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in

Contemporary Music Performance

by

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2016
The Dissertation of Dustin Donahue is approved, and it is acceptable in quality and form for publication on microfilm and electronically:

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2016
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ABSTRACT OF THE DISSERTATION


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Doctor of Musical Arts in Contemporary Music Performance
University of California, San Diego, 2016

Professor Steven Schick, chair

This dissertation investigates the turn to “open form” and “indeterminacy” among composers worldwide in the 1950s and 1960s. Looking first to the music of Anton Webern, this study traces the origins of a musical aesthetic that prioritized compositional systems and became a foundation for the exploration of open form techniques after World War II. The remainder of this study focuses on John Cage’s flexible, score-producing tools, *Fontana Mix*, *Cartridge Music*, and *Variations II*, examining the ways these works define themselves in spite of their inherent multiplicity. Their complex
relationship with interpretation and performance is examined through the realizations of John Cage and David Tudor in addition to my own recent experiences as an interpreter of this music.
Chapter I

Anton Webern’s Aesthetic of Openness and the Post-World War II Avant-Garde

From the early 1950s to the late 1960s, the musical avant-garde was saturated with experiments in “open form.” This apparent obsession was not limited to a particular country, school of thought, or institution; nearly every major figure of this period made some attempt to compose a work that left significant decisions to the performer. These decisions ranged from simple choices, such as the order of phrases in Karlheinz Stockhausen’s Klavierstück XI (1956), to extremely elaborate graphic notations like those of Sylvano Bussotti’s Sette Fogli (1959), to complex, indeterminate systems that could accommodate any instrument or length of time, as in John Cage’s Variations II (1961). In all such music, the performer was given an unprecedented role in actively constructing the form of a musical work. The sudden appearance of such works and massive scale of this trend defy simple explanation.

A. The Open Work

The most thorough and rigorous discussion of openness in the arts appears in Umberto Eco’s 1962 treatise, Opera Aperta.¹ Eco’s work draws heavily upon these radical musical ideas, citing contemporary works by Berio, Boulez, Pousseur, and Stockhausen as the objects of his discussion. Eco first undertakes a discussion of how

contemporary notions of open form developed in the arts. Curiously, however, his historical discussion is limited almost entirely to literature. Yet, having only discussed the other arts, Eco arrives triumphantly at the open form music of the 1950s as a *summa* of aesthetic openness. But literary models cannot fully account for the ubiquitous trend toward open form composition in the middle twentieth century; problematically, Eco does not discuss how musicians came to privilege multiplicity and formal variability.

Regardless of its musical omissions, Eco’s study provides a critical framework with which to begin a discussion of musical openness. Contrary to what the term might suggest, Eco makes no distinction between an “open” work and a “closed” work. As Eco describes, “A work of art, therefore, is a complete and *closed* form in its uniqueness as a balanced organic whole, while at the same time constituting an *open* product on account of its susceptibility to countless different interpretations which do not impinge on its unadulterable specificity.”

In this way, all works of art must be considered “open.” While a work of art may indeed be fixed as a self-contained system of relationships, it is also always available to an infinite number of interpretations based on the perspective of the interpreter (who might be reader, observer, audience member, performer, etc.) Thus it is not a matter of whether a work is open or closed, but instead a matter of openness by the *degree* to which the work actively encourages the participation of the interpreter.

Eco’s model describes three degrees of openness. The first and third categories are most clearly defined. The first and most general category, discussed above, includes all works of art based on their infinity of available interpretations. This concept certainly applies to all musical works as well. The third category Eco describes as the “work in

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2 Ibid., 4.
movement,” a phenomenon limited to the twentieth century, idealized in the kinds of musical works mentioned above, in which the act of interpretation involves “the invitation to make the work together with the author.”

Works displaying third-degree openness

...reject the definitive, concluded message and multiply the formal possibilities of the distribution of their elements. They appeal to the initiative of the individual performer, and hence they offer themselves not as finite works which prescribe specific repetition along given structural coordinates but as “open” works, which are brought to their conclusion by the performer at the same time as he experiences them on an aesthetic plane.

In this way, each interpretation of such a work constitutes a different set of relationships. Such a work thus represents the opposite of first-degree openness, in which “countless interpretations do not impinge” upon the work; here, countless interpretations are necessary to create the work, yielding countless different results.

Occupying a middle ground between these two notions, Eco’s second degree of openness is more difficult to categorize. Eco arrives at this category by examining the role of the interpreter throughout history. He describes a trend in which increasing value and responsibility is placed on the interpreter: Looking first to the development of perspective in visual art, Eco claims, “The various devices of perspective were just so many different concessions to the actual location of the observer in order to ensure that he looked at the figure in the only possible right way – that is, the way the author of the work had prescribed, by providing various visual devices for the observer to focus on.”

Eco then finds increased freedom of interpretation in medieval scriptural study, citing

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3 Ibid., 21.
4 Ibid., 3.
5 Ibid., 5.
Dante’s description of four different ways to read a biblical text. A reader might choose to emphasize the “literal meaning,” “the allegory,” “the moral sense,” or “the anagogical sense,” in order to best suit their purposes. Nevertheless, for Eco, “It is obvious at this point that all available possibilities of interpretation have been exhausted. The reader can concentrate his attention on one sense rather than another, but he must always follow rules that entail a rigid univocality.”6 In the Baroque, art’s tendency toward abstraction and fluid movement leads to a new role for art; Man “is no longer able to see the work of art as an object which draws on given links with experience and which demands to be enjoyed; now he sees it as a potentially mystery to be solved, a role to fulfill, a stimulus to quicken his imagination.”7 In this way, Baroque art leads the interpreter beyond the work, functioning as a provocation of the mind rather than an arbiter of “authorized responses.”8

It is not, however, until the late nineteenth century that Eco identifies “the first conscious poetics of the open work” in the poetry of Mallarmé and his aesthetic that privileges ambiguity and suggestiveness. He cites Mallarmé, “To name an object is to suppress three-fourths of the enjoyment of the poem, which is composed of the pleasure of guessing little by little…” Indeed, appreciation of the text relies upon the interpreter freely exploring the ambiguities presented by the text. The power of these works lies in their ambiguity, as “the text sets out to stimulate the private world of the addressee so that he can draw from inside himself some deeper response that mirrors the subtler

6 Ibid., 6.
7 Ibid., 7.
8 Ibid., 7.
resonances underlying the text.”

It is in works of this sort that Eco identifies openness of the second degree, in which a fixed artwork relies upon the interpreter to explore and find a unique path through its relationships and create meaning from the author’s forms. It is this type of art, which first privileges multiplicity within a fixed form, that Eco identifies the origins of third-degree openness, so-called “works in movement.”

It is this step that is missing from Eco’s discussion of music. Yet, his discussion of James Joyce, who for Eco epitomizes second-degree openness, relies upon musical references. Looking at *Finnegan’s Wake*, Eco claims, “the work is finite in one sense, but in another sense it is unlimited. Each occurrence, each word stands in a series of possible relations with all others in the text. According to the semantic choice which we make in the case of one unit, so goes the way we interpret all other units in the text.”

Faced with the formalism of Joyce’s impossible syntax, onomatopoetic invention, and circular structure, readers are not directed by the work to a particular meaning or narrative. They must choose for themselves a method by which to create meaning among the deliberately complex web of interrelations before them. These personal strategies shape the meaning of the work in the mind of each reader. Eco then boldly claims, “The reader of *Finnegan’s Wake* is in a position similar to that of the person listening to postdodecaphonic serial composition…” Later in this discussion, he identifies musical practitioners of third-degree openness as “post-Webernian.” Eco makes a connection here between Joyce’s refusal of conventional syntax and the turn away from tonal conventions on the part of the early serial composers. Both employ structures rigidly

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9 Ibid., 9.  
10 Ibid., 10.  
11 Ibid., 10.  
12 Ibid., 11.
composed yet free of reference points, thus requiring the “theoretical, mental
collaboration of the consumer.” 13 Indeed, the deliberate refusal of conventional syntax
“requires him [the listener] to constitute his own system of auditory relationships. He
must allow such a center to emerge from the sound continuum. Here are no privileged
points of view, and all available perspectives are equally valid and rich in potential.” 14 As
described below, these quotations resonate strongly with those of Webern.

It is surprising that a more detailed discussion of serialism and, in particular, the
music of Anton Webern is absent from Opera Aperta. Perhaps Webern’s reputation for
rigor, strictness, and precision allowed his part in fostering musical openness to be
overlooked. Even Webern’s greatest post-war advocate, Pierre Boulez, laments, “Neither
the Mallarmé of the ‘coup de dés’ nor Joyce was paralleled by anything in the music of
their epoch.” 15 Yet, as in Joyce, it is precisely this rigor and strictness, the willingness to
create highly organized forms without points of reference, that allows the interpreter to
enter the work and create meaning. Indeed, just as Eco identifies the first conscious
aesthetics of the open work in Mallarmé and Joyce, it is in Webern that the first musical
poetics of the open work emerge.

B. Webern’s Aesthetic of Openness

Webern’s music provides a critical link between the late-nineteenth century and
the development of the open work in the middle twentieth century. Throughout his

13 Ibid., 11.
14 Ibid., 18.
writings, he is careful to make deliberate connections with the past in order to demonstrate the strong historical foundations of twelve-tone composition.

At the core of Webern’s lectures, *The Path to Twelve-Note Composition* (1932) and *The Path to the New Music* (1933), lies a discussion of musical unity. Webern sees the search for ever-greater unity, in the service of comprehensibility, as the central motivation behind historical developments in music. Indeed, Webern sees all music in relation to the fundamental problem of unity:

Unity is surely the indispensible thing if meaning is to exist. Unity, to be very general, is the establishment of the utmost relatedness between all component parts. So in music, as in all other human utterance, the aim is to make as clear as possible the relationships between the parts of the unity; in short, to show how one thing leads to another.16

Webern’s discussion of unity in music operates in two dimensions: the horizontal, in which unity is expressed by thematicism, and the vertical, in which unity is expressed by harmony. Thematic unity is achieved by generating as much material as possible from a single source. In this way, Webern idealizes the fugues of Bach, in particular his *Art of the Fugue* (ca. 1740) in which

All these fugues are based on one single theme, which is constantly transformed: a thick book of musical ideas whose whole content arises from a single idea! What does all this mean? The desire for maximum unity. Everything is derived from one basic idea, from the one fugue-theme! Everything is thematic.17

Indeed, *The Art of Fugue* not only derives everything from a single theme, but it attempts to do so comprehensively, exploring all possibilities inherent in the theme. It does so by presenting the theme in every possible way: fugues for two to four voices, fugues at each

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17 Ibid., 30.
basic interval, in retrograde, and in inversion. In this attempt to constantly reveal new forms of a single idea, Webern sees Bach much in the same way that Eco looks at Baroque art, which “never allows a privileged, definitive, frontal view: rather it induces the spectator to shift his position continuously in order to see the work in constantly new aspects, as if it were in a state of perpetual transformation.”¹⁸ Webern’s discussion of variation form, particularly in the hands of Beethoven, extends this notion. Webern describes, “Beethoven’s Ninth Symphony, finale theme in unison; all that follows is derived from this idea, which is the primeval form. Unheard-of things happen, and yet it’s constantly the same thing!”¹⁹

Harmonic unity comes about by relating all pitches to a single fundamental pitch. A fundamental pitch creates a landmark, a point of reference for the listener to ensure that the changes in pitch may always be clear and that all harmonic moves are understandable and comprehensible. As harmonic practice became more and more elaborate, particularly in the nineteenth century, reference to the fundamental pitch became strained; this was “a time when one returned at the last moment, and where for long stretches it was not clear what key was meant. ‘Suspended tonality.’ It only emerged at the end: the whole thing, everything that had occurred, is to be understood in this way or that.”²⁰ Here Webern implies that the tonal closure at the end of a work fundamentally limited the listener’s free navigation of the sound. By reestablishing the fundamental pitch, the listener’s ability to go “beyond” the music is negated by the assertion of a single “authorized response.”

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¹⁸ Eco, 7.
¹⁹ Webern, 52.
²⁰ Ibid., 39
Finally, the synthesis of these two unities provides the impulse that structures a work: thematic variation along a harmonic trajectory. The composer’s craft resides in reconciling the competing needs of one trajectory with the demands of the other.

However, Webern views these competing demands as an obstacle toward the goal of greater unity. If, on the other hand, both the thematic and harmonic were derived from the same source, only then could complete unity be achieved: “So the style that Schoenberg and his school are seeking is a new *inter-penetration* of music’s material in the horizontal and the vertical…”21 He views this approach as a continuation of the “polyphonic thinking” of Renaissance composers (“just as the Netherlanders started off by writing at the top the five notes from which everything was derived,”22) and the fugal writing of Bach (in which “Bach wanted to show all that could be extracted from one single idea.”23) While Bach’s transformations were extensive, Webern sought to be *exhaustive*, seeking every possible transformation of the single idea. Employing the four forms of twelve-tone composition (prime, retrograde, inversion, retrograde inversion) ensured that a single order of twelve pitches would quite literally give rise to every aspect of the work. The four forms, combined with transposition, ensured that only forty-eight transformations were possible; Webern makes great effort to be clear that these forty-eight forms “are the same thing throughout.”24 Every element, both melodic and harmonic, would be derived from the same ordered chromatic. While earlier music had been driven by a synthesis of harmonic and thematic needs, Webern’s twelve-note music

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21 Ibid., 35. (My emphasis.)
22 Ibid., 35. “The Netherlanders” here refer primarily to Heinrich Isaac (c. 1445-1517) and Josquin de Prez (c. 1450-1521).
23 Ibid., 55.
24 Ibid., 41.
proposes a scenario in which the harmonic and the thematic are not in opposition. Here, both are in service of the same unity of expression.

This has direct ramifications for harmonic practice. Discussing the twelve-tone method, Webern describes a musical scenario in which “All twelve notes have equal rights. If one of them is repeated before the other eleven have occurred it would acquire a special status.”[^25] No longer unified in its relationship to a fundamental pitch, harmony must only be unified in its *distribution*; this music systematically refuses any notion of a reference point.

This approach arose for Webern from a desire to *maintain* the sense of ambiguity inherent in late-nineteenth century harmonic practice indefinitely, without the closure of a fundamental note. Webern relished the multiplicity inherent in this undirected harmonic movement, stating that the “double meaning” of these harmonies allowed one to “move elsewhere as fast as possible.”[^26] He describes a trend in which “the course of the piece became steadily more ambiguous, until a time had been reached when these wandering chords were the ones most used, and the moment came when the keynote could be given up altogether.”[^27] Webern here refers to the pre-serial, “atonal” music of Schoenberg, Berg, and Webern that occupied their compositional practice from roughly 1908-1922. Here, “The ear was satisfied with this suspended state, too; nothing was missing when one had ended ‘in the air’ – one felt still the flow of the complex as a whole was sufficient and satisfying.”[^28] Twelve-tone composition systematizes this “in the air” property by refusing any note to be repeated before the appearance of the remaining

[^25]: Ibid., 51.
[^26]: Ibid., 46.
[^27]: Ibid., 28.
[^28]: Ibid., 39.
eleven. Indeed, in refusing to reference a fundamental note, Webern preserves the possibility of moving in any direction, rejecting the goal-directed movement of tonality in favor of a “complex” of harmonic relationships. This idea parallels Eco’s description of a similar phenomenon in the sciences: “The notion of a ‘field’ is provided by physics and implies a revised vision of the classic relationship posited between cause and effect as a rigid, one-directional system: now a complex interplay of motive forces is envisaged, a configuration of possible events, a complete dynamism of structure.”

Webern’s twelve-tone method glorifies this network of possibilities as an aesthetic goal. Acknowledging his obsession for self-similar, unified expression, Webern provides an analogy; “An ash-tray, seen from all sides, is always the same, and yet different. So an idea should be presented in the most multifarious way possible.”

Webern’s music attempts to express the full multiplicity of the row, constantly presenting it in a new light. The multiple forms of the row, being the same thing and defying hierarchical arrangement, refuse a single identity. Each one is simply one view of the ash-tray. The equal distribution of the forty-eight forms of the row ensures continual reference to an “object” that is never named. Acknowledging this indirectness, Webern remarks, “This way of circling – never calling things by their right name – using one substitute after another for the basic chords – preferring to leave open everything that’s implied; that’s the nature of twelve-note composition!”

Thus twelve-tone composition systematically refuses the closure of earlier music in favor of implication and ambiguity.

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29 Eco, 14.
30 Webern, 53.
31 Ibid., 47.
Webern’s new system of equality has ramifications that extend beyond the construction of pitch material. Because harmonic motion is no longer possible (again, only distribution is), one presentation of the row is as harmonically “charged” as the next; the music is only capable of stasis. The only fluctuation possible is the rate at which this distribution is deployed. For Webern, duration becomes the only salient formal unit. Indeed, “each ‘run’ of twelve notes marked a division within the piece, idea or theme.”

In this way, an entire temporal unit may be experienced in an instant (as in the twelve-note chord) or, deployed slowly, may take any period of time. This marks a stark contrast to the periodic structures of earlier music, in which Webern finds a dependence upon the eight-bar sentence, which “had to be as simple and comprehensible as possible” so that its variations could be easily followed. Webern sees this simplicity as responsible for a certain flattening or homogeneity in earlier music, noting, “Certainly a Mahler symphony is put together differently from one by Beethoven, but in essence it’s the same, and a Schoenberg theme is also based on these forms, the period and the eight-bar phrase.”

The description of the twelve-tone row as a temporal unit explicitly defies this codified structure. The simple reason for this is that the composers Webern mentions needed each variation to be understood in relation to its origin; the theme generates – in time – variations. But Webern’s music operates on a different principle. Changes need not be registered since all material describes the same thing. He upends traditional notions of thematicism in favor of an organic unity. Thus the function of time in his music must be to simply allow these unified forms to share a common space. The result is perceived as a

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32 Ibid., 51.
33 Ibid., 35.
34 Ibid., 33.
radical discontinuity in Webern’s music where phrases seem to end arbitrarily. Indeed, Webern does not need to demonstrate his variations, rather the forty-eight forms of the row embody the entire realm of possibility.

With all of this in mind, Webern’s new aesthetic leads to a new role for the listener. Without the reference points of a fundamental pitch, generative thematicism, or periodic phrases, the listener, unable to anticipate, is allowed to find his own way and construct meaning in any possible way with the sounds at hand. This, for Eco, defines second-degree openness. He summarizes, “[works of second-degree openness] situate aesthetic pleasure less in the final recognition of a form than in the apprehension of the continuously open process that allows one to discover ever-changing profiles and possibilities in a single form.”35 Indeed, Webern goes to great lengths to ensure that no “final form” exists in his music, thus leaving the listener to repeatedly rediscover an idea only through implication.

C. Unity, Discontinuity, and “Free Fantasy”

Adorno once remarked:

The late Webern proscribes the manufacture of musical forms. They are already sensed to be external to the pure nature of the row. His last works are the schemata of rows translated into notes. He wants to abolish the difference between the series and the composition and to do this by especially ingenious selection of rows. The rows are structured as if they were already the composition.36

Indeed, the rigor with which Webern composed his rows is quite evident. At all times, the concept of unity is of prime concern. The row of the Symphony, Op. 21 (1928), Webern’s

35 Eco, 74.
36 Theodor Adorno, Philosophy of New Music, tr. Robert Hullot-Kentor (Minneapolis: University of Minnesota Press, 2006), 86.
second substantial instrumental score in the twelve-tone style, provides a perfect example. The original form of the row is given in Figure 1.1. Here, the second half of the row is a retrograde of the first half, transposed by a tritone. This means that the retrograde will possess the same intervallic sequence as the prime. Due to this redundant quality, only twenty-four unique forms of the row are possible. Figure 1.2 gives the matrix for this row; this redundancy appears on a larger scale in that any prime form is equal to a retrograde six half-steps away, as seen in comparing \( R_5 \) and \( P_E \), \( R_2 \) and \( P_8 \), and so on. A transformation that is intended to generate variation on the row here simply repeats the row. This reflexive quality must have appealed to Webern’s desire to present the row as “constantly the same thing;” indeed, all possibilities appear to have been derived from not from the prime form of the row, but rather the first six notes of the prime form of the row. Containing its own retrograde, the Op. 21 row does appear as the kind of microcomposition that Adorno describes.

