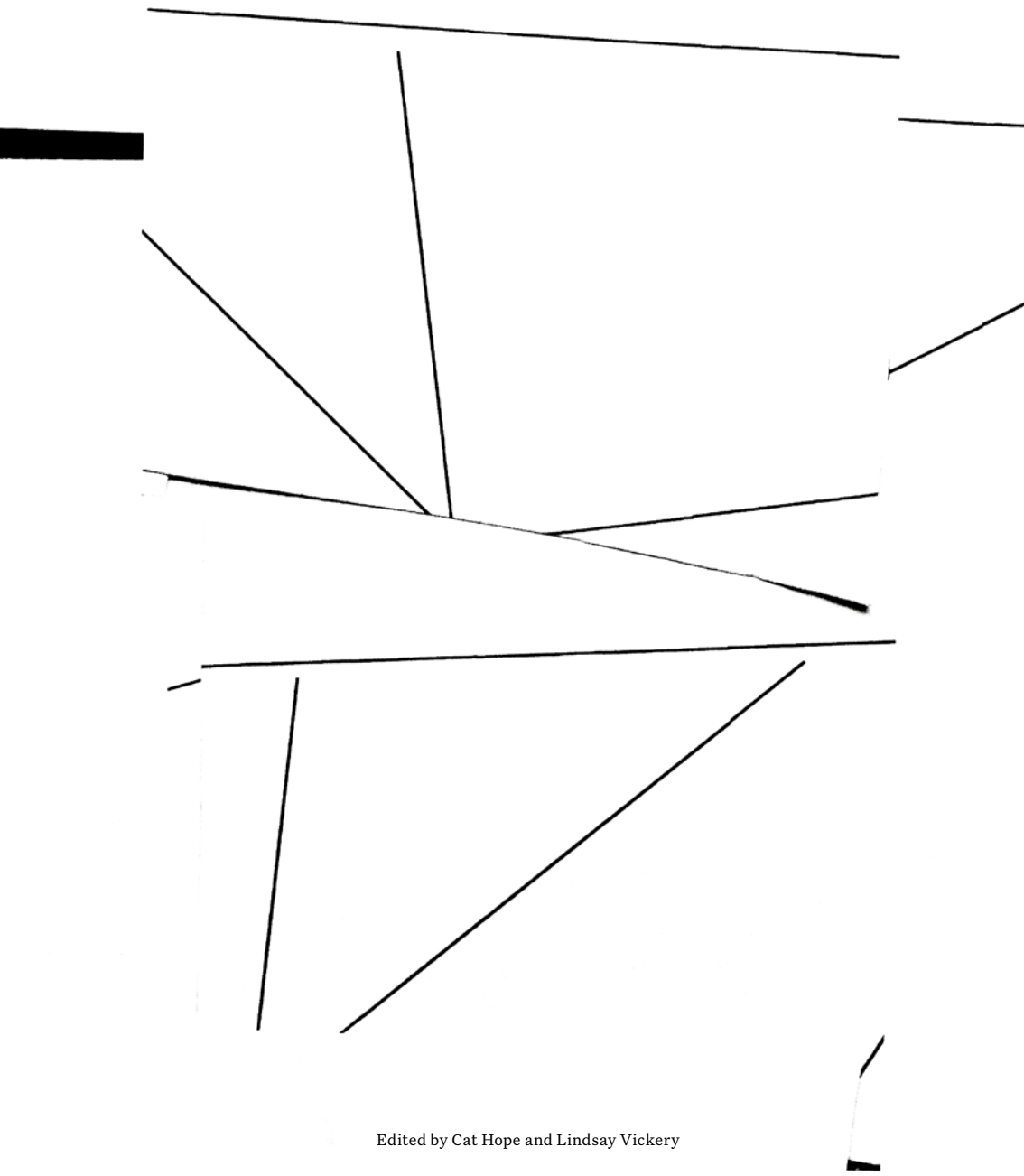
Actions | Remarks
John Cage's *Variations*



Edited by Cat Hope and Lindsay Vickery

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John Cage's *Variations* and the expansion of the score, sonic materials, space, and the environment.

