Techniques of the Contemporary Composer. See Chapter 14, Indeterminancy, and Chapter 17, Algorithmic Composition.

HEUSSENSTAMM, GEORGE. The Norton Manual of Music Notation.

KARKOSCHKA, ERHARD. Notation in New Music.

KOSTELANETZ, RICHARD, ED. John Cage.

MORGAN, ROBERT P. Twentieth-Century Music. See Chapter 17, Indeterminacy.


READ, GARDNER. Modern Rhythmic Notation.

SIMMS, BRYAN. Music of the Twentieth Century. See Chapter 13, Indeterminacy.

STONE, KURT. Music Notation in the Twentieth Century.

WILLIAMS, J. KENT. Theories and Analyses of Twentieth-Century Music. See Chapter 16, Chance and Indeterminacy.