![Figure 1.1: Symphony, Op. 21 row.](image)

\[
\begin{array}{cccccccccccc}
P_5 & 5 & 8 & 7 & 6 & T & 9 & 3 & 4 & 0 & 1 & 2 & E \\
P_2 & 2 & 5 & 4 & 3 & 7 & 6 & 0 & 1 & 9 & T & E & 8 \\
P_9 & 3 & 6 & 5 & 4 & 8 & 7 & 1 & 2 & T & E & 0 & 9 \\
P_9 & 4 & 7 & 6 & 5 & 9 & 8 & 2 & 3 & E & 0 & 1 & T \\
P_0 & 0 & 3 & 2 & 1 & 5 & 4 & T & E & 7 & 8 & 9 & 6 \\
P_1 & 1 & 4 & 3 & 2 & 6 & 5 & E & 0 & 8 & 9 & T & 7 \\
P_2 & 7 & T & 9 & 8 & 0 & E & 5 & 6 & 2 & 3 & 4 & 1 \\
P_0 & 6 & 9 & 8 & 7 & E & T & 4 & 5 & 1 & 2 & 3 & 0 \\
P_9 & T & 1 & 0 & E & 3 & 2 & 8 & 9 & 5 & 6 & 7 & 4 \\
P_e & 9 & 0 & E & T & 2 & 1 & 7 & 8 & 4 & 5 & 6 & 3 \\
P_0 & 8 & E & T & 9 & 1 & 0 & 6 & 7 & 3 & 4 & 5 & 2 \\
P_6 & E & 2 & 1 & 0 & 4 & 3 & 9 & T & 6 & 7 & 8 & 5 \\
\end{array}
\]

![Figure 1.2: Symphony, Op. 21 matrix.](image)
The row employed in his final instrumental work, *Variations, Op. 30* (1940), exhibits an even more nuanced construction. The row and matrix are shown in Figures 1.3 and 1.4, respectively. Like the Op. 21 row, the row in Op. 30 displays a unique reflexive property. Here, all forms of the row are the same as their retrograde inversion, again limiting the available number of possible row forms and creating an incredibly rigorous network of interrelations. Beyond this, the row contains several other unique properties. The row can be divided into three segments of four notes (labeled A, B, and C on the matrix in Figure 1.4), each utilizing only the intervals of a minor second or minor third. Segment A (A-Bb-Db-C) uses the intervals m2-m3-m2. Segment B (B-D-Eb-Gb) inverts this order, using the intervals m3-m2-m3. Segment C (F-E-G-Ab) repeats the original ordering of intervals, m2-m3-m2. This symmetry likely appealed to Webern, as
all the material in the score uses only four-note segments of the row. But the row can also be divided into two self-similar groups. The first seven notes of the row possess the same intervallic content as the final seven notes in the row. Both seven-note segments can be described in prime form as \((0 1 4 3 2 5 6)\). In seeking to derive everything from a single idea, Webern appears to have composed his rows such that they display the same types of variation used in the composition itself. The many row forms, quite literally in these examples, become one object, seen from different perspectives.

In applying these rows to their actual musical environment, Webern was no less systematic. The *Variations, Op. 30* provide a particularly fertile example for analysis. This is Webern’s last instrumental work and the result of sixteen years of composition with the twelve-tone method since the Op. 17 of 1924-5. The transparent textures of *Variations* further aid in the parsing of techniques and textures.

Webern describes the opening section of *Variations* as the “theme” or subject of variation; after this theme, six “variations” follow. Yet, referring only to the opening section, Webern states, “the ‘theme’ itself consists, as I said, of nothing but variations…”\(^{37}\) Indeed, seven complete rows are deployed in these opening twenty-one measures. These are drawn from the original row form \((P_9)\) and its half-step transposition \((P_T)\). Just as the row was composed of three-times-four notes, so here the row forms are presented in four-note segments. No attempt is made on Webern’s part to present the row as a continuous unit. The first presentation of row, seen in ms. 0-3 of Figure 1.5, begins with \(P_9\)A in the double bass, \(P_9\)B in the oboe, and \(P_9\)C in the trombone. This presentation

thus spans a register of four octaves and a half step, from B♭₁-B₅. To add further confusion, another row segment, P₇A, is presented in counterpoint with P₉B in ms. 2.

Even the four-note row segment is never confined to a single register. Almost all consecutive notes of the row-segment leap by sevenths or tenths rather than the small intervals described in the original row. For example, the opening four-note gesture, seen
in ms. 0-1 of Figure 1.5, leaps first by a major seventh plus an octave, then by a minor tenth, then by a minor seventh. Clearly, the row is not used as a “theme” in the sense that it is heard as a continuous twelve-note unit. Rather, great care is taken to subvert any possible continuity.

Indeed, the temporal structure is extremely fragmented, constantly shifting between tempo 160 and tempo 112, with frequent fermatas and ritardandos. Absent is the periodicity that characterized thematic presentation in earlier music. Instead, the section comes to an end only at the completion of all row forms, as described below. It is unlikely to be a coincidence that the twenty-one row segments presented in this “theme” occur in the time of twenty-one measures. This temporal unit is an arbitrary one that merely allows row segments to inhabit a shared space.

Of the row forms deployed, three are repeated while one occurs only once. This can be accounted for in the striking pyramid-structure deployment of the row segments, as seen in Figure 1.6 (segments are listed from top-to-bottom with the earliest entrances listed first; columns simply serve to clarify row membership.) The ordering and counterpoint of these row forms implies a roughly symmetrical progression that can be divided into three areas: the first, in which \( P_9 \) and \( P_T \) are cast in counterpoint; the second, which includes \( R_T, R_9, \) and a return to \( R_T \); and the third, in which \( P_9 \) and \( P_T \) again appear in counterpoint.
This “A-B-A” structure is a clear reflection of the three-part division of the row itself. As described above, the row’s A and C segments contain the same intervallic content while the B segment consists of a reversal of those intervals. Here, the first and third sections of the “theme” feature counterpoint between the same row forms, while the second section literally reverses these two row forms via retrograde. Thus Webern literally builds the form of his theme in the image of the row itself.

The second variation (ms. 56-73) demonstrates a particularly striking application of the twelve-note method. The passage itself is highly unusual: it consists almost entirely of four-note chords. Only twice are the chords slurred together to create a small “gesture” (ms. 56-57 and ms. 58) while the remainder of the section relies on the counterpoint of isolated four-note events. In such a texture, very little has been “connected” musically by
the composer. Indeed, the strength of this music rests on the listener in attempting to relate these isolated sounds in spite of the jarring discontinuity. This passage exemplifies one of Eco’s few direct observations concerning Webern’s music, “The progressions are ambiguous: a sequence of notes may be followed by another, unpredictable one that can be accepted by the listener only after he has heard it.” But Webern’s method theoretically guarantees unity in spite of the unpredictable texture. This unity is at first elusive, but reveals itself in highly unusual ways.

Whereas the “theme” of Variations drew entirely from a small repertoire of row forms, $P_9$ and $P_T$ and their retrogrades, the second variation quickly expands its repertoire. Forms $P_9$ and $P_T$ are first deployed, as before, in four-note segments. These rows are completed quickly as new rows segments begin to appear. The first thirteen chords of this section, drawn from many different row forms ($P_9, P_T, P_5, P_7, P_0, and P_2$), are presented and subsequently repeated in reverse order, beginning with a repetition of the thirteenth chord. This thirteenth sonority $[8, 7, E, T]$ appears in the matrix as both $P_7C$ and $P_0A$, thus its repetition serves double function, completing both row forms. Following this retrograde presentation of the chord sequence, a series of eight more four-note segments complete the variation.

While this procedure is reminiscent of the “theme,” in that it creates a sequence of row segments and reverses that sequence, the use of row segments is surprisingly unique. The “theme” employed four-note row segments, but did so in such a way that the row was completed relatively quickly. Here, in contrast, several row segments remain as fragments of their rows throughout this section. From the initial thirteen-chord sequence,

38 Eco, 96.
P₅B (ms. 58, last eighth-note) and P₂B (ms. 59, downbeat) exist as the sole components of their respective rows. Again in the eight-chord sequence that concludes this variation, P₄B and P₃B are presented without their complements. By the end of this variation, six rows are complete while four remain as fragments, represented only by their B segment. This is an irregularity that, given Webern’s devotion to rigor and strictness, must be accounted for.

Looking closely at the completion of the first two row forms, P₉ and P₇, a symmetrical alternation occurs within the matrix, as seen in Figure 1.7. Figure 1.8 adds the fragments P₅B and P₂B, which also occur in mirror. Row forms P₇ and P₀ are then completed in the same mirror alternation as P₉ and P₇, bearing in mind chord 13’s double function; Figure 1.9 presents the complete order of the initial thirteen-chord sequence. After the retrograde presentation of this chord sequence, the eight-chord series follows a similar pattern as shown in Figure 1.10: first two fragments appear in mirror, followed by two completed rows in alternation. Figure 1.11 shows the complete sequence of twenty-one chords throughout the second variation.

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Figure 1.7: Variations, Variation 2, Chords 1-6.
Figure 1.8: Variations, Variation 2, Chords 1-8.

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Figure 1.9: Variations, Variation 2, Chords 1-13.

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Figure 1.10: Variations, Variation 2, Chords 14-21.

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<td>P_E</td>
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These charts reveal an unusual technique: Webern’s use of the twelve-tone method is here derived from the structure of the matrix itself. Symmetrical moves are made around the matrix to determine moment-to-moment pitch material. The four aberrant row segments are allowed to remain incomplete only by virtue of their origin in the mirror-moves made around the matrix.

It is reasonable to conclude that, due to the rigor with which the row was composed, any four-note segment of the matrix is a reflection of the row itself. It is thus no longer necessary to always complete the row since the four-note segment is always a microcosm of the row. This may be what Webern had in mind when he remarks, “Only now is it possible to compose in free fantasy, adhering to nothing except the row. To put it quite paradoxically, only through these unprecedented fetters has complete freedom become possible!” Just as Webern so greatly admired the polyphony of Heinrich Isaac, in which “Each part has its own development, and is a completely self-contained,

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39 Webern, 55-56.
separately comprehensible, wonderfully animated construction,” so too in Webern’s music even a single chord is completely self-contained and separately comprehensible, containing within it a reflection of the entire work. In this way, even the most disparate elements are allowed coexist due to their mutual origin in the guiding system of the row. Thus the “free fantasy” that Webern describes is not the freedom that authorizes authorial expression, but instead the freedom that enables arbitrary choices like the symmetries described above. Because a global structure is now built into the smallest elements, Webern no longer required additional structures to guide musical form. Eco seems to speak to this phenomenon directly when he says, “The open work assumes the task of giving us an image of discontinuity. It does not narrate it; it is it.” In composing such a rigorous network of interrelated segments, Webern does not need to demonstrate his variations; rather, these segments themselves are the variations.

**D. Webern in Post-World War II Aesthetics**

It should come as no surprise that all those who experimented with open form (Eco’s third-degree openness) in the 1950s and 1960s shared Webern as a mutual point of departure. It was not Schoenberg, Stravinsky, nor Debussy, but Webern who became the foundation of the post-World War II avant-garde. As a result of Nazi censorship and the devastation of European cultural centers, Webern’s music remained largely unknown in the immediate aftermath of World War II. Stockhausen recalls, “Unforgettable, the first encounter with Webern’s music. One’s mind runs back to the days when copies of

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41 Eco, 90.
Webern scores were handed on from one to another, when a shared passion caused friendships to be sealed.” Nearly every composer from this period has a similar Webern story; his unassuming music carried with it an incredible weight and magnitude. Pierre Boulez famously rejected the music of Arnold Schoenberg, citing the inherent conservatism of even his twelve-tone music, in favor of Webern. It was Webern, not Schoenberg, whose music represented a turning point in Western music: “I have said that Webern is the threshold: let us have the clairvoyance to consider him as such. Let us accept that antinomy of power destroyed and impossibilities abolished.” Similarly for Stockhausen, Webern became the source of a new path forward: “once we have begun to realize that we are not fallen from the sky, but are irrevocably tied to our – not to any other – tradition, then we recognize that it is Webern who has pointed most emphatically into the future.”

The influence of Webern could also be felt in America where a New York City performance of Webern’s Op. 21 in 1950 famously led to the meeting of John Cage and Morton Feldman. Each serendipitously left the concert early after the audience’s negative response to the *Symphony*; recognizing Cage, Feldman asked “Wasn’t that beautiful?” and a friendship was sealed. After this performance of the *Symphony*, Cage writes to Boulez, “I was deeply moved. Also I copied it since it was nowhere to be bought.”

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44 Stockhausen, “For the 15th of September, 1955,” 38.
Christian Wolff\textsuperscript{46} and Ben Johnston attest that analysis of the Webern *Symphony* was, at that time, the first task for a student intending to study with Cage. When Johnston failed to do so before arriving in New York, he appears to have been “punished” with the assignment to splice tape for *Williams Mix*.\textsuperscript{47}

While throughout the 1950s, Boulez, Cage, and Stockhausen began to move in radically different aesthetic directions, it is remarkable to note the way in which all three iconoclasts appear to have been genuinely affected by Webern’s music. Despite the fact that all three composers would go on to explore what Eco calls third-degree openness, their aesthetic differences quickly became lines of attack. In their public arguments, Webern frequently reappears, held up to support an attack describing sins committed against his ghost. Indeed, in one of the few moments that Cage makes direct mention of Webern, he merely attacks the term “post-Webernian” as applied to the Darmstadt school of composers, stating “this term apparently means only music written after that of Webern, not music written because of that of Webern: there is no sign of *klangfarbenmelodie*, no concern for discontinuity – rather a surprising acceptance of even the most banal of continuity devices…”\textsuperscript{48} The truth of what it mean to compose music because of Webern was deeply personal for each of these composers. Yet, seeing Webern as the first proponent of openness in music, it is critical to explore the ways in which his aesthetic establishes common ground for the post-war generation of composers.

The aesthetic positions of these composers resonate strongly with Webern’s open aesthetic as discussed above. Fundamental aesthetic concepts, derived from those of Webern, form a common language between these composers. Boulez in 1954 writes of a demand for “a nonhomogeneous distribution of developments… a notion of discontinuous time, thanks to structures that will be bound together rather than remaining airtight; finally, a sort of development in which the closed circuit will not being the only solution envisaged.”

Stockhausen envisions a similar kind of liberation, stating, “Everything that is determined once and for ever is like an order: you either submit to it or go against it, in which case you make a mistake. The alternative is a multi-meaningful order, with which you might feel free to use your imagination…”

While for the Europeans, visions of multiplicity and openness are depicted as goals to be obtained, Cage emphasizes these notions as fact: “We are not, in these dances and music, saying something. We are simple-minded enough to think that if we were saying something we would use words. We are rather doing something. The meaning of what we do is determined by each one who sees and hears it.”

These statements make clear that the aesthetics of second-degree openness were pervasive among post-war composers. All of the above emphasize an open rather than “final” form of the work, and seek a music that engages the listener as a provocation of the imagination.

Fundamental to the music of all of these post-war composers was the concept of discontinuity. Webern’s music, in its refusal of periodic structures, generative development, and fragmentation through orchestration, expresses itself in its

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51 Cage, “In This Day…,” (1956) in Silence, 94.
discontinuities. For the generation that would rely on Webern’s music as a foundation, discontinuity became the normative procedure. The iconic confrontation between Stockhausen and Adorno at the 1951 Darmstadt course illustrates this fundamental shift. Stockhausen notes that, at that time, “Adorno was considered to be an authority on the avant-garde movement: he had just written The Philosophy of the New Music and in this book had literally destroyed Stravinsky as a reactionary.” Yet, when the young Stockhausen and Karel Goeyvaerts performed the latter’s Sonata for Two Pianos, which Stockhausen describes as “indeed ‘point music’: just isolated tones,” Adorno was profoundly perplexed. Iddon notes that Adorno’s confusion revolved around the question of “why there was no sense of phrase, which is to say no obvious cadence between antecedent and consequent.” Clearly what Adorno valued in music was the kind of periodic structures and continuous development that defined even Schoenberg’s music (as even Webern did not hesitate to point out.) Stockhausen famously replied to Adorno’s questioning, “but Professor, you are looking for a chicken in an abstract painting.” The way in which music existed in time had fundamentally changed; Adorno, clinging to traditional notions of continuity in music, failed to see the extent to which a discontinuous view of time, first undertaken in the music of Webern, took hold over the post-war avant-garde.

53 Ibid.  
54 Martin Iddon, New Music at Darmstadt: Nono, Stockhausen, Cage, and Boulez (Cambridge: Cambridge University Press, 2013), 55.  
55 See note 34 above.  
56 Stockhausen, Stockhausen on Music, 36.
Expanding on Webernian concepts of discontinuity, Cage defines the duality of continuity and discontinuity (or, in his terminology, “no-continuity”) as a matter of openness: “No-continuity simply means accepting that continuity that happens. Continuity means the opposite: making that particular continuity that excludes all others.” Thus, at least for Cage, the construction of continuity in music is directly related to the “final form” or the “closed-circuit” as described above; refusing this final form and embracing an open aesthetic demanded the rejection of constructed continuities in music.

In another way, the discontinuous experience of *klangfarbenmelodie* in Webern’s music led to a radical reconceptualization of musical space. The second variation of Webern’s Op. 30, for example, consisted entirely of single sonorities, typically performed by a single instrument family in the ensemble. Only rarely does the music create small gestures in which two notes are slurred together; more often, the music consists of the unpredictable counterpoint of isolated sonorities. The performer in this music focuses solely on the performance of a single note; unlike in earlier music (even that of Schoenberg), they cannot rationalize this note by what came before it, nor can they project where this note might lead. This startling phenomenon, in which a single note exists like a star amidst a constellation, had profound impact upon the post-war generation.

Boulez remarks that “Webern created a new dimension, which we might label diagonal, a sort of distribution of points, or blocs, or figures no longer on the flat space,”

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but in the sound-space.”

He goes on, “Each sound is a phenomenon in itself, linked to the others, as goes without saying, by a very puissant context. Attention is attracted to the unique place that each takes in the register in which it is located. This is a matter of interrelationships among autonomous phenomena rather than of total relations being exercised over a group as a result of certain *donées.*” Indeed, the idea of *klangfarbenmelodie*, combined with the extreme isolation of single notes in Webern’s music, inspired the composition of individual timbres in Stockhausen’s electronic music.

Stockhausen notes:

That composing with sounds could also involve the composition of the sounds themselves, was no longer self-evident… The Viennese School of Schoenberg, Berg and Webern had reduced their musical themes and motifs to entities of only two sounds, to intervals. Webern in particular, Anton von Webern… It took a little leap forward to reach the idea of composing, or synthesizing, the individual sound.

While Cage does not explicitly mention Webern as an influence in this matter, he does attack the European composers, as mentioned above, for their abandonment of *klangfarbenmelodie*; clearly he felt a strong affinity for this concept and its ramifications. Cage’s writing is rife with similar sentiments to those of Boulez and Stockhausen. He speaks of a desire to know “not what I think a sound is, but what it actually is, in all of its acoustical details & then letting the sound exist, itself changing in a changing sonorous environment.”

He also speaks of a total sound-space, the limits of which are ear-determined only, the position of a particular sound in this space being the result of five determinants: frequency or pitch, amplitude or loudness, overtone structure or timbre, duration, and morphology (how the sound begins, goes on, and dies.

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59 Ibid., 384.
away). By the alteration of any one of these determinants, the position of the sound in the sound-space changes.62

Cage’s notion of a sound-space here not only echoes Boulez’s comment describing Webern’s new musical dimension, but also resonates with Stockhausen’s notion of constructing an individual sound. The notion that a sound can be autonomous, and that music can embrace the composition of a single sound, is, for these composers, a concept derived directly from the experience of Webern’s music.

Echoing Webern’s statement that the “unprecedented fetters” of the twelve-tone method led to true freedom, all of these composers put their efforts toward extremely rigorous compositional systems so as to provide a framework for intuitive or arbitrary choices. In his iconic work, *Le Marteau sans maître* (1952/1957), Boulez employs the twelve-tone method only insofar as generating limitations upon the material used in composition. He speaks to this function of the method in his 1957 article, *Alea*:

> If I give the series of pitches determined registers, there clearly will be only one solution for a given note; that is to say, this note will be fixed ineluctably in its register (absolute frequency), intensity, and duration: a unique chance for a meeting of these organizations at this ‘point’ of sound. But suppose that we maintain the same series of sounds but do not impose a register upon it, that the register be left to the improvisation in the writing; immediately we have a ‘right’ of registers, a geometric place for the ‘points’ that answer to the other three characteristics: relative generic frequency, intensity, and duration.63

Thus the series, precisely because of its rigorous organization, allows for “improvisation in the writing.” For Boulez, composition was defined precisely by this kind of decision making, stating: “For, classically, composition is the result of constant choice… Inside of

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certain networks of possibilities, it is to be led – from solution to solution – to choose.”

It is the twelve-tone method that here provides a network of possibilities from which he can then make his mark as a composer. In other words, the twelve-tone method provided Boulez with a language from which he freely selects. This leads Iddon to conclude:

“Doubtless Le Marteau sans maître is potentially implied by Boulez’s material-generation procedures, but it is only one of a truly vast multiplicity of pieces that Boulez might have chosen following those procedures.” Indeed, while Le Marteau does not employ “open form” devices, the variability afforded by a rigorous method points to the multiplicity derived from Webern’s compositional technique.

Although he composed with radically different methods than Boulez, Cage too worked in way that paralleled Webern’s free play within a rigorous system. In his Concerto for Prepared Piano and Chamber Orchestra (1950-51, notably Cage’s first substantial work after his encounter with Webern’s Symphony in 1950), Cage utilized a system of charts to generate the orchestral material. Despite their resemblance to the twelve-tone matrix, these contained pre-composed sonorities on the horizontal axis, and a “favored” orchestration on the vertical axis. Cage describes the use of these charts in a letter to Boulez in 1951:

I then made moves on this chart of a ‘thematic nature’ but, as you may easily see, with an ‘athematic’ result. This entire first movement uses only 2 moves, e.g. down 2, over 3, up 4, etc. This move can be varied from a given spot on the chart by going in any of the directions… [The second] movement is nothing but an actually drawn series of circles (diminishing in size) on these charts…”

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64 Ibid., 39.
65 Iddon, 154.
66 Nattiez, 93.
Because of the systematic nature of the chart (which organized sound events by orchestration), Cage felt liberated, freely accepting any result the chart-process yielded. While Cage most certainly had not known of Webern’s similar technique of arbitrary, symmetrical moves upon the matrix in Variations, the similarities here are profound. In both cases, any unit of the chart embodies the entire realm of possibility, thus allowing any move to be as justified as any other. While the differences between Boulez and Cage are already pronounced, the freedoms bestowed by the rigorous system reveal their common concerns in spite of disparate results.