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Contents

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Expansion of Mobility of the Score in Cage's *Variations I-III*

John Cage's eight *Variations* (1958-67) occupy a unique position in the composer's output. By the late 1950s, Cage had made significant progress in exploring the use of indeterminate sound sources (such as turntable[1] and radio[2] works), and had invented a range of chance procedures for generating notation and indeterminacy of notation. His attention now turned towards the indeterminacy and "mobility" of formal structure itself: "a way to further the diversity and flexibility of his compositions by removing the fixity of the score itself."[3]

The *Variations* were one of the principal vehicles for the exploration of this idea, constituting nearly a quarter of his compositional output during this period. The works also delineate a major shift in Cage's work and ambitions—following the completion of *Variations VIII*, the most open of the works in every respect, Cage returned, for the most part, to more traditional compositional outcomes marked by his exploration of the "recomposition" of pre-existing works.

The *Variations* emerged during a period in which Cage was exploring two key and revolutionary concepts: chance operations, in which random selections of existing objects or artifacts, "ready-mades,"[4] are used as a means of determining score elements that are "free of individual taste and memory (psychology) and also of the literature and 'traditions' of the art;"[5] and indeterminacy, namely ambiguities in a score's specifications that require the performer to "employ his own discretion."[6] This exploration had begun in 1951 with Cage's works composed using the chance procedures of the I Ching[7] *(Music of Changes* and *Imaginary Landscape No. 4 (March No. 2)*).[8]

Over the ten years from 1958 to 1967, Cage revisited the *Variations* series as a means of expanding his investigation not only of non-linear interaction with the score but also of instrumentation, sonic materials, the performance space, and the environment. The works chart an evolution from the "personal" sound-world of the performer and the score, to a

vision potentially embracing the totality of sound on a global scale. Table 1 gives a summary of the evolution of Cage's approach to the score, sound sources, and the performance space in the *Variations* series.

<table>
<tr><th>Variations</th><th>Score Specification</th><th>Sound Sources</th><th>Performance Space</th></tr>
<tr><td>I (1958)</td><td rowspan="2">Quasi-determinate score components (transparencies)</td><td>Instruments</td><td rowspan="2">Unspecified</td></tr>
<tr><td>II (1961)</td><td>Sound- producing means</td></tr>
<tr><td>III (1963)</td><td>Indeterminate score components (transparencies)</td><td>Actions</td><td>Environmental influences</td></tr>
<tr><td>IV (1963)</td><td>Topographical map and transparencies</td><td>Sound-producing means</td><td rowspan="5">Integrated</td></tr>
<tr><td>V (1965)</td><td>Astronomical chart and remarks</td><td rowspan="2">Electronic sound systems</td></tr>
<tr><td>VI (1966)</td><td>Sound system component diagram (transparencies)</td></tr>
<tr><td>VII (1966)</td><td rowspan="2">Remarks</td><td>Real-time sounds</td></tr>
<tr><td>VIII (1967)</td><td>"Silence" (ambient sounds)</td></tr>
</table>

Table 1 Summary of score specifications, sound sources and performance space for *Variations I* to *VIII*.

The composition of *Variations I* coincided with *Concert for piano and orchestra* (1958),[9] his most ambitious exploration of traditionally printed but indeterminate notation. It was perhaps this task that focused Cage's mind on the limitations of paper-printed notations, because the dominant medium employed in the *Variations* is the score printed on transparent cellulose acetate sheets—transparencies—commonly used as an affordable medium for overhead projection prior to the invention of digital projectors. As transparencies could be superimposed, they afforded a degree of mobility for the score components, permitting numerous configurations and orientations and consequently numerous instantiations of a work from the same materials. The development appears

to be Cage's solution to the restriction of the fixed printed page and an extension of his exploration of indeterminacy in music notation. In addition to *Variations I*, Cage employed scores comprising multiple transparencies in a number of other works during that time including the works *Music Walk* (1958), *Fontana Mix* (1958), *Cartridge Music* (1960) and *Music for Amplified Toy Pianos* (1960).