A Webernian concept of variation further unifies these early open form composers. As discussed above, Webern refused the generative transformation-in-time of earlier music. Instead, his variations are embodied in the material itself; one variation does not lead to the next, but rather all variations exist as multiple, simultaneous expressions of one idea. This concept is at the root of the first examples of open form composition. Both Stockhausen’s Klavierstück XI (1956), and Boulez’s Third Sonata (1955-57) formalize this conception of variation by offering the performer multiple routes of temporal progression through the work. While all musical material is thoroughly composed, and thus unified in conception, the performer determines the actual temporal unfolding of each work.

In Klavierstück XI, this takes the form of several musical phrases distributed around a (very large) single sheet, surrounded by Mallarmean white space; the performer begins with any phrase and, upon completion of each phrase, moves to any other. Signs at the end of each phrase indicate to the performer how the next phrase is to be performed (at what speed, dynamic range, and the amount of rest to insert between phrases.)
Because the serial origin of this music fundamentally rejects generative variation, the order of phrases is of no consequence; any one may begin or end a performance since a logical unfolding in time is no longer necessary.

A similar notion exists in Boulez’s *Third Sonata*, where the pianist confronts compulsory segments of music alternated with parenthetical segments, of which any may be performed or omitted. The performer may also arrange the small movements of this piece in a variety of possible orders. Because one idea does not lead to the next, material becomes dispensable. In choosing to perform more of the parenthetical segments, the performer simply presents further possible variations and adds depth to the identity of an already multifarious experience.

John Cage’s first open form work, *Winter Music* (1957) for 1-20 pianists also embodies this notion. Here, Cage presents the performer(s) with twenty unnumbered pages, of which any number in any order may be used for performance. Each page consists of multiple staff fragments distributed around the page, each containing between one and four sonorities. The notes of each sonority are the results of tracing imperfections on the paper, a technique Cage had systematically cultivated throughout the 1950s. The only temporal progression dictated is that a performer must perform all of the chords on one page before moving to another page; the score does not demand a particular order within a page. Thus, each one of the twenty pages can equally represent the piece. Additional pianists would further emphasize this fact, embracing the likely situation in which multiple pages of the score would be heard simultaneously. As manifestations of a single system, these materials are fully interchangeable; any combination of sounds is acceptable since each sound is derived from the same compositional procedure. While the
compositional procedure in *Winter Music* is radically different than the twelve-tone method, it embraces the same concept of variation as that of Boulez and Stockhausen in their early open form music.

The task of the performer in these works is a direct extension of the role of the listener in Webern’s music; the listener, faced with a rigorously organized complex of sound, spontaneously created for himself a means of navigation through the sounds. Eco reminds us that here the listener, unable to predict, can only attempt to rationalize a sound after he has heard it. In *Klavierstück XI*, the *Third Sonata*, and *Winter Music*, it is instead the *performer* that is unable to anticipate, who literally creates a provisional pathway through the material in real time and is only able to make decisions *after* a phrase has been performed.

The role of the listener, however, is not altogether different in these works. While the performer’s experience undoubtedly changes due to the nature of their encounter with radically different formal devices, the listener is not privy to this encounter; the performance they witness proceeds much like any other performance in the Western tradition. These novel formal methods are confined to the performer’s engagement with the printed score. They are largely “inaudible” devices that ignore the possibility of modifying the form of the concert experience.

Extending the notion that any material derived from a rigorous system is inherently an expression of that system, both Cage and Stockhausen turn to the creation of variable systems designed to produce a multitude of musical results. John Cage’s *Variations I* (1958), for example, provides the interpreter with only the materials *with which to make* a score. A constellation of points printed on a transparent sheet is placed
over a similar sheet of lines. Each point represents a sound event and the distance from that point to each line yields data describing each parameter of the sound. Cage provides multiple sheets of each type and the sheets may be overlaid in any number of ways, resulting in an unpredictable number of possible combinations. This data may then be applied to any instrument(s) in order to create a piece of any duration. Yet, because all musical material is a result of the rigorous process of measuring the relationships among components of the system, any methodically obtained result is acceptable as a representation of the work itself. Cage’s exploration of open compositional systems was extensive and led to dramatic reassessments of his musical aesthetic; this development will be discussed thoroughly in the following chapter.

Stockhausen embraced a similar principle throughout the late 1950s and early 1960s, yet achieved radically different results. His massive work for four orchestras, Carré (1959-1960), was derived from a “basic score” in which a shorthand notation suggested pitches, articulations, durations, dynamics, and spatial movements for each of the 101 original “moments” of the piece. Stockhausen himself, after composing this “basic score,” left the vast majority of the composition to his assistant, Cornelius Cardew. The final form of the piece is completely fixed, but has its origin in a rigorously composed framework that allowed Stockhausen to accept the details of the composition as realized by another musician.

While Cardew would attack Stockhausen for refusing to release the “basic score,” Stockhausen would indeed produce many scores that exist only in this shorthand form,

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such as the labyrinthine Plus-Minus (1963). Here, the score consists of seven pages of symbols and seven pages of notes; these materials may be performed by any number of players for any duration. The extremely elaborate system of symbols dictates a great deal of transformations hat the performer must then apply to the pitch material given on a page of notes. Of Plus-Minus, Maconie writes:

> Today we are able to understand the concept of such a music by direct analogy with a computer program which determines the way in which information is processed while leaving the choice of information to be processed to the individual user... The score is complex, and the complexity is a consequence of wanting to retain control, however remote, of the pitch-information content of the piece as well as the transformational process.\(^{68}\)

Thus, while the sonic results might vary greatly from performer to performer, each performance embodies a transformational process that is central to the definition of the work.

Again, while Variations I and Plus-Minus could not be more different in their materials and process, they share as their foundation a concept that, for Eco, defines the open work. Eco writes that in the open work, “there is a tendency to see every execution of the work of art as divorced from its ultimate definition. Every performance explains the composition but does not exhaust it.”\(^{69}\) Indeed, these works exist entirely as score-making processes. They rely on multiple realizations in order to provide ever-greater perspectives into the nature of the work, without ever directly defining the work in a final form.

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\(^{68}\) Maconie, 156-157.

\(^{69}\) Eco, 15.
Chapter II

Scores Producing Scores: John Cage’s Fontana Mix

A. The Problem of the Performer in Chance Composition

In the late 1950s, John Cage became increasingly dissatisfied with the results of rigorous chance-determined compositional processes. In his 1958 Darmstadt lecture, “Indeterminacy,” he rejects his own Music of Changes (1952), stating, “The Music of Changes is an object more inhuman than human, since chance operations have brought it into being. The fact that these things that constitute it, though only sounds, have come together to control a human being, the performer, gives the work the alarming aspect of a Frankenstein monster.” He continues, “This situation is of course characteristic of Western music, the masterpieces of which are its most frightening examples, which when concerned with humane communication only move over from Frankenstein monster to Dictator.”

At issue here is the way in which the chance-determined compositional process gives rise to an otherwise conventionally-notated score.

In Music of Changes, Cage employed an elaborate system of charts containing musical information. Independent charts contained pre-composed cells for pitch collections, rhythms, and dynamics. Cage would consult the I Ching to select a cell from each chart, and combine them into a single sound event in the final score. The complexity of the compositional process resulted in an incredible richness of notational detail in all aspects of the performance. For Cage, these details suppress the creative mind of the

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performer: “The function of the performer in the case of the Music of Changes is that of a contractor who, following an architect’s blueprint, constructs a building… his work is specifically laid out before him. He is therefore not able to perform from his own center but must identify himself insofar as is possible with the center of the work as written.”

The score’s authority over the performer contrasts that of the composer, who, through the use of chance operations, achieves a distance from the actual, note-to-note details of the music. His performer experiences no relief from the typical procedures of Western music, and must submit themselves to the score’s control regardless of the music’s origin in chance techniques.

From this point, Cage seeks a method by which the performer can share the same experience of acceptance that he had found in chance composition. He sees in the indeterminate music of Earle Brown and Morton Feldman the possibility that the performer might “perform from his own center” and “[identify] with no matter what eventuality” just as Cage did in composing Music of Changes. Notably, many of the examples that Cage cites in his Darmstadt lecture, “Indeterminacy,” come from the repertoire of David Tudor. For Cage, Feldman’s Intersection 3 (1953) and Brown’s Four Systems (1954) provide fruitful precedents for the liberation of both composer and performer, while Cage describes his own Music of Changes alongside Karlheinz Stockhausen’s Klavierstück XI (1956) as compositions that, in spite of their use of chance procedures, fail to “remove the work in its performance from the body of European musical conventions.”

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2 Ibid.
4 Ibid.
The urgency to afford the performer more agency was spurred, at least in part, by David Tudor’s extraordinary engagement with this repertoire, all of which (aside from *Music of Changes*) demands varying degrees of input from the performer. Tudor approached these works as provocations, frequently creating his own imaginative, fully-notated scores as solutions to the questions posed by indeterminate techniques. *Intersection 3* and *Four Systems* were two such examples of this practice.⁵ Tudor even recalls, in a 1987 interview, refusing to continue playing “very black” European repertoire in the late 1950s, remarking, “I began to feel that I’d done this before! … I wanted to be able to do new things constantly.”⁶ For Cage, it became a priority to continue produce work that would interest Tudor. He reflects, “In all my works since 1952, I have tried to achieve what would seem interesting and vibrant to David Tudor. Whatever succeeds in the works I have done has been determined in relationship to him.”⁷ These dual concerns, on one hand the need to escape the hierarchies of Western music, and on the other, Tudor’s obsession with innovation and new experiences, drove Cage to explore methods of indeterminacy in the late 1950s.

**B. Winter Music**

Cage’s first experiments in indeterminacy begin in 1957 with *Winter Music*, a work for one to twenty pianists. The score provides twenty pages of material, any amount of which may be utilized in performance and in any ordering. Each page contains five

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systems of staff fragments, each fragment containing a number of aggregates. While the notation of *Winter Music* is largely conventional, Cage employs a complicating procedure: each aggregate is preceded by two clef signs. These might be two similar clefs, in which case all of the notes in that aggregate are to be read in that clef. However, in the event that the two clef signs are unmatched, a pair of numbers appears above the aggregate which direct the performer as to how many notes should be read in each clef. As an example, the indication “2-3” above a five-note aggregate indicates that two notes might be read in treble clef while the remaining three are read in bass clef, or vice versa. In this way, Cage leaves the decision to the performer as to the exact contents of the aggregate, presenting a range of possibilities rather than one finite sonority. This marks one of the first instances in Cage’s work where the compositional process led to what Pritchett describes as “little mechanisms or mobile structures”\(^8\) that require further input from the performer in order to create a sound event.

Iddon describes in great detail David Tudor’s approach to solving these mechanisms. Notably, Tudor created a “pitch index” for each variable aggregate which rewrote the collection entirely in bass clef, and again in treble. This allowed Tudor to quickly see the harmonic possibilities available for each sonority. As each note was selected from one clef, the corresponding note was removed from the index in the other clef. Iddon notes that Tudor “was doubtless making specific decisions regarding the pitch content of particular aggregates at the point of entering them into his manuscript books.”\(^9\)

Tudor seems to have rejected from the start the possibility of making decisions

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spontaneously in performance. It was a given, for Tudor, that the goal of indexing the possible pitches for each sonority was to facilitate the creation of a new written score. In this way, Tudor’s role in creating a new score of Winter Music strongly resembles Cage’s role in creating a score from the charts of Music of Changes via selection from a predetermined pool of possibilities. Tudor acknowledges this same connection in a 1987 interview with Peter Dickinson:

DT: [In Music of Changes] those sounds are really [Cage’s]. They weren’t dictated completely by coins. He had to make, say, an aggregate, which would depend on what sounds were available to him at that time. He then chose the arrangement of the pitches – the equivalent of choosing the sound.
PD: In the way he asked the performer in Winter Music to choose the aggregates in various ratios?
DT: Right. It’s very much the same, except that in Music of Changes it was he who made those choices.¹⁰

Cage further stipulates that the pages of Winter Music might be performed “in whole or in part” and that “overlappings, interpenetrations, are also free.”¹¹ This indication seems to have been applied liberally in Tudor’s realization as often he combined several pages of material on top of one another. According to Iddon, these overlapping readings typically combined the sparsest pages of the score, suggesting a normalization of density in his version.¹² Here, Tudor chose to eliminate (in a way that still follows the indications of the score) the variations in density among the pages of Winter Music, opting instead for a certain minimum of sonic activity in his performance. These decisions result in a written document (Tudor’s performance score) that is largely the result of Tudor’s own choices and preferences. Noting the extent to which this

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¹⁰ Dickinson, 84.
¹² Iddon, 61.
product was not demanded by the composer, but instead sculpted by Tudor’s input, Cage’s role here is relegated to that of *provocation* rather than, as he felt was the case in his earlier work, direction.

**C. Concert for Piano and Orchestra**

For Cage, it became clear that conventional musical notation was at odds with the mission of affording more agency to his performers. He writes in 1958, “…more essential than composing by means of chance operations, it seems to me now, is composing in such a way that what one does it indeterminate of its performance. In such a case one can just work directly, for nothing one does gives rise to anything that is preconceived. This necessitates, of course, a rather great change in the habits of notation.”\(^{13}\) *Winter Music* had already experimented with a modification of musical notation, but it was soon followed by a massive project dedicated to systematically developing new, indeterminate methods of composition. This project, the *Concert for Piano and Orchestra*, focused on the exploration of musical writing.

The *Concert for Piano*, like *Winter Music*, consists only of parts without a unifying score. Parts exist for thirteen orchestral instruments as well as the extremely complex *Solo for Piano*. Any number and any amount of these parts may be performed together to constitute a performance of the *Concert for Piano*. The orchestral parts were all made with the same process of locating imperfections in paper Cage had utilized in “the 10,000 things” and *Music for Piano*, and explore many unconventional instrumental techniques. The notation in these parts relates space to time, but otherwise relies on

conventional notation to describe pitch. However, the performer retains a great deal of choice, as Cage utilizes different sized noteheads to describe both dynamic and duration. For example, a large note head might be loud, long, or both pending the performer’s discretion.

However, it is the part written with David Tudor in mind, the *Solo for Piano*, that forms the focus of Cage’s compositional efforts in the *Concert*. This part consists of eighty-four distinct types of musical notation comprising sixty-three pages of material; each type of notation is identified by an alphabetical code, linking it to the instructions provided in the work’s preface. Throughout the work, no description is given as to a sense of form or time. The notation-types simply inhabit a shared, non-linear space. Cage instead leaves the large-scale form of the work to the pianist, stating, “The whole is to be taken as a body of material presentable at any point between minimum (nothing played) and maximum (everything played), both horizontally and vertically: a program made within a determined length of time… may involve any reading, i.e., any sequence of parts or parts thereof.”

Thus the *Solo for Piano* is conceived not as a work to be prepared from beginning to end, but instead a collection of materials that *may* be utilized for performance. The pianist is given complete agency in choosing how much material is played, which materials are played, and how long the piece might last.

In order to explore new methods of musical writing, Cage subjected his compositional process to manipulation by chance procedures. For each module in the *Solo for Piano*, chance would determine if he would utilize an existing compositional method, vary an existing method, or create an entirely new method altogether. It is this

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chance process that gives rise to the eighty-four types of notation found within the work. This positions the Solo for Piano in a new light relative to his earlier work; previously, the compositional process determined the note-to-note details of the composition (as in the Music of Changes). Here, the compositional process creates a network of relationships between processes which will later be realized as note-to-note details by the performer. For Cage, the material of this work is that of compositional processes. These, rather than actual sounds, are subjected to variation, repetition, and innovation.

For Cage, this work grew directly from his study with Schoenberg. He would later say of Schoenberg, “For him, there was only repetition; he used to say that the principle of variation represented only the repetitions of something identical.”\(^{15}\) To Cage, it was this same principle that motivated the Solo for Piano, “In Concert for Piano, I decided to apply [Schoenberg’s] principle of variation and repetition, and then innovation and invention of new forms, to the entire work, that is, to the ways of composing… it was only the result of a certain work, and within that work, of my faithfulness in following through to the end the plan I had drawn up for myself, which was to apply, with the help of chance operations, Schoenberg’s distinctions.”\(^{16}\) Cage’s adherence to a strict compositional process, a practice derived from the experience of Schoenberg’s twelve-tone music, is responsible for creating coherence among the incredible diversity of notations within the Solo for Piano. Just as the strict application of chance processes in Music of Changes allowed Cage to accept any sounding results, here in the Solo for Piano, the strict application of chance processes allows Cage to accept any written

\(^{15}\) Cage and Charles, 45.  
\(^{16}\) Ibid., 159.
results. These results most often require the input of the performer to actually determine the sounding nature of the work. In such a situation, the performer assumes a role similar to that of the composer in the *Music of Changes*, describing note-to-note details from a guiding process.

David Tudor’s first version of the *Solo for Piano* illuminates his dedication to the “constantly new.” Holzaepfel notes that Tudor made an index of the notation-types so as to identify which notations were utilized more than once and to note which notations are modifications of earlier notation-types. Tudor then systematically avoided any repeated notations in his realization. Once he had “solved” the puzzle of any particular notation-type, he appears to have felt no need to address that notation again in spite of the possibility of discovering new results. In this choice, Tudor declares his prioritization of process over results. He embraces Schoenberg’s notion that a variation constitutes a repetition. In Tudor’s prioritization of the new, only new processes can lead to new experiences; just as he had discarded the inherent repetition of the complex European piano repertoire, here he discards even a single reuse of a compositional process.

**D. Notation CC**

Because Cage’s compositional process in *Solo for Piano* demanded frequent changes of notation, many novel notations appear only in a single instance. Cage’s compositional process only allows a new notation to be explored in more detail if chance procedures demand a repetition of that notation. Used only once, notation CC is a particularly complex notation that remains distinct from any other in the *Solo for Piano*.

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\[17\] Holzaepfel, 212.
While Tudor felt no need to use any process more than once, Cage would continue to work with the notation of CC for many years after the *Solo for Piano*. The score provides the following explanation for CC, shown in Figure 2.1: “The four differently drawn lines = frequency, duration, amplitude, overtone structure, in any correspondence. Measurements defining these are to be made perpendicularly from straight lines above and below their points of intersection with slanting lines. Numbers at ends of these give by their difference time available for sounds.”\(^{18}\)

\[\text{Figure 2.1: Solo for Piano, Notation CC.}\]

The great deal of information contained within CC generates only four sound events as described by each diagonal line. These four sound events represent only four possible *instances* of what could be generated with this method; the placement of

\(^{18}\) Cage, *Concert for Piano and Orchestra*. 
diagonal lines in any other orientation would give rise to different sets of musical information. The four curving lines are distinct, each following its own, independent trajectory. An observer of the score can trace the changes in a certain parameter over time as the line moves from left to right in CC; Cage counteracts the clarity of this trajectory by allowing only momentary glimpses into this process as it unfolds. The diagonal lines function as an “on” switch, making the sounds audible at just one point as they move along this unheard path. In this way, CC suggests its own abstraction; if the diagonal line might become mobile, one could generate a new sound event with each new position.

E. The Fontana Mix Tape

The Solo for Piano provided Cage with a vast resource for new notations, many of which (like notation CC) lay under-explored upon the completion of the work. Several of these new notations would serve as the basis for Cage’s works from 1958-1961. A great number of works from this period can be traced back to notation CC. The first of these works was a piece for magnetic tape called Fontana Mix, composed at the Studio di Fonologia della Radiotelevisione Italiana (RAI) in Milan in late 1958.

To create Fontana Mix, notation CC was transformed into a variable process by converting its components into transparent layers which might be arranged in any orientation. In this way, notation CC became a process capable of generating any number of instances like that of CC. Cage created ten pages of six differentiated curving lines. Any one of these sheets could be combined with any one of ten transparent pages.

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19 For example, as discussed in Chapter 3 below, notation BB would be further explored in Music Walk (1958), Variations I (1958), and Variations II (1960).
containing points. A new component, a grid twenty units by one-hundred units, is placed on top of these two sheets. The points facilitate the positioning of the diagonal line, which must intersect a point contained within the grid and a point outside of it. This also limits the number of possible orientations of the diagonal line relative to that of the curving lines; connecting each inside point to each outside point results in a fixed number of readings for each orientation of the other materials. One possible orientation of these materials can be seen in Figure 2.2.

Figure 2.2: One possible orientation of the Fontana Mix materials.
Horizontal readings on the grid indicate measurements of time. Much like CC, the points of entry and exit of the diagonal line relative to the top and bottom of the grid create a window in which an event may occur. Within this window, “Measurements vertically on the graph with respect to the intersections of the curved lines and the straight line may specify actions to be made… where the latter have been categorized and related quantitatively to 20.” Cage explains that in the case of the Fontana Mix tape, the thickest line specified sound sources, selecting from a pool of twenty choices. The other lines “may specify machines (among those available) for the alteration of original material. Amplitude, frequency, overtone structure may be changed, loops and specific durations introduced.”

From these materials, Cage made several hundred readings to fill the two seventeen-minute tapes of Fontana Mix. Each reading created a list of machines and sound sources to be utilized in creating a sound event. Sound sources were categorized in a method similar to that of Cage’s earlier tape music, Williams Mix, from 1953: “A) city sounds, B) country sounds, C) electronic sounds, D) manually-produced sounds (including music), E) wind-produced music (including songs), and F) ‘small’ sounds requiring amplification.” This list became the instructions for the creation of sonic content on the tapes. Seen in Figure 2.3, sound event number four gives a clear example of these instructions:

21 Ibid.
22 John Cage, “Fontana Mix” manuscript materials, JPB 95-3 Folder 268-272, New York Public Library Performing Arts Research Collections.
23 Pritchett, 90.
4. 22.5-30.7 [time bracket in seconds]
C \text{sinc}D_{1} \quad [C: \text{electronic sounds, D: manually-produced sounds}]
ring modulator \quad [\text{means of modifying timbre}]
speed of tape machine \quad [\text{means of modifying frequency}]
magnetic echo \quad [\text{means of modifying timbre}]
5\% \text{ or } 95\% \quad [\text{choice of amplitude level}]

Figure 2.3: Description of sound event four from Fontana Mix manuscript materials.\textsuperscript{24}

These instructions function more as a traditional “score” than the transparent materials of Fontana Mix in that they specify with precision the components of a given sound event. While there remains some ambiguity with regards to how the ring modulator (or other modifiers) might be utilized, this sound event contains a unique set of characteristics. As with his earlier tape piece, Williams Mix, Cage published a score, inviting others to make new version of the tape. However, for Williams Mix, Cage published a document that describes the results of his chance method; it is a document that describes the lengths of tape to be used, types of sound sources, and the types of splicing techniques used for each segment of tape. The Fontana Mix tape instructions, which remain unpublished, contain much of the information contained within the Williams Mix score, albeit in prose form.

But the document published as the Fontana Mix score contains only the transparent materials derived from CC. The score exists only as the tool Cage employed to generate the content of the Fontana Mix tape. As such, an interpreter tasked with the production of a new Fontana Mix tape can only begin for themselves as Cage began, overlaying the transparent materials, making measurements, and assigning those

\textsuperscript{24} John Cage, “Fontana Mix: Tape 1” manuscript, JPB 95-3 Folder 268, New York Public Library Performing Arts Research Collections. Bracketed text is my own, added for clarification.
measurements to available means of manipulation. They likely no longer have access to
the same machines Cage employed at the Studio di Fonologia nor are they even
encouraged to designate sound sources using Cage’s categories from Williams Mix. The
interpreter can only make a new score from these materials, one that is likely to take on a
radically different form than Cage’s 1958 version on magnetic tape.

F. The Fontana Mix Tool

Beyond the construction of tape music, the published document invites the use of
the Fontana Mix materials for the creation of any new score: “The use of this material is
not limited to tape music but may be used freely for instrumental, vocal and theatrical
purposes. Thus, after a program of action has been made from it, it may be used to
specify a program for the performance of the otherwise unchanging material. Where
possible technically this can be not only simple changes of time (starting, stopping) but
also alterations of frequency, amplitude, use of filters and distribution of the sound in
space.”25 With this indication, Cage shifts the focus of Fontana Mix away from its first
result (the Fontana Mix tape) and toward the compositional process itself. The interpreter
is invited to build a score using the chance procedures outlined by the Fontana Mix
materials.

Fontana Mix becomes a process that might be applied to any collection of
materials. The process, generally speaking, 1) designates a window of activity in which
“action” (broadly defined) might take place, 2) selects from a predetermined collection of
materials which one or more materials will be used in that window, and (optionally) 3)

25 Cage, Fontana Mix.
selects from a predetermined collection of means of modifying the material identified in step 2. Pritchett connects this process to Cage’s earlier works, noting, “In essence, then, the approach of Fontana Mix is the same as that of the earlier chart pieces – defined materials randomly ordered and coordinated within random time units.” By removing the specific parameters to which this chance process might ultimately be applied, Cage moves away from the notion of an indeterminate score producing realizations and toward the notion of a score-tool producing other scores.

The notion that a score might produce another score had already been a significant part of David Tudor’s musical practice. Cage’s scores of the late 1950s had been, for Tudor, an initial provocation necessitating a new, detailed score. Iddon notes that “in Tudor’s hands, Winter Music, the Solo for Piano, and Variations I all already existed, quite literally, as ‘means of making scores.’” While in those earlier works the necessity to create a new score was not a requirement of the composition (for example, one could learn to read Winter Music and many notations from the Solo for Piano as they appear in the score,) in Fontana Mix, Cage embeds the score-making procedure into the work itself. There is nothing here to be “read” in performance. Instead, the interpreter in this work must apply the same kind of meticulous notation and decision-making that Tudor applied in his realizations of earlier works.

Furthermore, Cage had already acknowledged in earlier works that the processes of chance composition, once rigorously designed, might be carried out by anyone. In creating Williams Mix, Cage recalls, “the quantity of work I had to do was so immense

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26 Pritchett, 132.
27 Iddon, 138.
that David Tudor learned all of my composition techniques and composed at the same
time as I, along with me. His assistance helped me a lot.”

The materials of *Fontana Mix* are designed, essentially, to “teach” anyone a particular technique of chance composition, allowing anyone to carry out the work of producing a score. The interpreter must then begin with a concern for *process* rather than results.

Cage himself produced a number of autonomous scores utilizing the *Fontana Mix* tool. The title page of the published *Fontana Mix* describes itself as, “Material for tape music of that title; also *Water Walk* (1959), *Sounds of Venice* (1959), *Aria for M. Sop.* (1958), *Theatre Piece* (1960), *WBAI* (1960). Also used by Cornelius Cardew to make *Solo for Guitar.*” All of these works, which include some of Cage’s most well-known pieces, were derived from engagement with the *Fontana Mix* materials. Each of these works (with the exception of Cardew’s *Solo for Guitar*, of which there is no existing record) was published as an independent score, making clear that these were not simply “realizations” of *Fontana Mix*, but new, autonomous works in their own right. These works take on radically different forms and mediums, pointing to the breadth of possibilities available within the *Fontana Mix* tool.

**G. Aria**

After the production of the *Fontana Mix* tape music, Cage’s first score-product generated with *Fontana Mix* was *Aria* of 1958. This work, written for Cathy Berberian during Cage’s Italian tour, generates a “program of action” for solo voice utilizing texts,

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28 Cage and Charles, 124.
29 Cage, *Fontana Mix*. 
languages, and vocal styles as “otherwise unchanging materials.” As seen in Figure 2.4, curving lines suggest vocal contours while time is read spatially from left to right (Cage indicates that the first performance read one page as thirty seconds, but any other relationship may be used.) Each gesture in the score is distinguished by one or more colors or line textures which correspond to ten different vocal styles selected by the performer. The text of the work moves between five languages (English, French, Italian, Armenian, and Russian); phrases range from as little as a single letter to several words from these languages. The vocalist also provides “any noises (‘unmusical’ use of the voice, auxiliary percussion, mechanical or electronic devices)” indicated in the score by black boxes.

While it is impossible to reconstruct the compositional decisions in such a work, these parameters suggest a clear relationship to the Fontana Mix materials. Time brackets likely select the length of each vocal contour; the five languages plus the auxiliary noises likely correspond to the six curving lines of the tool, one or more of which might be “active” within a given time bracket; the ten vocal styles could easily relate to every two of the twenty vertical units of the grid. While my analysis has not found a direct correlation, the pitch contours bear great resemblance to the curves of the six lines in the Fontana Mix tool, suggesting that the lines themselves may have been responsible for the pitch content of the work. All of the English texts in Aria were drawn from an English translation of Meister Eckhart by Franz Pfeiffer, published in 1947. The French texts were drawn from the Mallarmé Œuvres Complètes published by G. Jean-Aubrey and

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Henri Mondor in 1945.\textsuperscript{31} The source of the remaining Italian, Armenian, and Russian texts are likely unidentifiable due to the lack of lengthy phrases in any of these languages and in the case of the latter two languages, transliteration likely undertaken by Berberian herself.\textsuperscript{32}

\textbf{Figure 2.4:} \textit{Aria}, Page 9.

While this work at first appears to have little in common with the \textit{Fontana Mix} tape music, there exist a number of important similarities. First, both works begin with a collection of found materials; in the case of the tape music, this was a catalogue of recorded sounds, while in the case of \textit{Aria}, this was a selection of existing texts. Selections of source and length were then made via the \textit{Fontana Mix} tool. Selections from a pool of modifiers (available machines in the tape music, vocal styles in \textit{Aria}) were

\footnotesize
\begin{itemize}
\item \textsuperscript{31} Stéphane Mallarmé, \textit{Œuvres Complètes}, eds. Henri Mondor and G. Jean-Aubrey (Paris: Gallimard, 1945).
\item \textsuperscript{32} Kate Meehan, “Not Just a Pretty Voice: Cathy Berberian as Collaborator, Composer and Creator,” (PhD Diss., Washington University in St. Louis, 2011), 70.
\end{itemize}

then made and applied using the *Fontana Mix* tool. The result in both cases is a new work that removes otherwise “coherent” materials from their original context, cross-wiring them with unrelated means of modification. In *Aria*, this produces a powerful sense of discontinuity. As an example, in Berberian’s version (described by Cage in the score), Mallarmé’s enigmatic line, “si ceci est cela / cela est ceci” is sung with her “Marlene Dietrich” vocal style.\(^{33}\) In another passage, the fragmented English texts “that shall continue / breaking the shell / far-removed / at rest” pass through five different vocal styles and alternate between registral extremes.\(^{34}\)

In the score to *Aria*, Cage indicates that *Aria* might be performed “in whole or in part” (just like the *Solo for Piano*), thus constituting again a “body of material” that might be used in any way necessitated by a given performance. He further indicates that it may be performed alone, with the *Fontana Mix* tape, or any parts of the *Concert for Piano*. This represents only the second instance in which Cage makes explicit allowances for the simultaneous performance of several of his works. The first instance was among the various works of the “10,000 things” project of the mid-1950s, in which any amount of the works for pianos, string player, speaker, and percussionist\(^{35}\) may be performed in any combination. Cage likely considered these works suitable for simultaneous performance due to their shared compositional process. The same was likely true of *Aria*, the *Fontana Mix* tape music, and the *Concert for Piano*, as these works share among them the use of the notation CC from the *Concert for Piano*. Berberian frequently performed the *Aria* alongside the *Fontana Mix* tape music and her published recording presents these two

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34 Ibid., 6.
35 That is, 34’46.776” for a pianist, 31’57.9864” for a pianist, 27’10.554” for a percussionist, 45’ for a speaker, and 26’1.1499” for a string player.
works in combination.\textsuperscript{36} Letters between Cage and Tudor indicate that a planned performance of Berberian singing \textit{Aria} with the \textit{Concert for Piano} conducted by Bruno Maderna in 1959 was never realized, but Iddon notes that \textit{Aria}, the \textit{Fontana Mix} tape, and the \textit{Solo for Piano} were performed together in Japan in 1962.\textsuperscript{37} At this point in Cage’s aesthetic development, simultaneous performance of his works appears to have been justified only by procedural connections.

\textbf{H. Water Walk and Sounds of Venice}

The next products of the \textit{Fontana Mix} process were designed for a series of television appearances Cage made on his Italian tour. Beginning on January 29, 1959, Cage was a contestant on the Italian television show \textit{Lascia o raddoppia?} in which he was quizzed weekly on the subject of mushrooms. Over five weeks, Cage answered every question correctly, claiming the show’s maximum prize of five million lire. On three occasions, Cage presented his music as part of the broadcast. In his first appearance, he performed the solo prepared piano movements (I and IV) of \textit{Amores} (1943). In his remaining appearances, Cage premiered two new works, \textit{Water Walk} (February 5, 1959) and \textit{Sounds of Venice} (February 19, 1959).\textsuperscript{38} Both works were derived from the \textit{Fontana Mix} materials and exist as independent, autonomous scores.

These works have a great deal in common. Both works make \textit{actions} the “unchanging material” that will fill the time brackets of \textit{Fontana Mix}. In \textit{Water Walk},

\begin{itemize}
\item \textsuperscript{37} Iddon, 100.
\item \textsuperscript{38} Stefano Pocci, “John Cage a \textit{Lascia o raddoppia}?” last modified October 18, 2015, http://www.johncage.it/1959-lascia-o-raddoppia.html.
\end{itemize}
these actions were all related to water. Knowing that the *Fontana Mix* tool selects most easily from collections of twenty, Cage’s list of actions contains twenty items, including actions involving a *vasca da bagno* [bathtub], a water boiler on a hot plate, ice in a blender, and one item that describes the construction of a cocktail (“soda syphon + glass + drink. + ice.”)³⁹ In *Sounds of Venice*, Cage’s actions were derived from the experience of Venetian street life, and include lighting and smoking a cigarette and unveiling a cage of canaries. Both pieces also include actions familiar from other Cage pieces, including a variety of sounds on the interior and exterior of the piano, an assortment of whistles and duck calls, and an amplified slinky in *Sounds of Venice*. Both works are furthermore accompanied by tape playback, the content of which was composed alongside the *Fontana Mix* tape at the Studio di Fonologia in late 1958.

Both scores are notated in a manner reminiscent of *Water Music* (1954) in which text instructions appear along a timeline.⁴⁰ Occasional graphic symbols are used to indicate the general placement of a sound inside the piano, or when a single symbol is more efficient than a text description (as with the “mechanical fish” in *Water Walk.*). The relationship of these two works to the *Fontana Mix* materials is much simpler than that of *Aria*. Cage remarks that after having made a list of actions “that I was willing to involve myself in,”⁴¹ the *Fontana Mix* tool would select one of the actions and specify a time bracket in which this event may occur. Given that the published scores place actions at discrete points rather than allowing for “windows” of time for each action, Cage likely

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⁴¹ Kirby and Schechner, 61.
placed events along the timeline idiomatically such that they could be accomplished within their time brackets while moving fluidly from one action to the next. Cage recalls that “I don’t think I used all six of the lines. I used as many as I thought were necessary.” In observing his list of actions and comparing this to the published score, my estimation is that only one of the curving lines was used. The intersection of this one line with the diagonal line would select one of the twenty options and a particular time frame. It is possible, however, that other lines were used to make more complete descriptions of these actions, such as the relative location of interior piano events or selection of particular whistles in Water Walk.

In either case, Cage demonstrates a liberal application of the Fontana Mix process to accommodate the already complex nature of theatrical actions. Here, few (if any) modifiers are applied to the original collection of materials. The actions are presented in the score almost exactly as described in his original list; Fontana Mix is only responsible for the random selection and distribution of these events in time. Unlike in the previous Fontana Mix scores, the original list of actions in these works remains easily identifiable and understandable. The final score in both television works retains the “theme” that organized the original list of actions. This is very much not the case in Aria, where the texts of Meister Eckhart and Mallarmé are scarcely recognizable after their randomized fragmentation and disassociation, nor in the Fontana Mix tape music, where “country sounds” and “city sounds” are rendered indistinguishable after a great deal of modification. This worked to Cage’s advantage on Lascia o raddoppia?, and later on the American television shows I’ve Got A Secret and The Henry Morgan Show, where the

42 Ibid.
seemingly absurd sequences of familiar actions garnered great laughter and applause from a shocked studio audience.\(^\text{43}\)

Even though Cage had been working on the tape playback for *Water Walk* and *Sounds of Venice* in late 1958, the composition of both performed parts happened in an unusually short period of time. Fetterman’s discussion of *Water Walk* revolves around worksheets that were ultimately discarded. These worksheets contain “forty time brackets with one or two numbers indicating numbered events … and some dynamics from pppp to ffff”\(^\text{44}\) and also a variety of actions that do not appear in the final score (for example, “start eggs cooking” and “start washing machine.”)\(^\text{45}\) Only two dynamic markings appear in the published version of *Water Walk*, both describing the slamming of the piano lid (one *p* and one *ff*.) Fetterman’s worksheets seem to point to a preliminary version that was likely much more complex than the published score.

The list of actions available at the New York Public Library, however, *does* correspond to the actions that appear in the final score.\(^\text{46}\) Interestingly, this list is written on an envelope sent from Cologne to John Cage (care of Luciano Berio in Milan) postmarked January 29, 1959. This date indicates that the final list of *Water Walk* actions, and thus the final score, was not completed until the week of the first performance (which took place on February 5, 1959.) The urgency to complete and learn the work likely led to a new reading of the *Fontana Mix* materials that did not describe dynamic information.


\(^{45}\) Ibid.

\(^{46}\) Cage, “List of items for use in Water Walk.”
Cage even appears to have learned the work in the television studio, stating “I rehearsed very carefully, over and over and over again with people watching me and correcting me, because I had to do it within three minutes. It had many actions in it and it demanded what you might call virtuosity. I was unwilling to perform it until I was certain that I could do it well.”

This rather compressed timeline (particularly when compared to the many months-long gestation of Music of Changes and Williams Mix) points to an additional benefit of Cage’s involvement with score-making processes. The simplification of the Fontana Mix procedures in creating Water Walk and Sounds of Venice was likely the result of working on tour and Cage’s new-found notoriety, where Cage was no longer afforded the time to compose with the elaborate, complex chance procedures of Music of Changes. By removing levels of detail from the process, Cage was able to adapt the result to suit the available time and circumstances of the planned performance.

1. Theatre Piece

The next product of the Fontana Mix materials was Theatre Piece (1960). This work consists of eight parts, any number and any part of which may be utilized in performance. The pages within each part may also be performed in any order. The parts may be performed by any performer, “performing musician, dancer, singer.” The premiere performance involved two dancers (Merce Cunningham and Carolyn Brown), five musicians (including Cage, Tudor), and one lighting designer (Nicholas Cernovitch).

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47 Kirby and Schechner, 61.
who was accompanied by an assistant.\footnote{Fetterman, 108.} All involved utilized the parts of *Theatre Piece* to create a “program of action” for what was a thirty-minute performance.

Seen in Figure 2.5, the parts of *Theatre Piece* are themselves indeterminate scores. In each part, time runs from left to right in two systems per page. The actual time scale is variable, although Cage provides transparent rulers that divide each system into 100, 120, 180, 50, or 60 parts; any of these rulers (or any other supplied by the performer) may be employed and may be changed at any point. Brackets of time, delineated by horizontal lines, indicate periods in which actions may occur. The action is selected from a list supplied by the performer of twenty nouns or verbs and indicated in the score by one or more large numbers (1-20) above each time bracket. Below each time bracket, Cage lists four more numbers, which might provide the performer with up to four answers to questions that might arise regarding that action. Here there may also be an “X,” which indicates that the performer has free choice over the answer to that particular question. Further indications above the line (such “+1” or “-3”) direct the performer to add or remove items from the initial list of twenty nouns or verbs, making the gamut of available actions itself variable throughout the work.
Theatre Piece relates directly to simple readings of the Fontana Mix materials. Pritchett even describes Theatre Piece as “prefabricated” Fontana Mix readings.”

Indeed, the six lines of Fontana Mix were likely read in terms of 1) selecting from the list of twenty, 2-5) providing a numerical answer to each of four questions, and 6) adding or subtracting items from the list. An “X” was likely noted when one of the curving lines failed to intersect with the diagonal line of Fontana Mix. Time brackets were transcribed proportionally onto the page, which could then be read in any time scale.

This document thus represents an “intermediate” stage of working with the Fontana Mix materials; it presents the results of overlaying and measuring the transparencies in simple numerical form, before any parameters have been assigned and before any decisions have been made regarding duration or medium. Cage recalls, “When

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50 Pritchett, 134.
I was writing the *Theatre Piece* I started out in terms of process, just overlaying these things and taking measurements, and I went far enough with that concept to put it on paper, but not to specify verbally. I left that up to the performer. I stopped the process before it was realized, leaving the realization up to the individual." As a result, *Theatre Piece* can be utilized to describe a “program of action” for any performer and any situation. The details of the score are redundant of *Fontana Mix*; a program of action of any length *could always* have been made with the *Fontana Mix* materials by anyone willing to engage with them. In this way, *Theatre Piece* exists as an invitation to any performer to work with the chance procedures of *Fontana Mix*, and does so by extending them a “head start” in dealing with the complexities of the transparent score. In many ways the form of *Theatre Piece* is concerned with practicality; it invites participation from a larger number of performers who are required to do far less preparatory work in making the score compared to starting from *Fontana Mix* itself.

When combined with the performer’s input, *Theatre Piece* becomes a performance that selects randomly from the performer’s list of actions, suggesting the sudden performance of an action or even suggesting the combination of many actions simultaneously. In many ways, *Theatre Piece* is reminiscent of Cage’s own theatrical engagement with the *Fontana Mix* materials like *Water Walk* and *Sounds of Venice*. Indeed, Cage would later go so far as to describe *Water Walk* as a “written out” example of what might result from a serious engagement with the *Theatre Piece* parts: “I’ve rarely seen people do [Theatre Piece] well. They mostly do it in such a way that they don’t have to confront a new experience. They almost never do. When I gave the example with

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51 Kirby and Schechner, 63.
Water Walk [1959], which I wrote out, I gave the example of how that kind of thing can be done. I wanted a lot of activity in a short period of time.” Curiously, Tudor’s version appears to have resembled Cage’s Water Walk in its use of whistles, toy noisemakers, unusual piano sounds, and even the playback of recorded sound. These were clearly not “new experiences” for Tudor, nevertheless Cage singled out Tudor as the only participant in the premiere with his approval to continue performing the work. While at first this appears to contradict Cage’s stated goal, it serves to sharpen Cage’s notion of “new experience.” In the notes to Theatre Piece, Cage states that “Each performer is who he is (e.g. performing musician, dancer, singer), but he is also performing a piece of theatrical music.” With this remark, Cage seems to indicate that a performer should bring to Theatre Piece the actions of their profession, actions that would be typical of them in performance. In this light, Tudor’s actions, vaguely reminiscent of earlier Cage works, could be seen as typical of Tudor’s work as a pianist commonly performing Cage’s music. The “new experiences” that Cage describes thus are not located in the performer’s list of actions but in the subjecting of ordinary action to the dissociating, decontextualizing fragmentation characteristic of the Fontana Mix process. For Cage, the route to new experiences did not lie in exploring new content, but was only possible through new processes. Just as Cage sought the truly new through the exploration of alternative notational forms in Concert for Piano, here the truly new is the result of subjecting the everyday to a new organizational process.