The specification of instrumental forces in the first three *Variations* is remarkably broad and open to interpretation. *Variations I* prescribes "any number of performers: any number and kind of instruments," *Variations II* simply states "any number of players and any number of sound producing means." These prescriptions differ from prior "flexible instrumentation" works in which a fixed compositional object may be realized through multiple orchestrations, in that the materials defining *Variations I* were capable of generating further instantiations of the score to accommodate orchestrations of any dimension or type.

The pursuit of openness continued in *Variations III,* which specifies only "one or any number of people performing any actions" and "any other activities going on at the same time." Here the "instrumentation" does not explicitly imply the production of "sound." For example, according to James Pritchett, Cage's own 1963 performance of *Variations III* "included untangling electrical cords, putting on his glasses, smoking a cigarette, writing a letter, and drinking a glass of water."[10] The specifications also allow for "some or all of one's obligation [to] be performed through ambient circumstances (environmental changes) by simply noticing or responding to them," significantly opening the work to influences in terms of the physical space and time in which it is performed in addition to distinct and potentially divergent activities and aesthetics.

Despite their radical openness, in practice, according to the thirty-eight listed recordings from Discogs[11] between 1958 and 2018, the conventional chamber music milieu has continued to dominate the performance practice of *Variations I-III*. No recording has included more than seven players and instrumentations have tended to include instruments typical of post-1950 concert music (flute (8), clarinet (3), alto saxophone (1), horn (1), trumpet (1), trombone (1), electric guitar (1), percussion (8), piano (12), organ (3), voice (2), violin (5), viola (1), cello (9), and double bass (2)). A smaller number of versions have included sound sources commonly associated with Cage (sound objects (1), tape (1), electronics (2), and radio (2)), instruments invented more recently (computer (5)), "period" instruments

(glass harmonica (1), and harpsichord (1)) and non-Western instruments (mbira (1), and steel drums (1)). While commercial release perhaps self-selects for established ensembles based in the classical idiom, these numbers suggest that the openness of Cage's scores is yet to be fully reflected in their interpretation.

As is typical for musical concert works, *Variations I* and *II* do not specifically reference the performance location. They are implicitly conceived for presentation within the "concert" format and are abstract in the sense that there is no specification in regard to the context or location in which they are to be performed and no required or implied interaction with it. The allusion to "actions," "other activities," and "ambient circumstances" in *Variations III* marked a transition in Cage's thinking within the *Variations* series. This change most likely drew on Cage's experiences with the mixed media and theatrical performances at Black Mountain College in 1948 and 1953[12] that his student Allan Kaprow would later term "Happenings."[13] Cage's shifting outlook is reflected in his ongoing interaction with early Minimalist sculptor Robert Morris who characterized Cage's aim as "de-aestheticization of art" rather than "aestheticization of the world."[14] They prefigure the explicit positioning of performance location as the subject of the work in *Variations IV* and precede Morris's 1966 statement that "the experience of the work necessarily exists in time" and the coinage of the term "Site-Specific" by Richard Serra in 1989.[15]

This discussion focuses on the first three *Variations,* exploring the scope of their score materials, their conceptual origins, their issues as performative scores, and assessing the extent and effectiveness of their openness.

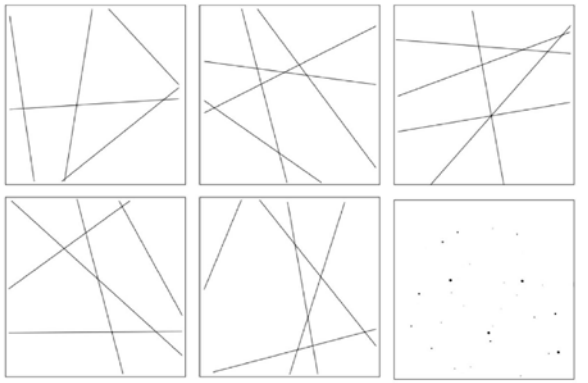


Figure 1 Score materials for *Variations I*.

Variations I and *II*

Cage's score materials for *Variations I* and *II* have been described as "toolkits."[16] At first glance they appear to be a deconstruction of the traditional score, with only the five stave lines and the noteheads remaining, and left to float freely in two dimensions. The materials for *Variations I* comprise six square transparencies: the first printed with points and the other five printed with a particular configuration of five lines.