52 Fetterman, 236.
53 Ibid., 239.
54 Iddon, 158.
55 Cage, Theatre Piece, my emphasis.
Observing the connections between *Water Walk* and *Theatre Piece*, Cage once again moves from *instance* to *process*. Much like notation CC from the *Concert for Piano* was generalized into the variable *Fontana Mix*, *Water Walk*, as only a particular *instance* of one type of engagement with *Fontana Mix*, becomes general as the indeterminate *Theatre Piece*. Subjecting action to the *Fontana Mix* tool pointed to broader applications beyond only those that might produce sounds. This notion extends the breadth of media to which the *Fontana Mix* process was applied, pointing to the centricity of *process* rather than results; the experience of this fragmenting process is the aesthetic goal of all *Fontana Mix* products. All of these scores provide avenues to the experience of defamiliarization and fragmentation; they are the means by which anyone (any “performer” broadly conceived) might access new experience.

**J. WBAI**

The final *Fontana Mix* product, *WBAI* (1960), takes on indeterminate form as well. *WBAI* is described as “material for making a mechanical program” and again most directly resembles the kinds of “prefabricated” *Fontana Mix* readings in *Theatre Piece*. Cage suggests that *WBAI* be used to direct the operation of machines (“e.g. tape machines in a performance of the *Fontana Mix* with *Solo for Piano, Aria*, etc.”) He also indicates that it was used to direct LP playback and tone controls of his voice in performing the lectures of *Indeterminacy*. The score provides information for four machines (to be determined by the performer) read left to right according to any time scale. For each machine, black horizontal lines represent the only content of the score. These lines

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indicate the duration of use for each machine. This limited amount of information
suggests an extremely reduced reading of the *Fontana Mix* materials. Many readings of
the materials might suggest these simple relationships, but the basic process of
determining a time bracket and selecting a source (here one of four machines) to be used
in that time bracket remains characteristic of the *Fontana Mix* score-making procedure.
Notably, *WBAI* exists within the family of works related to notation CC that might be
performed simultaneously. In this role, *WBAI* forms a performed part for the sound
projectionist, further complicating the playback of the *Fontana Mix* tape music.
Furthermore, the role of the sound projectionist changes; rather than being subservient to
the musical needs of the work, here the sound projectionist becomes “active” as a
performer, working in parallel with the performers on stage in shaping the final form of
the performance.

**K. Evaluating the Score-Tool**

Cage’s own work with the *Fontana Mix* tool demonstrates the enormous
flexibility granted by the score-producing tool. The abstraction of notation CC allowed
Cage to apply similar procedures to any work that engaged with a predetermined
collection of materials and expect radically different results. Cage could even customize,
based on the available time or magnitude of the work, how much detail would be
described by the *Fontana Mix* process. The results range from the binary indications of
*WBAI* to the complex fragmentation of *Aria*. Cage would use as much of the materials of
*Fontana Mix* as he deemed necessary for each project, using only time brackets in *WBAI*
and all six curving lines in many iterations in *Aria*. 
In this way, Cage felt free to choose, in his analogy, to “work slowly with oil” or “rapidly with water colors.”

Previously, Cage required two distinct compositional methods suited to different rates of working. He saw his method of locating imperfections in paper as the “rapid” method, while “working with oil” symbolized the laborious process of consulting I Ching. Flexible use of the Fontana Mix tool afforded Cage a range of possible working methods within the same general process. Cage reflects that the use of transparent sheets enabled the generation of large quantities of chance-determined information in a rather efficient process. Rather than tossing three coins six times for each sound as in Music of Changes, with the Fontana Mix tool, Cage could generate all the information needed for one event through one reading of the materials.

As his career become more and more active in the late 1950s, issues of efficiency and practicality were increasingly important for Cage. He observes in 1961, “Though we are not leaving anything, our notations are changing and sometimes even disappearing. Usefulness is uppermost in our minds.”

This emphasis on usefulness allows the interpreter to accommodate the work to a particular performance context, just as Cage did in the television solos, which were not only designed as visually interesting theatrical events, but were also confined to the friendly length of three minutes and prepared within a week’s time. Indeed, Cage’s score-tools upend the notion that the interpreter “must identify himself insofar as is possible with the center of the work as written.”

Rather, an interpreter can use Cage’s process to fulfill any obligation. Furthermore, because these works make no demands of the performance situation, they can easily be adapted to

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57 Cage and Charles, 44.
58 Ibid.
59 Cage, “Where are we going? What are we doing?,” (1961) in Silence, 229 - italic text, right column.
60 Ibid.
accommodate the available resources. For example, if a sound system were not available for one performance, a new, acoustic score could be made. In the case of a conventional score that demands a sound system, if one could not be procured, the work would likely go unperformed.

Furthermore, even in the case of the scores produced with *Fontana Mix*, Cage would increasingly describe his works as “bodies of material” from which the performer might create a performance. The score no longer demands beginning-to-end performance. This in many ways in an outgrowth of the aesthetic of Webern and Schoenberg (described in Chapter 1) in which any result of a strict process constitutes a complete representation of that process. As one example, each gesture of *Aria* refers to the *Fontana Mix* process. As such, any gesture or number of gestures might constitute a “complete” performance of the work.

In many ways, the *Fontana Mix* tool reflects many of the concerns Cage expressed in his initial turn to indeterminacy. Tudor’s assertion that conventionally notated scores repeated old experiences, paired with his desire “to be able to do new things constantly”⁶¹ led Cage to prioritize new, unexpected experiences through the use of indeterminate notations. The result of this turn, both in the *Concert for Piano and Orchestra* and later in *Fontana Mix*, was a systematic exploration of innovation. As revealed by Cage’s own work with the *Fontana Mix* materials, the score-making tool became a means of discovering new experiences while maintaining a strict sense of process.

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⁶¹ Dickinson, 85.
Furthermore, the score-tool rejects the authority of the conventional score, allowing performers, venues, and available materials to dictate the identity of the work. In 1961, Cage would describe his score-tools as a foil to musical hierarchies: “What we do is not utterly different from what we used to do. That is: we used to get an idea and do it and then someone else had to do more or less what he was told to do. Now we get an idea and present it in such a way that it can be used by him who is going to do it… All the people have become active and enjoy what you might call individual security.”62 In Music of Changes, the score’s authority forced the interpreter to “[follow] an architect’s blueprint.”63 The score-tool inverts this hierarchy; the interpreter asserts for themselves the way in which the materials should be used.

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62 Cage, “Where Are We Going? What Are We Doing?,” in Silence, 203 - plain text, right column.
Chapter III

Performing Indeterminacy and Composing Questions:

John Cage’s Cartridge Music and Variations II

A. Cartridge Music

Cartridge Music (1960) continues Cage’s work with overlapping transparent sheets as a tool for producing chance-determined events. As the first such tool not directly derived from the notational experiments of the Concert for Piano, it represents a continued investigation of the possibilities of this method as a means of producing scores. Much like Fontana Mix, Cartridge Music was designed with a specific use in mind. In the case of Fontana Mix, this was the production of music on tape; with Cartridge Music, this was the production of live electronic music, particularly utilizing the “small” sounds only audible through the use of phonograph cartridges. In this way, Cartridge Music represents a dedication to the exploration of electronic components in performance, not just as playback devices or sound reinforcement, but as tools responsible for the live generation of sound events. Cartridge Music also initiates Cage and Tudor’s exploration of indeterminate performance as an extension of their experience with both Cage’s variable score-tools and the use of electronics in performance.

The Cartridge Music transparencies consist of twenty sheets containing one to twenty “biomorphic” shapes,¹ a sheet with points, a sheet with circles, a sheet with the

¹ John Cage, “Rhythm Etc.,” (1961) in A Year From Monday: New Lectures and Writings (Middletown CT: Wesleyan University Press, 1967), 120. Since these shapes function as symbols for the cartridges in this
face of a stopwatch, and sheets containing a meandering dotted line with a circle at one end. The interpreter first selects one of the sheets containing shapes equal to the number of available cartridges and then overlays the remaining sheets. The dotted line is arranged such that its circle contains a point outside of the shape and intersects a point within the shape. Figure 3.1 presents one such orientation of the materials, making readings for a single cartridge.

The interpreter then follows the dotted line from one end to the other to determine the details of an event. Noting the dotted line’s entry and exit with the stopwatch establishes a time bracket within which the event will occur. Given the use of a stopwatch, only seconds can be determined, such as :21 and :03 in Figure 3.1. These seconds, according to Cage, “may refer to any one of the minutes of the total time programmed.”

This indicates that time brackets do not determine an ordering of events; any number of brackets might be used to fill the agreed-upon length of the performance, and they might be utilized in any order. Furthermore, since the dotted line might be followed beginning at either end, this particular bracket in Figure 3.1 might begin at X:21 and end at X:03, or vice versa. Cage also accounts for the possibility of the dotted line having no intersection with the stopwatch, in which case that event should occur outside of any other determined time brackets.

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work, Cage likely chose this word carefully. As demonstrated below, he saw electronic components as inherently unpredictable; the cartridges are “alive” and seemingly act of their own accord.  
Figure 3.1: One possible orientation of the Cartridge Music materials.
Intersections of the dotted line with the other elements determine actions to be taken within the time bracket. The shapes represent the available cartridges. The intersection of the dotted line with a point inside the shape determines a sound produced with that cartridge. The intersection of the dotted line with a point outside the shape determines an “auxiliary” sound produced “by any other means.” Intersection of the dotted line with a circle inside the shape determines an adjustment of the amplitude control of the amplifier. Intersection of the dotted line with a circle outside the shape determines an adjustment of the tone control of the amplifier. These often indicate two intersections as the dotted line enters and leaves the circle; Cage ambiguously indicates, “Notate these, using one or both in performance.” Repetitive actions arise if the dotted line crosses itself upon a point or circle. If the boundary of a shape, the dotted line, and a circle all intersect, this determines a change of the cartridge indicated by the shape.

In contrast to Fontana Mix, Cage also provides some information that might guide the aesthetic choices of the performer. He suggests that contact microphones might be fixed to nearby objects to easily access auxiliary sounds “having an electronic character.” He further indicates that “All events, ordinarily thought to be undesirable, such as feedback, humming, howling, etc., are to be accepted in this situation.” Here, Cage shows an aesthetic preference for those sounds that might occur spontaneously (as the inevitable result of performing with microphones as implements,) sounds generated from within the electronic system itself.

Finally, the number of performers should be “at least that of the cartridges and not greater than twice the number of cartridges.” This statement has caused some confusion; Fetterman suggests that there could be “at most two cartridges” in a performance with
one performer. He undoubtedly draws upon Cage and Tudor’s own realizations of this work, in which Cage’s performance notation indicates two cartridges. It is left unnoted in the instructions, but Cage likely expected performers to make mutual use of the cartridges; all players prepare parts that might engage with each of the available cartridges. The result is not unlike the shared resources of *Music Walk* (1958), in which independently prepared parts might “produce a delay or alteration in plans” when multiple performers require the use of the same instruments. Indeed, Fetterman presents a New York Times review of a Cage and Tudor performance of *Cartridge Music* that clearly describes the shared use of two cartridges.

**B. Cage and Tudor – Notation and Choice**

Cage and Tudor performed *Cartridge Music* frequently as a duo throughout the early 1960s. A variety of manuscript sources reveal a great deal about the way the duo approached this work and its materials. Both performers made and performed from compact, handwritten scores that clearly demonstrate their approach. Iddon notes that while the two worked independently, their notations are so similar that they likely strategized their approach to the materials together at one point. While indeed quite

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5 Fetterman, 65.
6 Cage’s performance score is available as John Cage, “Realization of Cartridge Music” manuscript materials, JPB 95-3 Folder 299, New York Public Library Performing Arts Library Research Collections, and is discussed thoroughly in Fetterman, 63-64. Tudor’s performance score is excerpted in Fetterman, 61 and discussed in Martin Iddon, *John Cage and David Tudor: Correspondence on Interpretation and Performance* (Cambridge: Cambridge University Press, 2013), 169-175.
7 Iddon, 174.
similar, their notations each contain unique properties that reveal significant differences in interpretation.

Tudor made multiple realizations of the materials to suit different lengths of time. His notes contain distinct information for versions lasting both ten and twenty minutes.\textsuperscript{8} Cage’s score, seen in Figure 3.2, is arranged on cards, each describing one minute of the performance. His score consists of ten such cards constituting a ten-minute performance, however, each card can be rotated to present a different ten-minute score. These two versions are distinguished by Arabic and Roman numerals in the corners of the cards. These cards are ordered in a definite sequence; one follows either all of the Roman numeral notations or all of the Arabic numeral notations. This novel device may have allowed Cage to freely choose which version to perform without Tudor’s knowledge, thus making the resulting performance difficult to anticipate. It may also have allowed Cage to create a twenty-minute performance by combining the two versions; indeed, this notational method likely offered a certain degree of flexibility in how the materials would be presented and contrasts the distinct scores that Tudor produced to suit different durations.\textsuperscript{9}

\textsuperscript{8} Ibid., 170.
\textsuperscript{9} Cage’s cards were indeed designed for practicality; the reverse side of the cards contain a ten-minute realization of \textit{Music Walk}, in which, again, each card describes one minute. Cage’s performance scores for three different realizations were compactly contained within the ten note cards.
In Cage’s score, time brackets are indicated spatially from left to right while actions within those brackets are listed below. These actions are described in shorthand: numbers “1” and “2” refer to sounds on cartridges 1 and 2; a circle around a number indicates a change on that cartridge; “A” indicates an auxiliary sound (subscript numbers differentiate between up to five different auxiliary sounds); “T1” or “T2” indicate actions on the tone controls and is followed by a visual depiction of a knob, marked at two points. It is not clear from these materials how this graphic was utilized in performance. Iddon suggests these indicate a starting and ending position for the knob\textsuperscript{10} while Fetterman suggests that these indicate a possible range of settings on the knob.\textsuperscript{11} In either case, Cage’s notation indicates that particular values on the knobs were relevant to his performance. “AMP1” and “AMP2,” followed by a similar graphic, denote actions on the amplitude control. An “L” followed by a description (i.e. A, 1, 2, T1, etc.) indicates a repetitive action to be performed on that element.

\textsuperscript{10} Iddon, 174.
\textsuperscript{11} Fetterman, 64.
Seen in Figure 3.3, Tudor’s score, on the other hand, appears as a simple list of time brackets followed by a similar list of shorthand notations. Tudor sorts actions first based on their cartridge (1 or 2), and then indicates a sound (“X”), an adjustment of tone control (“T”), volume (“V”), a repeated action (“R”), or a change in the cartridge (“[C]”). The adjustment of tone and volume controls is strikingly different than Cage’s notation. Tudor follows each of these notations with an ascending or descending line (i.e. “T\)” or “T /”) to show an increase or decrease in that element’s value. This demonstrates some potential disagreement in how the two performers made adjustments in these elements; Cage seemingly sought specific values or areas on the knob while Tudor seems to have been primarily concerned only with the direction of the change rather than the amount of change.

![](image)

**Figure 3.3:** Reproduction of one page of David Tudor’s *Cartridge Music* performance score.\(^{12}\)

\(^{12}\) Transcription of the original manuscript from Fetterman, 61.
Another difference between the two scores is the approach to reading time brackets. None of Cage’s brackets are longer than a minute, suggesting that if the second of a pair of stopwatch intersections was less than the first, it would be assigned to the subsequent minute. (For example the pair X:54 and X:48 becomes 0:54 - 1:48 in his realization.) In general, Tudor’s brackets are similar, with one exception, presented in Iddon’s discussion, that lasts from 9:27 - 12:22.\textsuperscript{13} Iddon suggests that this was a largely pragmatic decision, noting the particular density of actions described in that event (an auxiliary repeated sound, a repeated tone adjustment on cartridge 1, a repeated sound on cartridge 1, and two changes of cartridge on cartridge 2.) Cage, however, seems to have ignored the possibility of adding minutes to brackets. As seen above in Figure 3.2, from 0:04-0:08, Cage’s score allows only four seconds to perform a similarly dense event (a tone adjustment on cartridge 1, a repeated sound on cartridge 2, a tone adjustment on cartridge 2, another tone adjustment on cartridge 1, a repeated sound on cartridge 1, and two distinct auxiliary sounds.) Both approaches are sanctioned by the score’s instruction that the numbers “may refer to any one of the minutes of the total time programmed.”

The possibility of displacing time brackets is another freedom inherent in the instructions; Cage chose to maintain the smallest possible bracket, accepting the existence of extremely dense events, while Tudor was simply more liberal with this direction, allowing practicality to determine the assignment of minutes to his time brackets. These differences point to the effects of personal decision-making in addressing the ambiguities of the instructions. Given the variability inherent in the \textit{Cartridge Music} materials, Cage’s instructions can hardly account for every possibility. Responding to the

\textsuperscript{13} Iddon, 172.
notion that these ambiguities necessitate the involvement of the ego of the performer, Cage states, “The performer can use similar methods to make the determinations that I have left free, and will if he’s in the spirit of the thing.”14 Indeed, both performers make their decisions derived from information in the notation. They simply chose very different ways of utilizing this information in performance.

In observing the performance scores, two aspects remain puzzling in their relationship to the Cartridge Music materials. Both Cage and Tudor describe distinct auxiliary sounds with subscript Arabic numerals; Cage’s score describes auxiliary sounds as A1, A2, A3, and A4 while Fetterman’s excerpt of Tudor’s score indicates A0, A1, and A2. This is a level of distinction not discussed in the published materials, though it appears to have been a priority for both performers. One possible rationale is purely practical; if four objects were amplified for use as auxiliary sounds, the duo may have worked together choosing when those objects were to be used in order to avoid collisions in performance. Indeed, Cage’s numeric distinctions appear in pencil (as opposed to the thick ink of the remainder of the score) and may well have been added in rehearsal. Nevertheless, these possible remnants of the rehearsal process are carefully left unspecified, allowing for any object to be designated a given number for any performance.

Furthermore, in Cage’s score, twelve events exist without any sounds produced on cartridges. This appears to be a direct contradiction of the score’s instructions which state that in order to create a reading, “...the dotted line intersects at least one point within

one of the shapes.”¹⁵ Since this type of intersection indicates a sound to be produced on
the corresponding cartridge, any time bracket must contain at least one sound on a
cartridge. As seen in Figure 3.3, Tudor’s score is consistent with this rule, and contains a
cartridge sound during each time bracket. Cage’s twelve anomalous events suggest the
possibility that Cage utilized intersections of the dotted line with points and circles
outside of the shapes to create readings. Again, there is no indication in the instructions
that leads to this usage of the materials. Cage’s means of identifying a “valid” reading
must have been different than Tudor’s, and perhaps even different from his published
instructions.

These differences and anomalies reveal a variety of discrepancies in the way Cage
and Tudor approached the Cartridge Music materials. But they also show that, in light of
the entire Cartridge Music process, certain details were unessential to the structure of the
tool. Importance was placed on making adjustments to the amplifier controls, but not on
how these adjustments would be made.

C. Performing Indeterminacy

However, the two performance scores are remarkably similar one very important
way: they both remain indeterminate. Neither performer makes indications in their score
about what sound to make, but only that a sound should be made. Cartridge Music gives
the interpreter no means of describing the details of a sound produced on a cartridge nor
the details of an auxiliary sound. This stands in contrast to similar works of this period.
Fontana Mix, as discussed above, selects between pools of possible sounds or sound

¹⁵ Cage, Cartridge Music.
characteristics. *Music Walk* is similar to *Cartridge Music* in that it specifies only where a sound is made (on the piano strings, keyboard, interior construction, or exterior construction, for example,) but Cage provides an additional transparent sheet that allows the interpreter to measure distances of a point to a group of lines in order to describe all aspects of the sound event. In *Cartridge Music*, Cage does away with the possibility of a detailed description of a sound. This change was deliberate. He acknowledges this difference in his program notes for these works. Regarding *Fontana Mix*, he notes, “This is a composition indeterminate of its performance.”\(^\text{16}\) However, with *Cartridge Music*, he extends indeterminacy to the act of performance, stating, “This is a composition indeterminate of its performance, and the performance is of actions which are often indeterminate of themselves.”\(^\text{17}\)

Indeed, Cage found electronic components to be inherently indeterminate. In 1961, Cage praised electronic tools (“tape-recorders, amplifiers, microphones, loud-speakers, photo-electric cells, etc.,”) because they are “things to be used which don’t necessarily determine the nature of what is done.”\(^\text{18}\) These components accept any sound as input, and do not therefore act as barriers to sonic experiences. They can thus be employed in an action with the possibility of any sound as an output. The phonograph cartridge is further unique in that all sounds produced with cartridges are acoustically inaudible, therefore unfamiliar and unpredictable to human ears. The result of any action with a cartridge modified by replacing the needle with a feather, for example, is unpredictable as this is not a sound that can be experienced acoustically. While these


\(^\text{17}\) Ibid., 60.

\(^\text{18}\) Cage, “Rhythm Etc.,” (1961) in *A Year from Monday*, 124.
sounds could certainly be rehearsed and eventually anticipated, both performance
notations allow for constant variability of both cartridge and auxiliary sounds.

Furthermore, the actions performed on the amplifier controls do not immediately
impact the sound. Instead, one performer might adjust the tone controls on an amplifier
only to affect the sound made by the other performer minutes later. Cage acknowledges
that utilizing electronics in this way can act as a means of screening out the intentions of
the performers; he states,

Another way [of avoiding intention in performance] is by making use of
electronic circuits to involve the performers in manipulating the
amplifiers. Somebody might be working at a microphone or a cartridge
point when another person is at the amplifier altering it. Both people are
prevented from successfully putting through any intentions… Even if one
of them was full of intentions, if none of them knew what the others’
intentions were… [The combination would] tend in a non-intentional,
unstructured direction, and would resemble what I referred to as daily
life.19

In this way, the use of electronics in Cartridge Music creates a circuitry between
performers that destabilizes cause and effect in this work. The already unfamiliar sounds
of cartridges and contact microphones pass through the network of amplitude and tone
adjustments made by the other performers, making the actions of any one performer
contingent upon an unpredictable system of variables. The use of electronics and this
network of contingencies allowed Cage to describe, for the first time in his work, actions
that are indeed “indeterminate of themselves.”

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19 John Cage, Michael Kirby, and Richard Schechner, “An Interview with John Cage,” The Tulane Drama
D. Abstraction of the *Cartridge Music* Tool

Much like *Fontana Mix*, Cage suggests alternative uses for the *Cartridge Music* tool in his preface to the score and made several other works utilizing this tool himself. These products of *Cartridge Music* involve works for percussion with electronics, piano with electronics, and several lectures. While the instructions for *Cartridge Music* are extremely specific in the way they address electronic components and amplifiers, Cage certainly viewed the tool as a general method that could be applied to almost any materials. Removing this medium-specific language from *Cartridge Music* reveals a generalized process described by the materials:

Given one or more objects of focus, and given an agreed-upon time length,

1. In what window of time will an event occur?
2. Does an action take place on or off of one of the objects of focus?
3. Should this action be altered in any way?
4. Should this action be repetitive?
5. Should an object of focus be replaced with another?

Much like *Fontana Mix* became generalized as a means of selection given a pool of possibilities, the *Cartridge Music* tool acts as a means of determining whether events address or ignore an object of focus, ways of altering that object, and possibly, replacing the object altogether. This is the process seen in the original *Cartridge Music*, where events take place on or off of phonograph cartridges and amplitude and tone adjustments
alter the nature of the events. Occasionally actions repeat, and occasionally cartridges are replaced.

While these general questions define the Cartridge Music process, the questions manifest themselves in the Cartridge Music materials as observations of specific relationships between the components on the transparencies. Particularly because the materials provide only one fixed sheet of points and one of circles, certain answers to these questions will be more common than others. Figure 3.4 totals the frequency of each action in my own readings of the single-cartridge page in addition to Cage’s two performance scores.

<table>
<thead>
<tr>
<th>Interpreter, (No. of shapes)</th>
<th>Time brackets</th>
<th>Actions on object</th>
<th>Auxiliary actions</th>
<th>Tone adjustments</th>
<th>Amplitude Adjustments</th>
<th>Repetitive Actions</th>
<th>Changes of object</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cage, Roman (2)</td>
<td>19</td>
<td>19</td>
<td>7</td>
<td>12</td>
<td>1</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Cage, Arabic (2)</td>
<td>20</td>
<td>12</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Donahue (1)</td>
<td>31</td>
<td>40</td>
<td>32</td>
<td>46</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

**Figure 3.4:** Total action-types present in realizations of Cartridge Music.

Even from this small sample, certain trends become clear. First, actions on objects occur more frequently than auxiliary actions, although auxiliary actions still assert a significant presence in the system. Tone adjustments are nearly as common as actions on objects (in one case, even more frequent) but amplitude adjustments are uncommon. This is likely the case because the above statistics rely upon sheets with one or two shapes. Since the shapes take up less of the total area of the page, it is therefore less likely that circles would be contained within a shape. This proportion would likely change
significantly using sheets with more than ten shapes, since in those cases most of the area of the sheet would be contained within shapes. Indeed, I would speculate, for the same reason, that in using sheets with more shapes, auxiliary sounds would become less frequent as amplitude adjustments become more common. Repetitive actions are also uncommon as they require intersection with the crossover points of the dotted line; there are only six such instances on the dotted line itself. Changes of object are the most rare, as they require a triple-intersection of shape, circle, and dotted line. Again, this would also become slightly more likely as more shapes are used.

These observations reveal that certain results can be expected from the Cartridge Music tool. The relationships already present on the various transparent sheets dictate the likelihood of specific events. While still determined by chance, the transparent materials act as a kind of bias, favoring certain answers to the general questions described above.

### E. Products of the Cartridge Music Tool

Viewing Cartridge Music as an abstraction, albeit it one with certain tendencies, points to the possibility of producing indeterminate scores for any arrangement of objects of focus and means of altering them. Cage suggests two such possibilities within the published Cartridge Music materials, neither of which utilize phonograph cartridges at all. The first proposal is Duet for Cymbal, in which a cymbal is amplified with a contact microphone and sounds are produced on or off of the cymbal. Presumably, tone and amplifier adjustments now simply apply to that used for the contact microphone. Cage suggests that “Where change of object is indicated, lower the cymbal into water or onto piano strings or onto a mat or other material or make some such action that changes the
sound radically, ” suggesting that “change of object” can be read differently given different mediums. The duo would perform *Duet for Cymbal* with Merce Cunningham’s dance, *Paired*, in 1964.

The second proposal is *Piano Duet*, in which Cage suggests a variety of approaches. The first possibility is to employ a contact microphone on the soundboard and use the sheet with one shape for readings (much like *Duet for Cymbal*.) Another possibility is to define two objects of focus, the keyboard and the strings, and use the sheet with two shapes. Yet another possibility is to define four objects of focus, the keyboard, strings, interior construction, and exterior construction, and use the sheet with four shapes. In this way, Cage makes clear that different versions of *Cartridge Music* might exist by defining any number of focus objects.

It is this process of abstraction that undoubtedly led Cage to employ the *Cartridge Music* tool in the service of writing several lectures and articles in the early 1960s:

“Where Are We Going? What Are We Doing?” (1961), “Rhythm Etc.” (1961), and “Jasper Johns: Stories and Ideas” (1963). Cage describes the process of engaging the *Cartridge Music* materials for the purposes of writing in the preface to “Rhythm Etc.,” which was written at the request of Gyorgy Kepes, a Professor of Architecture at the Massachusetts Institute of Technology, for an article discussing Le Corbusier’s notions of “the module… rhythm, proportion, symmetry, beauty, balance, etc.” Cage recalls selecting a sheet from *Cartridge Music* “which had the same number of biomorphic shapes that Kepes had given me subjects,” and continuing to make readings, “I was able

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20 Cage, *Cartridge Music*.
22 Cage, “Rhythm Etc.,” (1961) in *A Year From Monday*, 120.
to make a detailed plan for writing. Points within shapes were ideas relevant to a particular subject, points outside were irrelevant ideas. The circles were stories, likewise relevant and irrelevant. The numbers on the chronometer were interpreted, not as seconds, but as lines in stenographic notebooks."\(^{23}\) Indeed, the objects of focus in *Cartridge Music* here become *subjects* of focus, and therefore yield a clear plan for discussions on or off of “the point.” Similar means were employed in “Where Are We Going? What Are We Doing?” taking as subjects the two questions of the title and utilizing the sheet with two shapes. This determined a passage’s relevance to the two subjects, lengths of passages to be written, and moments to tell relevant or irrelevant stories.

Much like the use of electronics in *Cartridge Music* destabilizes cause and effect, in these text products, the writer’s intention is destabilized by frequent turns to irrelevant discussion and by the system’s control over the length of each passage. Nevertheless, these limiting factors are still products of the relationships on the transparent materials. It can be anticipated that relevant passages will be slightly more likely than irrelevant ones, just as in Cage and Tudor’s realization, where cartridge events were slightly more common than auxiliary events. Even when employed to direct the writing of a text, the *Cartridge Music* tool can be identified by certain priorities and tendencies.

Mirroring the way in which the *Cartridge Music* tool describes only actions and not sounds, Cage and Tudor’s realization of *Cartridge Music* sought to explore the inherent indeterminacy of electronic systems and the possibility of performance actions might produce indeterminate results. The score-tool itself, however, was still structured in

\(^{23}\) Ibid.
such a way that it might typically yield predictable results. The problem of undoing this cause-and-effect relationship between a composed, indeterminate process and its results would be addressed in a series of works titled *Variations*.

**F. Precedents of *Variations II***

Cage began his series of *Variations* in 1958 immediately following the exploration of indeterminate notations in the *Concert for Piano*. Most of the eight works in this series utilize methods of overlaying transparent sheets to generate chance-determined information.\(^{24}\) *Variations I* (1958) began as an extrapolation of notations BB (seen in Figure 3.5) and similar notations BJ and BV from the *Concert for Piano*. *Variations I* extends this notation to mobile, transparent materials much like *Fontana Mix* extends from notation CC, as described above.

![Notation BB from Solo for Piano.](image)

**Figure 3.5:** Notation BB from *Solo for Piano*.

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\(^{24}\) Only the *Variations V* (1965), *Variations VII* (1966), and *Variations VII* (1978) do not. These scores exist primarily as after-the-fact text descriptions of performances staged by Cage and various collaborators.
Notation BB presents a square containing eleven points and five distinctive lines labeled D, F, S, A, and O. Cage states, “Notes are single sounds. Lines are duration (D), frequency (F), overtone structure (S), amplitude (A) and occurrence (succession) (O). Proximity to these, measured by dropping perpendiculars from notes to lines gives, respectively, longest, lowest, simplest, loudest, and earliest.” Thus by observing the distance from each point to each line, the interpreter can describe complete parametric information for each note.

This notation was rendered mobile in *Variations I*, where five different arrangements of five lines and a page containing twenty-seven points of four sizes are printed on transparent material. Overlaying any of the sheets with lines with that of the points generates parametric information for twenty-seven sound events. Each sheet of lines can be rotated against the points, providing a multitude of arrangements to generate information. In making a realization, the interpreter assigns the five parameters to lines of their choice, though Cage does stipulate that these lines should be read as “lowest frequency, simplest overtone structure, greatest amplitude, least duration, and earliest occurrence within a decided upon time.” The interpreter would then measure distances from points to lines as in notation BB in order to describe the sound events.

For Cage, this method of measurement enabled the description of sound information along a continuum. In the late 1950s, his lectures frequently describe thinking about sound in terms of a “total sound-space” that rejects the distinct units of conventional musical thinking:

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Musical habits include scales, modes, theories of counterpoint and harmony, and the study of timbres... In mathematical terms these all concern discrete steps. They resemble walking - in the case of pitches, on steppingstones twelve in number. This cautious stepping is not characteristic of the possibilities of magnetic tape, which is revealing to us that musical action or existence can occur at any point or along any line or curve or what have you in total sound-space; that we are, in fact, technically equipped to transform our contemporary awareness of nature’s manner of operation into art.\textsuperscript{27}

Notably, Cage refers to his experience with electronics as a provocation for this conception of sound. He refers again to the fact that electronic components accept any input; a tape recorder does not “determine the nature of what is done.”\textsuperscript{28} In contrast, a piano, divided into discrete steps and therefore excluding a great variety of sounds, “leaves its notes scattered all over the music that was played.”\textsuperscript{29} Thus, where a conventional instrument demands the use of certain sounds at the exclusion of others, electronics function as tools without this inherent bias, allowing any sound to be utilized musically.

The notation employed in \textit{Variations I} was designed as a graphic depiction of the coexistence of sounds within a “total sound-space.” Cage states, “as we know, sounds are events in a field of possibilities, not only at the discrete points conventions have favored. The notation of \textit{Variations} departs from music and imitates the physical reality.”\textsuperscript{30}

Embracing a continuum of musical parameters necessitated the abandonment of conventional notation (which, Cage might say, leave its forms and priorities scattered all over the music that was made) and the invention of a notation that was continuously

\textsuperscript{28} Cage, “Rhythm Etc.,” (1961) in \textit{A Year from Monday}, 124.
\textsuperscript{29} Ibid.
variable like the product he wished to create. Measurement from a point to a line enabled the inclusion of any value for any parameter. This process allowed for a conception of duration and point of occurrence without reference to conventional rhythm and meter, description of frequency without reference to the twelve equal-tempered pitch divisions, and description of amplitude without reference to conventional dynamics.

Nevertheless, while *Variations I* introduced a flexibility that was not present in notation BB, it is constrained by the fixed arrangements of lines and points. Additionally, the score allows only a finite number of orientations of the point and line sheets. Furthermore, because Cage’s used different point sizes to indicate the number of sounds in an event, every reading of *Variations I* contains the same twenty-seven event-types: thirteen single sounds, seven two-sound events, three three-sound events, and four events with four or more sounds. This device is at odds with his goal to access a “total sound-space” by insisting on a certain distribution of event-types. All readings will be saturated with single-sound events; three-sound events will always be the most rare. Furthermore, Cage’s description of each line as a maximum or minimum within the continuum undoubtedly shapes the information in any given reading of *Variations I*. As a result, *Variations I* is far less variable than score-tools like *Fontana Mix* and *Cartridge Music*, which allow for infinite arrangements of the materials and do not inherently refer to specific characteristics of sound.

**G. Variations II**

In many ways, *Variations II* seeks to correct these limiting factors. The score consists of six lines and five points. However, each line and each point is printed on a
separate transparent sheet. No relationships are fixed; all elements combine arbitrarily with each superimposition of the materials. One such combination of the materials is seen in Figure 3.6. Because all elements are mobile, any measurements may exist between elements. Furthermore, the six lines describe parameters without suggesting any kind of maximum or minimum. These lines represent frequency, amplitude, timbre, point of occurrence, and “structure of event.” The interpreter must decide how to describe relationships within each parameter. “Structure of event” is unique to Variations II, and describes the “number of sounds making up an aggregate or constellation.” This device replaced the point-sizes in Variations I, enabling the system of measurement to account for any distribution of event-types. In contrast with the twenty-seven events in each reading of Variations I, Cage begins Variations II with five events (points) per reading, but actively encourages the interpreter to use any number of readings to fill the agreed-upon duration. Cage even subtly alters his language regarding orchestration; where Variations I asked for “any kind and number of instruments,” Variations II is for “any number of players and any sound producing means.” This change implies the inclusion of sounds that are not conventionally “instrumental,” further embracing the idea of a “total sound-space” by eliminating the “steppingstones” to sound provided by conventional instruments.

Figure 3.6: One possible arrangement of the *Variations II* materials.
In “Rhythm, Etc.,” Cage celebrates the way in which the problems of *Variations I* were resolved. In discussing the reasons for abandoning a concern for proportion, Cage writes:

6) We have found ways of composing indeterminately, writing on sheets of transparent plastic which can be superimposed in any ways; and 7) -- it took three years to realize the necessity -- We have found that one notation is all that should go on a single such sheet (no proportion = optimum flexibility = any proportion). This brings to mind the Russian chickens.

Fragmentation. We began by increasing the differences between the sounds making a *klangfarbenmelodie*. More and more we left openings in our space of time. What changed matters radically was the willingness to stop work altogether before the structure was complete. After that there was no longer any fixed structure; just parts in any number, superimposition, and duration.\(^{32}\)

This quotation reveals a sense of relief in discovering the method of creating *Variations II*. He indicates that this new method allowed the entire structure of the work to exist without reference to any proportions, thereby allowing any possibility to arise through maximum flexibility of the materials. He notes the importance of “willingness to stop… before the structure was complete,” suggesting that the abandonment of the structured materials of the *Cartridge Music* tool, which markedly shaped the outcome of the readings, contributed greatly to the sense of flexibility attained with *Variations II*. Cage’s “equation” in this statement might thus be detailed to indicate that “no proportions” in the score-tool’s materials yield “any proportions” between the resulting events.

Of further interest is his reference to both fragmentation and *klangfarbenmelodie*. These terms refer almost directly to Webern and his music, and betray a dedication to

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\(^{32}\) Cage, “Rhythm Etc.,” (1961) in *A Year from Monday*, 126.
these ideas even amidst his most radically indeterminate work. It seems that *klangfarbenmelodie* was a way for Cage to rationalize the idea of a “total sound-space” in musical terms. By 1959, Cage proposed that Webern’s music “suggests the autonomy of a sound in time-space and the possibility of making music not dependent upon linear continuity means.”

Cage believed that *klangfarbenmelodie* provided a model for the coexistence of unrelated sounds in music; therefore, “increasing the differences between sounds making a *klangfarbenmelodie*” would embrace an infinite continuum of different sounds in which seemingly unrelated sounds can coexist, occur on their own time, and occur without the calibration of scales, meters, and instruments.

**H. Abstraction of Variations II**

While indeed an infinite number of readings are possible with these materials, certain principles are common to all readings of the *Variations II* materials. Thomas DeLio’s analysis of *Variations II* points to a fascinating characteristic of the process.

DeLio examines closely the relationships present in any single arrangement of the transparencies and demonstrates that each orientation of the six lines defines a “subspace” of possibilities. (Here his terminology resonates with Cage’s idea of a “total sound-space”; the arrangement of lines delimits a “plane” of possibilities with that total space.) The five arbitrary points in one reading merely select specific manifestations of this subspace.

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35 Ibid., 366.
As a simple example, if the line for “amplitude” is parallel and distant from the line for “frequency,” any point between the two lines will exhibit an inverse relationship between these parameters. A point close to the “amplitude” line might indicate a very loud, low sound. A point close to the “frequency” line would then indicate a soft, high sound. This orientation of these two lines rules out the possibility of a loud, low sound. This is extremely oversimplified, but demonstrates that each orientation of six lines actually excludes some types of sound events. Said another way, each orientation encompasses a specific set of possibilities.

Thus, the Variations II system works on two levels of infinite variation. First, the information gathered through one reading of the materials is only a single manifestation of the subspace. Second, each subspace is but a single manifestation of the process as a whole, which is defined by an infinite number of unique subspaces. This idea of process looks directly to notions of system and process advocated by the Second Viennese School; Webern believed that, through the use of a rigorous system, any product of that system constituted a complete representation of the system. In Variations II, each arrangement of the materials is a manifestation of the global process, and the specific events determined within each arrangement of the materials constitute a manifestation of that particular arrangement.

However, DeLio’s observations ignore one aspect of the score that disturbs any sense of clarity in describing the workings of the Variations II process. In addition to the rules described above, Cage also proposes, “if questions arise regarding other matters or details… put the question in such a way that it can be answered by measurement of a
dropped perpendicular.\textsuperscript{36} This indication has led critics and historians to cast \textit{Variations II} as a kind of endgame of Western music, a composition that subsumes any other piece of music that has been or could be written. In some sense, this is true simply because \textit{Variations II} represents an infinity of possible structures. However, DeLio’s analysis, revealing the intricate webs of relationships in even a single reading of the materials, demonstrates the extreme unlikelihood of, say, recreating Beethoven’s \textit{Fifth Symphony}, as one commentator would propose.\textsuperscript{37}

Cage’s instruction is useful, however, in that it points to a broad method at work in \textit{Variations II}. This statement opens up the line-measurement method as a means of answering any question. Indeed, Cage’s score-tool could be simplified to: \textit{Ask a question in such a way that it can be answered by the measurement of a point to a line.}

Whereas Cage’s earlier score-tools can be seen as a series of questions that would be answered by the chance techniques provided in the materials, \textit{Variations II} proposes a method for the asking of questions and a means of answering them with a single chance procedure.

In the interstitial stories published in Cage’s first book, \textit{Silence}, Cage recounts a memory that he would return to many times later in life. He describes a counterpoint class with Schoenberg in which Cage was asked to solve a problem at the blackboard. Upon finding a solution, Schoenberg asked him to find another solution, and repeated this process exhaustively. Cage recalls, “Finally, I said, ‘There are no more solutions.’”

\textsuperscript{36} Cage, \textit{Variations II}.
[Schoenberg] said, ‘What is the principle underlying all of the solutions?’”

Recounting this story in a 1979 interview, Cage adds, “I was unable to answer.” He continues, however:

Recently I have come to view that the principle underlying all of the solutions is the question we ask. We can answer a question in any way, but the questions we ask will determine, somewhat, the nature of the answer.

... 

It says in the *I Ching* that if you don’t accept the answer, that you have no right to ask again… I have sometimes renounced the questions that I’ve asked. I have thrown away some work, seeing that it was trivial, since I had not found the proper questions. But I’ve never thrown away the answers to the questions that I’ve considered to be useful questions to ask. 