The "points" square consists of twenty-seven points of four sizes corresponding to the number of sounds they represent as illustrated in Table 2.

Square	27 Points	No. of Sounds
13	Very small	1
7	Small but larger	2
3	Greater size	3
4	Largest	4+

Table 2 The contents of the "points square" *Variations I*.

A performance is prepared by first assigning one of five sonic parameters to each line: frequency, duration, amplitude, timbre and point of occurrence, measuring the perpendicular distance from each point to each line (see Figure 2), and finally using the derived measurements to generate a fixed "instantiation". The means of reading the score and the particular constraints of each parameter (magnitude, grain, etc) are left to the performer.

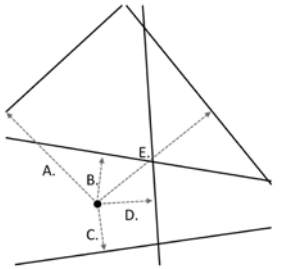


Figure 2 For each event, five parameters (A-E) are defined by the measurement of the perpendicular distance from each point to each line.

As the score is printed on transparencies, each of the six squares can be arrange in eight orientations. This is roughly analogous to the four possible permutations of a twelve-tone series, with the addition that the structure represented on the square can also be arranged in four "reflected" orientations (see Figure 3).

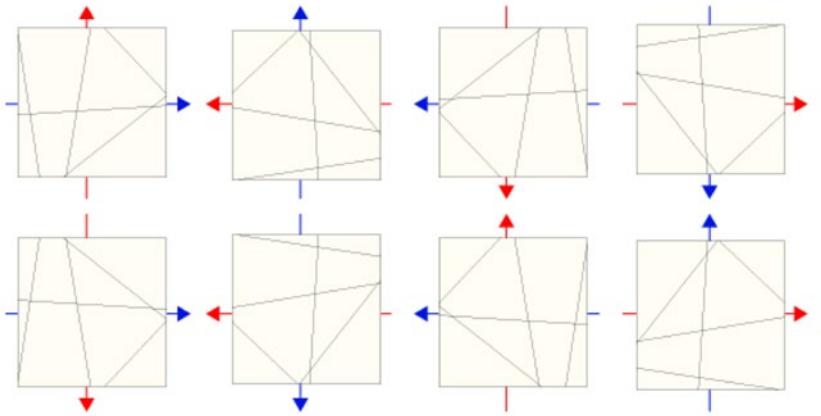


Figure 3 The eight possible orientations available for each of the six squares comprising *Variations I*.

In *Variations II* there are six transparent squares with one line each which are to be arranged in any configuration to generate six sonic parameters: frequency, duration, amplitude, timbre, point of occurrence, and structure of the event (which Cage defines as "the number of sounds making up an aggregate or constellation.")[17]

Pritchett identifies the "BV" and "BB" notations from Cage's *Concert for Piano* (1958) (see Figure 4) as the origin of this approach.[18] The crucial difference is that as the score components are transparent, they may be arranged in numerous (*Variations I*) or quasi-infinite (*Variations II*) configurations.[19] It has already been noted that it may have been the very limitations of the paper-printed score of *Concert* that gave rise to this novel methodology.

The lineage of the first two *Variations* may be more complex than simply *Concert's BV* and *BB* notations. It is conceptually varied from works involving indeterminacy

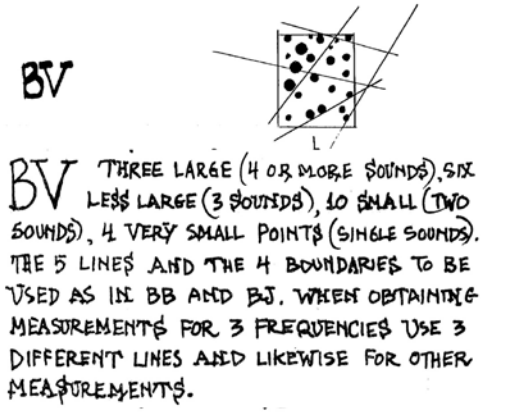


Figure 4The BV notation from Cage's *Concert for Piano* (1958).