The exchange with Schoenberg was a profoundly impactful experience for the young Cage, and impressed upon him the importance of an underlying principle, a system, from which the actual derived results are inconsequential. Cage confronted this lesson repeatedly through his experiences consulting chance operations for musical material. Score-tools like *Fontana Mix* and *Cartridge Music*, seen as a series of questions that produce specific kinds of chance-determined answers, clearly demonstrate that the questions asked have a profound effect on the answers found. In *Variations II*, Cage arrives at a process that designs questions. These questions all share the characteristic that they may be answered by the measurement of a line to a point. The predictable behaviors and proportions observed in the *Cartridge Music* process are not present in *Variations II*. Because the measurement of a point to a line represents an infinite continuum of

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38 Cage, *Silence*, 93.
possibilities, and because any question may be asked, the answer is not predetermined in any way. In this way, Cage appears to have resolved his preoccupation with Schoenberg and Webern’s notion of a comprehensive system. He had, in other words, arrived at a systematic process for the creation of questions.

I. Implications of Tudor’s Variations II

Pritchett suggests that when Cage delivered Variations II as a gift on David Tudor’s birthday in 1961, he likely expected a certain type of engagement from Tudor; “Quite probably, Cage would have expected Tudor to approach the work in a manner similar to the way he had approached all such compositions in the 1950s: to produce a very detailed performance score using the technique of precise measurement.”40 The realization that Tudor produced, however, represented a stark departure from his previous procedures. Indeed, Tudor’s realization is not only a radical, unexpected musical experience, but one that posed a challenge to Cage’s notions of measurement and the prioritization of musical systems.

A great deal of recent scholarship has addressed David Tudor’s remarkable realization of Variations II.41 As such, only a brief account of his practices is warranted here. Tudor began with an unconventional choice of instrument; he recalls, “This was a new piece and I wanted to make it a new experience so I wanted to experiment. I decided to do it for amplified piano. I had been assimilating experience using electronic equipment. I looked at the score and thought, ‘how can I realize these parameters using

electronic equipment?”42 The amplified piano setup ultimately consisted of a system involving air microphones, contact microphones, phonograph cartridges, and a variety of unconventional implements. The sustain pedal of the piano was held down throughout, creating a high potential for feedback.43 Much like his performances of Variations I and Theatre Piece relied upon instruments and sounds from earlier Cage works, here Cage and Tudor’s exploration of electronics in works like Cartridge Music and Music for Amplified Toy Pianos in the months prior to his experience with Variations II undoubtedly influenced his choice of instrument.44

That said, these works with electronics typically did not employ the kinds of parametric descriptions found in Variations II. As discussed above, Cartridge Music provides only indeterminate instructions; it does not provide a means of describing all aspects of a sound. Nakai notes that electronic systems undoubtedly introduce a great number of parameters not necessarily relevant in instrumental composition:

“...measurements might now be those of impedance, capacitor values, time constants, or cut-off frequencies, and parameters those of voltage, current, or resistance.”45 Indeed, Tudor’s choice of instrument immediately created tension with the parameters in Cage’s score.

42 David Tudor and Teddy Hultberg, “I smile when the sound is singing through the space: An Interview with David Tudor by Teddy Hultberg,” accessed September 20, 2016, http://davitudor.org/Articles/hultberg.html.
43 Pritchett, 14.
44 Fetterman, 238 catalogs Tudor’s chosen actions in Theatre Piece, which include an amplified coil of wire (previously used in Imaginary Landscape No. 2 (1942)) and a variety of whistles and toys (similar to those used in Water Music (1952)). Iddon, 91 notes that Tudor’s performance of Variations I also drew upon sounds from Water Music, Two Pastorales (1952), and a radio which was common to many early Cage works.
Tudor’s earliest sketches show readings of the materials describing the six parameters in terms of values from zero to five.46 This decision is remarkable in the way it seemingly rejects Cage’s notion of a “total sound-space,” by refusing to measure along a continuum, instead grouping readings into a limited and arbitrary number of discrete steps. A later sketch reveals even more general values, such as “low, middle, high” to describe frequency, or “single, dual, manifold” to describe structure of event.47

It was the problem of timbre, however, that led Tudor to radically reevaluate his approach. Variations II asks the interpreter to measure “overtone structure” along a continuum. Even with the sound of an acoustic piano, how can one compare the timbre of a muted low string pizzicato, an ordinary middle C, and a high string struck with a mallet? The overtone structure of each sound is rich and complex and resists description in simple relationships. Tudor’s choice of the amplified piano, however, further complicates this notion. One early sketch of his realization reveals multiple attempts at cataloging timbre. One strategy describes a range from acoustic sounds to heavily amplified sounds. Another describes timbres subjectively as “simple, compound, complex, and chaotic.”48 Ultimately, both methods were rejected. Cage vividly recalls Tudor’s thought process:

Yes, we know that we can easily measure time – with a chronometer, for example. We can relatively easily measure pitch; and, with the help of electronics, we can obtain very fine differences of frequency. If we really wanted to, we could even measure intensity with the help of a decibel system. But we cannot measure timbre. … Consequently, when he considered this question of measuring tones, and when he realized that he didn’t know how to proceed, he said to himself: all that I can afford about

46 Iddon, 177.
47 Iddon, 178.
48 Ibid.
In describing timbre as either simple or complex, Tudor arrived at a global approach to *Variations II*. Rejecting the precise measurement of frequencies, durations, and amplitudes, Tudor’s realization would embrace subjective assessments of a parameter’s relative complexity as a means of determining actions on the amplified piano. Tudor thus produced readings from the materials that would provide a rough indication of the behavior of each parameter. These readings were then used as prompts to guide the exploration of sounds at the instrument.

Nevertheless, Tudor acknowledges that the electronic instrument itself prevents precise knowledge of the attributes of any given sound event. *Cartridge Music* was based upon the inherent complexity of electronic sound, and indeed demonstrated the possibility of performance actions that could be considered indeterminate of themselves. Tudor’s *Variations II* was an extended exploration of this model of performance. He recalls, “in performance the parameters can interact in unforeseen ways, & the performance becomes a process of constant invention & re-invention of the sound events.”

In utilizing the electronic system of the amplified piano, Tudor ensured that he was unable to fully anticipate the outcome of a given action. Iddon even speculates that Tudor’s electronic system became increasingly complex as “he became better able to predict the results of his actions.”

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50 Hilberg, 34. Translation quoted in Iddon, 183.

51 Iddon, 186.
readings as a means of responding to the activity of sounds at the moment of performance. His actions in *Variations II* acted like questions, provocations made upon the amplified piano system designed to initiate one of a multitude of possible outcomes.

Faced with the demand that measurement function as a means of answering all questions, Tudor called into question the notion that a sound can be measured altogether. While Cage was concerned with accessing a “total sound-space,” Tudor’s realization asserts that this continuous space cannot be determined by independent parameters; rather, all aspects of a sound are linked. Moreover, the conditions of a given performance uniquely shape each sound event, forcing the performer to continually reinvent and reassess his actions during each performance. Just as *Variations II* represented a solution to Schoenberg’s puzzle of the underlying principle, Tudor’s interpretation of *Variations II* represented a certain solution to the performance of indeterminacy through the development of a means of performing that was itself indeterminate.

The experience of *Variations II*, both in composition and in performance, was a watershed moment for both Cage and Tudor. *Variations II* largely concludes Tudor’s career as a concert pianist, and marks the beginning of his turn to composing electronic systems. Cage was deeply affected by the challenge that Tudor’s realization posed to the foundations of his thinking. The works immediately following *Variations II* primarily concern actions. Actions, rather than sounds, had already been the focus of Cage’s score-tools like *Cartridge Music*, but after 1961, any connection of action to the production of sound was dropped. *Variations III* (1963) presents a score-tool of transparent materials; these materials provide readings for any number of performers to perform a particular number of actions, none of which must create a sound event. Rather, “Some or all of
one’s obligation may be performed through ambient circumstances (environmental changes) by simply noticing or responding to them.”52 Cage would later express his frustration with the fact that Variations III required counting individual actions to reach a particular number. He quickly saw any kind of quantification of events impractical: “We move through our activity without any space between one action and the next, and with many overlapping actions.”53 In acknowledging the impossibility of effectively measuring or quantifying anything, Cage had fully embraced the radical implications of Tudor’s Variations II realization.

In 1963, with his voice filtered heavily through use of a throat microphone, Cage would proclaim on German television, “For many years now, we have been thinking of composition in terms of sounds which are made up of their parameters: frequency, duration, amplitude, overtone structure, and whatever else one can think of. Now we have nothing to do with parameters. We produce sounds without giving parameters a thought.”54 Delivered with an authority uncommon to Cage’s mild demeanor, the spaces between his words are filled by the feedback and scraped piano strings of Tudor’s simultaneous performance of Variations II.

53 Cage, Kirby, and Schechner, 64.
Chapter IV

The Score-Tool in Performance: Realizing Cartridge Music: Solo for Cymbal and Variations II

Whenever anyone speaks informatively with precision about how something should be done, listen, if you can, with great interest, knowing his talk is descriptive of a single line in a sphere of illuminating potential activity, that each one of his measurements exists in a field that is wide open for exploration.

– John Cage, “Rhythm Etc.”

Throughout Cage’s development, changes in his compositional method frequently responded to the experience of performance. His use of the stopwatch to structure time without reference to meter and rhythm was undoubtedly derived from David Tudor’s use of a stopwatch in the performance of Music of Changes. Cage’s turn to indeterminacy and alternative notations in the late 1950s was undoubtedly motivated by his consideration of the experience of the performer in chance-determined music. As described above, his abandonment of parametric measurement and quantitative structures in the early 1960s was likely a reaction to the challenges posed by David Tudor’s performance of Variations II. These are but a few examples of the many ways that performance shaped Cage’s musical thought. Nevertheless, discussion of the interpretation and performance of Cage’s score-tools is notably absent from studies of his

music. In recent years, discussion of performance has increased, but almost always in reference to the work of David Tudor and his meticulously constructed realization documents.\(^4\) While these studies are invaluable, they establish a kind of discourse that ties the identity of works like Cartridge Music and Variations II to the specific results that Tudor produced. This tendency of historical study diminishes the ability of these score-tools to act as provocations to new experience. The purpose of the subsequent document, then, is to initiate a discussion of Cage’s score-tools at the level of interpretation, to evaluate the unique problems of interpretation posed by these unusual works, and to emphasize that continued realization and performance are critical to understanding their revolutionary nature.

A. Cartridge Music: Solo for Cymbal

From December 2015 through February 2016, I participated in a residency in Ólafsfjörður, Iceland, a small fishing town an hour’s drive from Akureyri, the most populous city in northern Iceland. I accompanied my partner, Rachel Beetz, who spent the period creating a sound installation utilizing photographs and field recordings collected in Ólafsfjörður. I assisted with this project while researching and writing the present document. I intended to spend these three months without access to instruments in order to focus intensely upon my research, therefore I brought only a pair of drumsticks and a set of vibraphone mallets with me to Iceland. In Ólafsfjörður, I had

\(^{4}\) You Nakai argues that it is precisely Tudor’s creation of written documents, themselves resembling fully-composed scores, that has encouraged this increase in scholarship. Tudor’s performances thereby warrant study on the grounds that they “always arrive at symbols that are intelligible to a trained musicologist.” You Nakai, “On the Instrumental Natures of David Tudor’s Music” (PhD diss., New York University, 2016): 6.
sporadic access to a drumset, but otherwise had no way of practicing. In mid-January, I received a request for a performance at Mengi, an experimental venue in Reykjavik. A concert had been cancelled at the last minute and they were asking me to fill the program which was now only two weeks away. I accepted the invitation in spite of having no idea how to create a program in two weeks without any instruments to prepare.

While I had limited access to instruments, Rachel and I had brought with us a good deal of recording equipment including microphones and contact microphones. I was immediately reminded of Cage’s *Cartridge Music*, in particular the *Duet for Cymbal* adaptation that only utilized a cymbal and a contact microphone, two things which would be easily accessible in Ólafsfjörður. Inspired by the various applications of *Cartridge Music* and *Fontana Mix* that went well beyond the uses outlined in the score, I felt very comfortable making a score from *Cartridge Music* that engaged with the limited materials at hand. In this way, *Cartridge Music* enabled the preparation of a performance in a situation where that might otherwise have been impossible.

I set to work making readings of the *Cartridge Music* materials with little idea of the nature of the final product. The transparent materials and their arbitrary combination forms a barrier to expectation; it was not easy to predict, even with the detailed score instructions, what information would be present in any given event.

Beginning to make readings, I found that if all sheets remained stationary, moving only the dotted line, a finite number of readings were possible with each sheet of shapes. A valid reading demanded the connection of a point outside the shape with a point inside the shape via the dotted line, therefore only so many orientations of the dotted line were possible. Seeing this possibility, I set out to be comprehensive in my readings and record
the information determined by every possible orientation. This approach yielded a total of thirty-one events.

For the sake of consistency, I always began readings moving from the circle on the dotted line toward its empty end. Maintaining this order, there was never a question about the size of a time bracket; if an intersection occurred at :32 on the stopwatch, then further down the line at :31, the second number would be taken to mean the next possible :31 and thus the time bracket would last for fifty-nine seconds. I used this trajectory to maintain the order of actions within each event as well. For example, if the first intersection moving away from the circle was with a point outside the shape, an auxiliary sound would occur first in that time bracket. While there is no explicit instruction to maintain any kind of ordering, I felt it would be helpful in generating a chance-determined ordering of actions within events, and therefore maintained this ordering in my score and in performance.

There are several alternatives to these basic decisions. The most fundamental change would be to ignore the possibility of being “comprehensive” and arbitrarily overlay all transparencies for each reading. In this way, an infinite number of arrangements would be possible. Another alternative would be to begin my readings from the empty end of the dotted line and move toward the circle, reversing the order of events and the numbers of the time bracket. If more than thirty-one readings were desired, utilizing these “inversions” might be a simple way to double the number of possible readings. Yet another change would be to ignore any ordering of information while making the reading. This would allow me to determine the order of actions within an event while preparing the realization, ultimately choosing whatever order I found most
practical or most interesting. Furthermore, if I ignored the order of time bracket indications, I could also choose which time number began or ended a time bracket to suit the realization. Tudor appears to have worked this way, stating, “If you take a time bracket, it says you start at :05 seconds and you stop at :35 seconds. It's also possible to read the bracket backwards. I mean, what difference does it make? … But that's also given in the score material. If you look at it, precisely, you see that there are those possibilities.”

Ultimately there is a great freedom here, as Tudor suggests, and this determination can only be made by the performer.

In maintaining the order of information along the dotted line, I chose to allow the transparent materials to determine as much about my realization as possible. I am not suggesting this is “correct,” but merely asserting that I prefer to leverage the information presented by the materials to make a decision that I might otherwise make intuitively. I also anticipated that these “unnecessary” details would be useful in addressing some of the freedoms of the score while maintaining a direct relationship to elements present in the materials. Indeed, I saw no reason, at least, to abandon the ordering of information at this stage of the realization. I knew full well that the practicalities of performance might suggest a different way of ordering actions and would reevaluate the importance of ordering at that stage of the process. While gathering data from the transparencies, I chose to maintain as much of the information as possible.

In this vein, since my arrangement of the materials presented three points within the shape, I also noted distinctions of which of the three points within the shape were

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5 David Tudor and Teddy Hutlberg, “I smile when the sound is singing through the space: An Interview with David Tudor by Teddy Hutlberg,” accessed September 20, 2016, http://davidtudor.org/Articles/hultberg.html.
intersected in each event. Rather than recording “sound on the object of focus,” I recorded this information as Sounds 1, Sound 2, or Sound 3. Again, I knew that this information was unessential and was prepared to discard it at any moment. However, if these three points could provide chance-derived information that might inform my decisions later in performance, I thought it simple enough to preserve these distinctions. In retrospect, I realize that I could have also maintained distinctions of which point outside the shape was implicated in an action in order to provide distinctions between auxiliary sounds. (This might be one way in which Cage and Tudor arrived at their distinctions of auxiliary sounds described above, although with 19 points available, there were certainly more than four distinctions to be made.)

In attempting to be “comprehensive” in my readings, several unexpected circumstances arose that are not accounted for in the *Cartridge Music* instructions. In many cases, the dotted line crossed the stopwatch in multiple instances, six times yielding two time brackets (i.e. Event 13, :24:-14 and :18:-25), and twice yielding three brackets (i.e. Event 3, :27:-17, :05:-57, and :43:-04.) As in Tudor’s discussion of time brackets above, a scenario like this gives the interpreter freedom to make a choice: Should this event be performed in *each* time bracket? Should *one* of these brackets be chosen for performance? Should the event’s actions be distributed across these brackets? Ultimately, I chose the simplest route, selecting only one of the listed brackets as I made my performance score. I do, however, find the possibility of repeated events in different time brackets to be an intriguing (and certainly valid) possibility.

In making readings beginning with each point outside of the shape, my orientation of the transparencies positioned one point inside of the stopwatch. This meant that in two
readings, only one number (the exit point) could be determined for the time bracket. Again, this anomaly presents a freedom for the interpreter: does this mean that the entire event happens in an instant? Should some additional line be drawn to connect the starting point to the perimeter of the stopwatch? Should this “bracket” be described only in terms of its ending point, starting at any time prior? Should this reading be discarded as an “invalid” positioning of the materials? I believe all these choices are justifiable and could even inspire creative renderings in performance. Ultimately, I made what I thought to be the simplest possible choice and discarded these events.

My approach to this point was one of gathering as much information and detail as possible. Even so, certain personal choices must be made in order to begin making readings altogether. Undoubtedly, these choices shaped the information I gathered. Embracing any of the alternative choices described above would have led my interpretation down a different path.

**B. Creating an Indeterminate Score**

Once information was gathered for all thirty-one events, I transcribed each event’s information onto a single note card. I shuffled this stack of cards and began assigning an order (and exact minutes) to the events. I had decided that this performance would last for ten minutes, so I would stop ordering events when I could no longer fit an entire event before 10’00”. The events were simply assigned to the next possible minute without any overlap. Therefore, if one event ended at 0:56 and the next event drawn began at :55, it was assigned to 1:55 and created a significant rest in the score. Ultimately nineteen of the thirty-one events were utilized to create the ten-minute work.
Seen in Figure 4.1, my notation at this point remained as ambiguous as possible. In this example, “Aux.” simply refers to the production of an auxiliary sound, which occurs to begin and to conclude this event. “X(3)” refers to a sound produced on the object of focus, with my distinction that this involves the third of the three points contained within the shape. This distinction had no meaning at this point. It simply remained present in the score in order to be considered later in the process. “Tone 3:00” is a variant of Cage’s knob notation described above in Figure 3.2. The “3:00” refers to the three-o’clock, which would be read as three-quarters of the way around a hypothetical knob. This “knob” notation also does not yet refer to any particular knob. The specific equipment used in performance would determine whether this notation would describe a generic “tone” control, the knobs of equalization control, or any other component that might effect the timbre of the sound event.

0:18 - 0:25
Aux.
X(3)
Tone 3:00
Aux.

1:43 – 2:35
Aux. Repeated
Aux.
X(1)

Figure 4.1: Two sample events from my score for Cartridge Music: Solo for Cymbal.

The process to this point demanded the production of an indeterminate score. While my score contained some additional distinctions of sound types, it still was not possible to anticipate the sounding result of the score I had created. In this particular situation, given limited time and limited resources, this indeterminacy was an advantage. It provided a series of specifications that could be adapted to suit the circumstances of
performance. I would not be disappointed, for example, if only a bass amplifier were available at the venue, despite the fact that this would result in a dramatically different sound world than a conventional PA. The ambiguities of the performance score would encourage the determination of unique sound events suited to this or any other types of equipment.

C. Instrument and Mapping

With a plan of actions and events in hand, I set out to apply this information to the amplified cymbal. The solo setting of this particular version immediately presented unique problems. For one, with only one performer, the performance lacks the destabilizing force created by shared electronic resources as seen in Cage and Tudor’s realization. In a solo setting, if I modify the amplitude control, for example, I have simply made an observable change to the musical environment. This change impacts only me; it is not the source of surprise or unpredictability present when multiple performers confront components without knowledge of their current settings. Lacking this element, a solo version is necessarily full of intent. A version for cymbal, rather than phonograph cartridges, only compounds this problem. Any gesture made on the cymbal was immediately linked to the resulting sound. These factors clearly did not yield the kind of “actions which are often indeterminate of themselves” that Cage describes in his introduction to Cartridge Music.6 Where Cartridge Music explores mysterious sonic activity below the threshold of audibility and inherently indeterminate sound-actions, my

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Solo for Cymbal seemed doomed to explore the obvious result of applying a drumstick to a cymbal. I was immediately dissatisfied with this medium, and sought to introduce aspects of unpredictability to the performance given the materials at hand.

My first step in addressing this problem was to realize that the object of focus in this performance was a contact microphone applied to a cymbal, not, in other words, a cymbal that happened to be amplified. A cymbal approached conventionally will never have an “electronic character” even when amplified; it will remain a louder, acoustic sound. Realizing this, I sought a palette of sounds that was unique to the contact microphone on the cymbal, sounds that could not be heard in any other situation. My goal became to ensure that no acoustic sound could be heard; the amplifier and microphone became a means of dislocating the cymbal from its conventional identity.