in performance—works incorporating radio (such as *Imaginary Landscape No. 4*) or indeterminacy of notation (such as *Aria* (1958)—and more closely aligned to the thinking of the *I Ching* works in which parameters were determined independently, and perhaps most clearly akin to the "paper imperfection technique" (*Music for Piano* (1952-6)) and "folded paper template" works (in which points were notated at intersections between creases in folded paper) (*Music for Carillion No. 1* (1952)), which required measurement of found structures for determination of musical materials. The determination of multiple sonic parameters in *Variations I* and *II* also suggests the impact of the "parametric thinking"[20] of integral serial composers (an influence on Cage since his "chart" compositions[21]) and share some of the terminology of serialism,[22] such as "aggregate" (used to avoid the harmonic implications of the term "chord") and "constellation."[23] Earle Brown's concept of proportional notation,[24] developed some years earlier, is also drawn upon and taken to its logical endpoint in works that are defined by proportion. The ability to "read" the score in any orientation perhaps also draws on the similar approach of Brown's *December 1952* (1954).

In regard to the score for *Variations I* Cage himself states:

Then, while I was at Wesleyan University, in this first piece I had had five lines on a single transparent sheet, though I had had no intention of putting them the way I did, I just drew them quickly.[25]

In addition to the conceptual connections between *Variations I*, the similarity between "paper imperfection technique" works and the "points" square are readily apparent (see Figure 4). As the name suggests, the "paper imperfection technique" used imperfections ("variations" perhaps) in the surface of the paper to spatially define points representing events in the score. The technique appears to have been inspired by the visual arts: Cage noted "[p]ainters, for example, work slowly with oil and rapidly with water colors . . . I looked at my paper, and I found my "water colors": suddenly I saw that the music, all the music, was already there."[26] The technique's ultimate origin is likely the surrealist technique "entoptic graphomania" first described along with their particularly Cagean aesthetic by Romanian artist Dolfi Trost in 1945:

> "Graphomanies Entoptiques," result from the interaction of automatism and provoking chance. They belong to processes which, denying any artistic construction, confuse the final image with the operation necessary for its very production. The graphomanies entoptiques are discovered if the points due to the existing color irregularities are automatically connected by lines to any immaculate sheet of paper . . . graphomanies entoptiques are ocular, causal, paranoiac, objective and aplastic.[27]

Figure 5 The "points" transparency from Cage's *Variations I* (left), and excerpt of *Music for Carillon no. 3* (1954) (centre) and *Music for Piano No. 55* (1956) (right).

The similarity raises the question whether *Variations I* is a "paper imperfections" piece or whether it just looks like one.

The folded paper template works were created by "arbitrarily folding pieces of paper and then making intersections at the holes. Once these stencils were made, Cage superimposed them on his graph paper score—placing them as points determined by an overall duration structure—and drew through the holes."[28] Could the lines squares of *Variations I* have been generated in a reverse process by drawing lines through points on the "points" square? Figure 6 is a superimposition of all orientations of the six squares of *Variations I*. While there are number of qualifying factors, including the composer, the publisher and my own reproduction and placement of the materials, the preponderance of line/point intersections is quite striking.

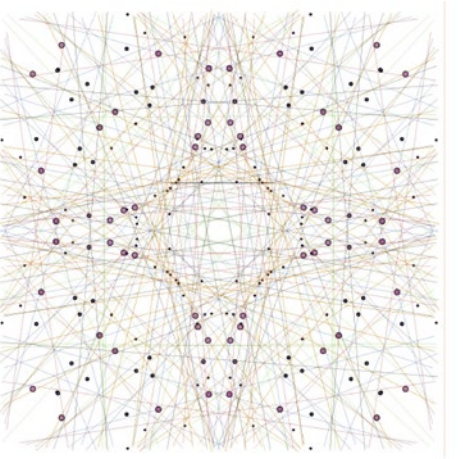


Figure 6 Every orientation of the six squares of *Variations I* superimposed.

Performance of *Variations I* and *II* has traditionally involved one of three methods: "simply observing"[29] the resulting score, annotating an instantiation of the score, or transcribing the detailed measurements of an instantiation into a "performance score."[30] "Simply observing" requires a complex process in which the entire surface of the score becomes "activated" as an information source. This process radically breaks with the left-right linearity of music reading. Performers must begin by searching for the point closest to the designated "point of occurrence" line (which will determine the first event in the

performance) and then fan out in arcs to judge the distances between that point and the other lines: designated for frequency, duration, amplitude, and timbre (see Figure 7).

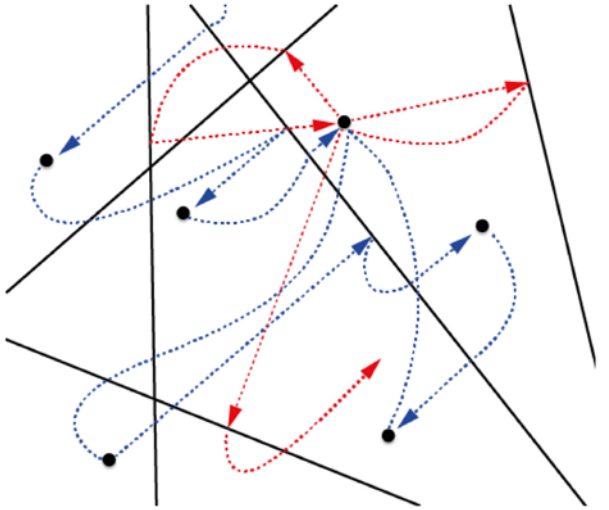


Figure 7 Reading the score for *Variations I* in two-dimensional arcs: first searching (blue) and then measuring (red) to determine a single event.

The second approach involves creating fixed instantiation of the score, manually measuring each parameter and then annotating them directly onto the score. Violinist Patricia Kopatchinskaja has written about her version of the work created in this manner (see Figure 8).[31]

The final approach involves manual measurement and collation of the multiple parameters and then their transcription into a "performance score." Such a score can take any form. James Pritchett shows that Tudor's version of *Variations II* reduced Cage's prescribed measurements to binary values: simple and complex. Tudor's score overcomes the issue of reading multiple axes (the fifty events he used were aligned in rows), however its transformation of the multi-parametrical notation into single- or double-bordered squares with intersecting lines and circled or plain points is nearly as enigmatic looking as the original.

In 2006, digital versions of *Variations II* were created independently by Nicholas Knouf[32] and Pierpaolo Leo.[33] Both of these adaptations were "installation"-based, in that they generated both the score and a sonification of the score for viewers to manipulate in an art gallery, rather than scored materials for live performance. The imperative of generating performance materials that are easily and intuitively read, led Decibel to the decision to create software that would collate and render the data created in *Variations I* and *II* into proportionally notated graphical scores[34]. In Decibel's realisations of *Variations I* and *II* the parametrical data derived from measuring perpendicular distances is evaluated and then used to generate a scrolling, proportionally notated screen-score. The score moves from right to left with the point of occurrence of each event, rendered as a horizontal rectangle, indicated by its point of contact with a vertical line or 'playhead' on the left of the screen. In this way the score moves "towards" the performer from the right in the same direction as a traditional paper score.

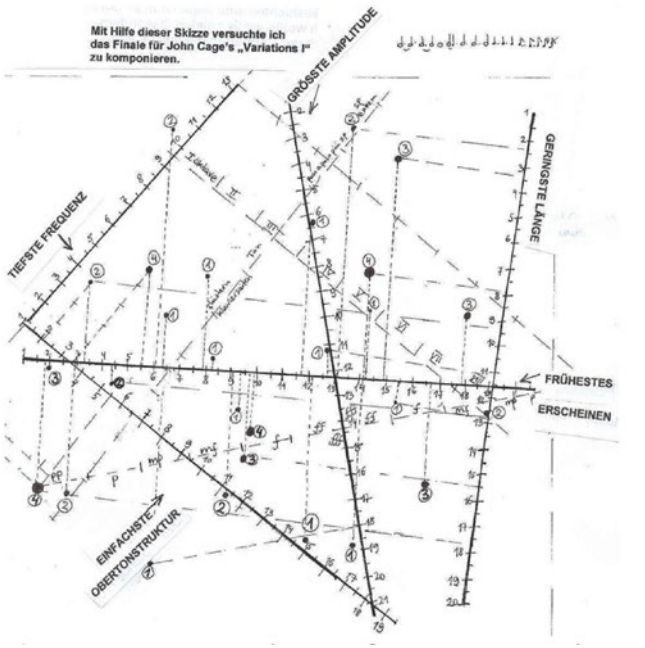


Figure 8 Annotated score for *Variations I* by Patricia Kopatchinskaja.