Inspired by the three distinct points with the shape that I noted in my readings, I maintained a distinction of three different ways of activating the cymbal. Sounds were 1) single attacks, 2) single sounds with multiple attacks, and 3) sustained sounds. Within these categories, a variety of implements and approaches were used to diversify the sound palette. For example, a single attack (with no acoustic sound) might be a soft strike of the cymbal with a fingernail while the amplifier is turned down completely; I could make an “electronic” attack by turning the volume up rapidly after the strike to simulate a strike, catching the high-partial resonance of the attack. The same method using the flesh of the thumb to quietly activate the cymbal yields a completely different, low-frequency attack. A single sound with multiple attacks might be a rough stone, rolled over the surface of the cymbal. The edges of the stone would make numerous, unpredictable, small attacks on the instrument, audible only through amplification. A sustained sound might be a
bowed stroke, \textit{flautando} along the edge of the cymbal; the contact microphone picks up different harmonics of the cymbal depending upon the location of the bow and the position of a nodal point depressed by the other hand. Working with the cymbal and microphone as a composite instrument and embracing sounds only audible via the contact microphone, I was able to intervene in the simple cause-and-effect relationship of striking a cymbal.

In order to further decentralize the solo performance, I looked to a precedent set by Cage and Tudor in their early performances of \textit{Cartridge Music}. Fetterman presents two newspaper reviews of Cage and Tudor’s \textit{Cartridge Music} performances that mention the inclusion of tape playback. One describes the operation of “four tape-recorders” and another mentions “low-frequency sounds culled from Time Records of Cage’s music.”

Fetterman speculates that the operation of four tape recorders might in fact be the projection of Cage’s lecture, “Where Are We Going? What Are We Doing?,” which was written with the \textit{Cartridge Music} tool and designed for playback on four simultaneous tapes. Regarding the specific claim that Time Records recordings were used, Fetterman proposes the possibility that the 1962 recording of \textit{Cartridge Music} may have been played back during the live performance. Given Cage’s acceptance of the simultaneous performance of \textit{Fontana Mix}-derived works described above, both options do seem plausible. In either case, it was clear that Cage and Tudor found it desirable to perform \textit{Cartridge Music} with tape playback, and there does seem to be a likelihood that this playback was related to \textit{Cartridge Music} in some way.

Seeing this example as a means of creating a multifaceted environment in the context of a solo performance, I decided to include recordings of the lecture “Where Are We Going? What Are We Doing?” alongside my Solo for Cymbal. I selected a ten-minute length of the lecture and recorded myself reading it in four channels. The result is an active, often unintelligible, complex of speech that provides a foundation of activity upon which the Solo for Cymbal can rest. The cymbal sounds now emerge from the texture of speech, occasionally blending with it and frequently disrupting it. Concerned that these two worlds were disparate and arbitrary, I selected a radio for use as my primary auxiliary sound in the Solo for Cymbal; not only does this instrument have a rich history in Cage’s music, but it also acted as a bridge, alternately referring to the sounds of the cymbal (when receiving static) and of the lectures (when receiving speech).

All of these components contributed to an environment that, while still an instrumental solo, was full of independent sonic activities. This multitude of forces decentralizes the activity of the soloist and moves the performance toward the kind of “non-intentional, unstructured direction” Cage sought in his own performances of Cartridge Music.8

D. Usefulness

The process of creating a new, indeterminate score from Cage’s Cartridge Music tool was particularly invigorating in light of my work as a percussionist. Typically, a score demands a certain instrumental array, and if that array is not available for a

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performance, the work cannot be performed. In Iceland, I had no access to instruments and therefore could not conceivably work on any repertoire.

The *Cartridge Music* tool works in the opposite order; it first asks what is available, and then constructs information for performing with the materials at hand. This enabled me to create a compelling musical experience without dozens of instruments and the square feet to set them up. In “Where Are We Going? What Are We Doing?,” Cage highlights his changing concern for practicality, “What we do is not utterly different from what we used to do. That is: we used to get an idea and do it and then someone else had to do more or less what he was told to do. Now we get an idea and present it in such a way that it can be used by him who is going to do it.”$^9$ This concern for *usefulness* resonates strongly with my work as a percussionist which is often constrained by logistical restrictions. If I had not had access to a cymbal, any object could stand in, even a mixing bowl from the kitchen or a scrap of sheet metal from the factory across the street from our Ólafsfjörður apartment. If I needed the work to last for thirty minutes rather than ten, that was also a possibility. If I needed a work that allowed the participation of five other musicians, *Cartridge Music* also provides for this possibility.

As such, the realization of the *Solo for Cymbal* was particularly useful for me in these circumstances. These conditions undoubtedly shaped the performance and created a piece that was as informed by the resources available to me in Iceland as it was informed by the properties of the *Cartridge Music* tool. With this in mind, this specific realization is unlikely to have the same kind of utility in different circumstances. Rather than repeat

the exact version of *Solo for Cymbal* that I prepared in Iceland, I am more likely to make new versions for future performances that are similarly shaped by unique circumstances and resources. In this way, the thirty-one readings of *Cartridge Music* that I produced in this process will never lose their utility; they remain available for the construction of a piece with a different duration, different instruments, or different electronic components.

**E. Variations II**

In March of 2012, I presented a solo concert that formed the foundation of the present study. The program reflected my fascination with indeterminacy and alternative forms of notation and centered on two major indeterminate works for percussion, Karlheinz Stockhausen’s *Zyklus* (1959) and Morton Feldman’s *King of Denmark* (1964). The program also included two contrasting versions of Earle Brown’s *Four Systems* (1952), a work open to any instrumentation, though frequently performed by Max Neuhaus in his first solo percussion recitals of the 1960s. Recognizing the historical significance of Cage’s *Variations II* and fascinated by Cage’s transparency tools, I eagerly undertook a realization of my own as a part of this project.

**F. Creating an Indeterminate Instrument**

As a percussionist, the choice of which instrument(s) to use in a realization of *Variations II* is not a simple one. A percussionist regularly engages with hundreds of instruments; there is not a single one that I would volunteer as “my instrument.” I was determined to allow the demands and priorities of the score to guide my choice of instrument. Three other factors led me away from making an intuitive choice. The score’s
demand for continuous ranges of frequency, in particular, is immediately at odds with most of the percussion family; pitched instruments are almost all fixed-pitch in equal temperament, without access to microtones or glissandi. With other types of instruments, each individual instrument produces more or less one pitch. To produce a second pitch, another instrument (of a different size, for instance) is required. In this way, percussion instruments primarily exist in the “discrete steps” that Cage would oppose in describing his ideal “total sound-space.”

Secondly, the score-tool itself subverts the traditional function of a score, leaving the actual note-to-note constructions to the determination of the interpreter. Seeing this, my inclination was to discover a parallel method of performance somehow removed from the cause-and-effect relationship inherent in percussive sound. Finally, I found it impossible to ignore David Tudor’s historic performance of Variations II, particularly the way his performance embraced unpredictability in performance while maintaining a close relationship with the readings of the materials.

It was the difficulty of engaging with frequency that ultimately led to a path forward. Cage’s language is deliberate; each parameter is described by a phrase both removed from musical conventions and evocative of continuous gradation. “Frequency” does not carry the historical baggage of “pitch,” and furthermore suggests a measurement in terms of Hertz values while “pitch” evokes the division of the octave into twelve discrete steps. Considering the entire range of Hertz values, it occurred to me that

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10 Discussed above in Chapter 3. For example, Cage would proclaim, “We’re getting into our heads that existence, the existence of a sound, for instance, is a field phenomenon, not one limited to known discrete points in that field - the conventionally accepted ones - but capable of appearance at any point in the field.” Cage, “Where Are We Going? What Are We Doing?,” (1961) in Silence, 199 – bold italic text, left column.
“frequency” need not be restricted to the range of audible pitch. If instead I considered those frequencies which are below the threshold of human hearing, where rates of vibration are perceived as pulsation (0-20Hz), any percussion instruments would be capable of representing a continuous range of frequencies.

Reading frequency as rate of pulsation, my realization moved forward rapidly. Wanting to again distance myself from the cause-and-effect relationship inherent in striking a percussion instrument, I looked for ways of creating pulsation without simply striking a drum. The work of Alvin Lucier – in particular, his Music for Snare Drum, Pure Wave Oscillator and One or More Reflective Surfaces (1990) – provided a model of how percussion instruments could be activated remotely. In this work, a sine tone oscillator sweeps slowly from high to low, causing sympathetic vibration in the snare drum as the tone passes through the drum’s resonant frequencies. I found that by situating a constant sine tone at the fundamental pitch of the snare drum (and thus producing a continuous sound from the drum), and multiplying that sine tone by a second, low-frequency oscillator (0-20Hz), the drum would pulse regularly at the rate of the low-frequency oscillator. Adding more low-frequency oscillators would create complex, sometimes highly irregular vibration patterns in the buzzing of the drum. The interactions between oscillators was, in the moment of performance, highly unpredictable. Even if two oscillators exhibited a simple, proportional relationship, their precise phase orientation and amplitude conditioned the resulting wave in ways beyond my control.

Ultimately, my instrument for Variations II consisted of a snare drum with a speaker mounted above it, and up to five oscillators. These oscillators were controlled by a hardware interface consisting of a series of faders which allowed me access to
continuous gradations of frequency and a series of knobs by which I could control fine
gradations of amplitude. In order to increase timbral diversity and create an environment
in which many sound events could occur simultaneously, this system was multiplied by
four: four snare drums, each with their own speaker and bank of oscillators, surround the
audience and create literal distance between the actions of the performer and the resulting
sounds.

G. The Problems of Measurement

All of the information obtained from the score must first be uncovered through a
process of measurement: “Drop perpendiculars from the points to the lines… Measure the
perpendiculars by means of any rule…”¹¹ Cage’s indication is deceptively open: “any
rule” will yield dramatically different values than any other, undoubtedly conditioning
the musical information. Acknowledging this fact, I searched for a way to avoid units
altogether, favoring instead a precise description of the relationships between points.
This was accomplished by converting all measurements to percentages, making it
possible to work abstractly, without arbitrary unit-values conditioning the information.
This approach had the further benefit of describing each parameter on a continuum rather
than any kind of stepped system. Furthermore, this approach yielded extremely precise
relative information that could be translated into musical information in any variety of
ways later in the process.

As a simplified example, using only one line and five points, dropped arbitrarily,
the following measurements are taken:

Point A: 1.5 cm
Point B: 1.6 cm
Point C: 6.7 cm
Point D: 3.1 cm
Point E: 0.2 cm

Rather than proceeding to translate these numbers into musical information (for example, finding some way of converting these numbers directly into amplitude indications,) I found it desirable to eliminate the arbitrary “centimeter” and describe the relationships abstractly. To do this, I converted all numbers to percentages, by describing each reading’s highest value as “100%.” From the example above, this yields the following data:

Point C: 6.7 cm = 100%
Point D: 3.1 cm = 46.27%
Point B: 1.6 cm = 23.88%
Point A: 1.5 cm = 22.39%
Point E: 0.2 cm = 0.03%

Thus each reading defines its own range. The point furthest from any line will always create a value of 100% and all other values can be described as a fraction of that maximum. Using this method, there is no loss of information in translation, and arbitrary units are eliminated.

(Information loss could happen, for instance, by ordering the information from lowest to highest values:

Point C: 6.7 cm = 5
Point D: 3.1 cm = 4
Point B: 1.6 cm = 3
Point A: 1.5 cm = 2
Point E: 0.2 cm = 1
Approaches like this one could certainly be useful – and have been, notably David Tudor’s realization, in which values were simply described as 1, “simple,” or 2, “complex,” – but do not reflect the actual distances of the points to one another.)

Even though the percentage method describes all relationships with precision, it nevertheless leaves its traces upon the readings by ensuring that every reading must have at least one value of 100%, making it impossible for all values to be very low. However, given that a full reading of the Variations II materials contains thirty measurements, each applied to one of six different parameters, it is highly unlikely that this persistent maximum will become legible in the musical information.

If multiple readings are used to produce a realization, this method has further implications. For example, if reading X has a maximum of 6.7cm, and reading Y has a maximum of 1.3cm, the percentage method has no way of relating these values across readings: reading Y’s 1.3cm is still treated as 100%. The potential pitfall here is that all readings may tend toward homogenous distributions. An arrangement that occupies a small area, like reading Y, cannot define itself as being “smaller” than reading X. In this sense, the percentage conversion functions as a variable lens upon each reading, ensuring that each reading exists within the same limits. Again, I was not concerned the actual units of measurement, but rather the relationships between points. With these “raw” percentages at hand, the problem now became the translation of this data into musical information.

H. Parameters in Practice

Employing these determinations, several parameters are immediately accessible:
**Frequency:** Taking 0% as the instruments’ lowest possible frequency and 100% as its highest, each pitch can be precisely calculated. In my realization, I defined the possible range of each frequency between zero and ten Hertz, again relying upon very low frequencies that would be expressed in the performance as rates of pulsation. The maximum of 10Hz was found through experimentation; I found that my ear did not perceive rates above 10Hz as pulsation, but rather as a kind of fluttering tone when projected through the snare drum.

**Amplitude:** Taking 0% as the instruments’ lowest possible amplitude and 100% as its highest, each amplitude can be precisely calculated. In my version, since amplitudes of oscillators were controlled via a programmable knob, I could determine in a sound check a maximum amplitude for each snare drum that created an “overwhelming” musical environment. This determined the range of each knob in that particular performance.

**Point-of-Occurrence:** Given any predetermined length of time, for example one minute, an event at 0% occurs at 0:00, while an event at 100% begins at 1:00; each other event-point may be precisely calculated. My realization of Variations II began with a ten-minute timeline. Six readings of the materials were employed to fill this duration, and so as to avoid equal, periodic sections, the duration of each reading was determined by measuring six points dropped over one line (as per Cage’s instruction to use additional measurements to answer other questions.) Thus each event’s point-of-occurrence percentage represented its position within one of these six chance-determined sections.

The remaining parameters rigidly oppose description via a continuum.
Timbre: As Tudor’s struggle with rationalizing timbre reveals, a clear continuum of timbre does not exist for any instrument. Cage provides one example of how to determine timbre in *Variations I*, where he describes short timbre measurements as those sounds having the “simplest overtone structure.”12 This, at least, serves as a template; sounds could thus be organized along a continuum ranging from “most sinusoidal” to “most noisy.” Other methods are also certainly possible (perhaps moving from “ordinary” to “extended” timbres, or from sounds with natural harmonics to those with inharmonic spectra) but nevertheless a clear continuum is difficult to identify.

In my realization, timbre posed even further difficulty due to the homogenous sound world of snare drums activated by sine tones. Ultimately, I used this determination to select which of the four possible drums would be utilized in each event. This meant that, in a given reading of five sound events, one drum would be used twice. In retrospect, I find this solution disappointing. With this method, there is no sense that timbre functions as a continuum. The sound world of my realization is markedly homogenous. In the future, I would like to experiment with ways of modifying the drums to produce different timbral gradations, perhaps “preparing” the drums during the performance by placing objects on the drumheads that will vibrate sympathetically while transforming the timbre of the instrument. While this solution might introduce greater timbral diversity, it still does not align with the notion of a timbre continuum.

Duration: The percentage method relies on knowing a finite ‘maximum,’ yet defining duration quantitatively necessarily includes the possibility of sounds of infinite duration. This can be clarified somewhat by describing a maximum duration as the total

duration of the timeline. That is, given the example of a one minute timeline, the longest possible sound is one minute in duration. Calculations for all other points are easily identified. Yet, this is an extremely problematic solution. This method inherently yields some extremely long durations, potentially of lengths that defy an instrument’s capability (for example, a duration of one minute for a vocal sound.) It also works against the determinations made by the point-in-time measurement. For example, a 100% duration might occur at 20% of the timeline. In this case, the timeline must expand to 120%, or the event’s duration must be shortened to 80%. In the most extreme case, a 100% duration could occur at 100% of the timeline, either doubling the timeline or making the event’s duration infinitely small.

In my realization, I embraced this possibility, allowing the maximum duration to be the length of the timeline. (As mentioned above, my realization was divided by chance into six sections, each containing one reading of the materials. The maximum duration within each section was the length of that section.) This did yield many instances in which a sound with a point-of-occurrence of, say, 80% of the section also lasted for 100% of the length of the timeline. This meant that this event would extend beyond the predetermined end of the timeline by 80%. The result of this method of reading point-of-occurrence and duration was that, while my initial timeline for the entire performance was ten minutes, through these unforeseen extensions, the final realization lasts for eleven minutes and fifty-five seconds.

I do not find this to be a satisfying method of structuring the work nor defining the parameter of duration; clear sections are quite audible in my realization. Beyond that, part of the usefulness of a score like Variations II is to create a performance of any
desired length. My method is likely to increase that length by a significant and unpredictable degree. But Cage does not provide any instructions as to how to structure multiple readings of the materials, so I did what I could to find a way of using measurement to combine multiple readings.

Other methods of describing duration are certainly possible, but are inherently subjective. As one alternative, I could pre-determine a maximum duration that is less likely to extend beyond the timeline, even if point-of-occurrence places that event very late in the timeline. This is actually in line with my strategies for other parameters. I could assess what a “reasonably long” duration might mean on my instrument, just as I had assessed a reasonable maximum for both frequency and amplitude.

Structure of Event: This is the only parameter that differs from those employed in Variations I. A line determination for “structure” replaced the use of differently-sized points in Variations I, where the size of a dot indicates an event of one, two, three, or four or more sounds. While a continuum from 1-X sounds in an event is certainly possible as a reading of this continuum, a percentage is not useful. A single numeric value also does not allow for the description of different structure-types, described in Variations I as sounds “played together or [as] ‘constellations.’” Nevertheless, in my realization, I used this measurement to select how many low-frequency oscillators were active in each sound event. 0-25%, for example, would indicate the use of only one low frequency oscillator. 25-50% would indicate the use of two (and so on), thus demanding further readings of the materials to determine the frequency and amplitude of that additional oscillator. In spite of the fact that it relies upon four discrete steps, adding an oscillator simply destabilizes the periodicity of the first oscillator. In this way, I found this method
successful in creating a wide range of event-types, ranging from stable, repeating pulsations to erratic and unpredictable fluctuations.

I. Score and Performance

After determining all of the information described above, I created a simple action-score that describes the changes made to the oscillators via my control surface. A sample event can be seen in Figure 4.2.

![Figure 4.2: Example of notation method in my performance score for Variations II.](image)

The vertical line represents the fader used to control the frequency of the oscillator. Here, a frequency reading of 75% is depicted as the fader three-quarters of the way up. Because the fader has been programmed digitally, the result is (roughly, depending upon the accuracy of performance,) a 7.5Hz frequency projected into the snare drum. The circle represents the knob used to control amplitude. Here, a 25% reading is depicted with the knob at “nine-o'clock”, one-quarter of the way up. Again, since the knob has been programmed digitally, it adjusts the amplitude to 25% of whatever maximum has been established for that performance.
In performance, I follow a stopwatch and turn on the oscillator indicated by a circled number at the time indicated. Since many of the events involve multiple oscillators, and since all four drums might be active at any given moment, I often must manipulate several faders and knobs simultaneously. The realization demands strange kind of virtuosity operating the control surface, yet this virtuosity is far removed from the traditions and conventions of percussion performance. I do not, as in conventional performance, respond to the sounds present in the hall in order to make subtle adjustments to my actions. In this way, I am primarily concerned with representing the measurements determined in my readings of the *Variations II* materials in performance. Because I have developed an instrument with inherent unpredictability (as a response to the priorities of the score-tool,) these performed measurements act as impulses that provoke the instrument into action.

**J. Collaboration and Provocation**

Exploring in detail Cage’s most radically indeterminate work remains one of the richest and most satisfying projects I have undertaken to date. By attempting to identify the score-tool’s priorities early in the process, I arrived at an instrument that I never would have chosen, nor even considered, as a medium for this work. Working this way felt in many ways like an unspoken collaboration with Cage. His materials brought to the process certain principles, such as the comprehensive use of measurement and the continuous gradations of musical information. With my background as a percussionist, my work with digital electronics, and my experience with the traditions of experimental sound practices in the late twentieth century, I also brought my own conditions and
priorities to the project. The intersection of Cage’s provocation and my own background resulted in a musical experience that neither of us likely could have predicted.

As a result, it could be said (and colleagues have observed) that my performances of Solo for Cymbal and Variations II do not “sound like Cage.” On one hand, a statement like this presumes that a realization of these works should act as an extension of a composer’s aesthetic expression. On the other, a statement like this has a foundation in the performance practice of the music. Tudor’s landmark realizations often relied upon sounds and strategies found in Cage’s earlier works, ensuring that they bear a connection to the materials that Cage had explored before his use of indeterminacy. Iddon notes that, “Even though the realizations of the Solo for Piano and Variations I were highly idiosyncratic at points, the final result in performance was recognizably a Cageian piece, despite the fact that ‘chance operations were used.’”13 If in fact chance operations were to be a means of accessing new experience, these works should be able to support materials not necessarily derived from Cage’s determinate compositions.

For this reason, my approach to making realizations of these score-tools in the twenty-first century focuses on the practical and aesthetic questions posed by each score-tool. Refusing to take certain sounds or instruments as “appropriately Cageian,” I enter into a conversation with the materials of the score. I prefer to view my realizations not as an extension of Cage’s expression, but rather a digestion of Cage’s ideas through the experiences and preferences of a performer from a different time and place.

Cage’s score-tools pose an intrinsic challenge to the conventions of Western music. In allowing Tudor’s performances to become synonymous with the works

13 Iddon, 175.
themselves, these works risk losing their provocation. Tudor agrees that the power of these works lies in their resistance to definition, and challenges future performers to continually reinvent them: “If those works [the Variations] seem to have lost their surprise, I think the performers should make it their job to make it surprising.” I would add that this notion runs both ways; if I see my role as a performer of these works to continually reinvigorate and reevaluate them, I hope in return that they will continue to challenge me to reevaluate my relationship with my instrument and explore new modes of performance.

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