In Decibel's performance, score duration is represented proportionally by the length of the rectangle. The vertical position of the rectangle indicates its frequency, thickness indicates volume and shade indicates timbre. The number of sounds in each event is specified by a number attached to each rectangle. A portion of such a realisation is shown in Figure 9.

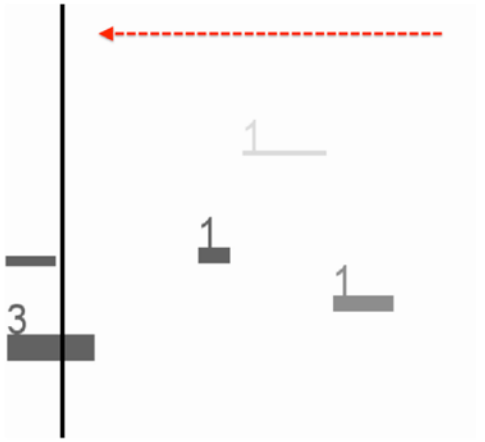


Figure 9 Decibel's scrolling, proportionally notated screen-score for *Variations I*. The arrow indicates the direction of the scrolling score. Screenshot from The Decibel John Cage Variations app).

The notation draws on conventions established in works by Cage and his colleagues Earle Brown and Christian Wolfe, as illustrated in Figure 10. This transcription enables a faster reading for performers using familiar symbols. In addition the graphics appear ahead of the 'playhead,' giving the performer time to consider their approach to the graphics. The score can be read by a single performer or multiple versions of the score can be generated for a group of performers in a network of iPads.

The procedures required for the generation of an instantiation of *Variations I* encompass determinate, permutable, and indeterminate variables. The number and position of the points and lines is determined and there is a finite number of possible combinations and orientations of the transparencies, however the range of the continuum upon which each parameter is plotted is decided by the performer and is therefore entirely open. Table 4 illustrates the determinate, permutable, and indeterminate factors involved in the generation of an instantiation of the work and suggests a limit of 38400 possible arrangements of squares, orientations, and parameter assignments.

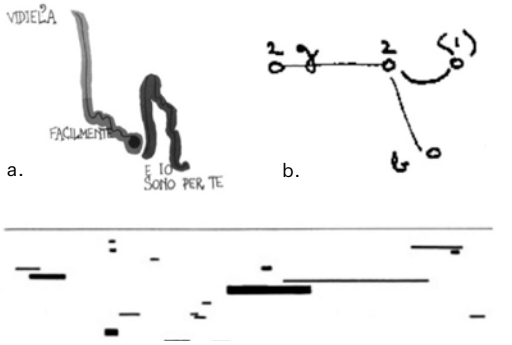


Figure 10 Graphical notation conventions drawn from a.) Cage *Aria* (1958)[35]—timbre-shade equivalence; b.) Wolff *Duo for Pianists I* (1957)[36]–numbers representing the number of sounds in an event: c.) Brown *Folio and 4 Systems* (1954)[37]—proportional notation: length-duration and thickness-amplitude equivalence.[38]

Fowler has noted however that the maximum number of permutations is actually significantly greater given that for the points that generate "4+" sounds Cage specifies that "In using pluralities, an equal number of the 5 other squares (having 5 lines each) are to be used for determinations, or equal number of positions, — each square having 4."[39]

Determinate Elements	No.
Points / Sounds	27
Lines / Parameters	5
Min. no. of parameters	135 (27×5)
Permutations	
Orientation of Points Square	8
Functions of Lines	5! (120)
Orientations of Lined Squares	8
No. of Lined Squares	5
Max. No. of Permutations	38400
Indeterminate Elements	
Frequency / Overtone / Amplitude / Range / Instrumentation	Open
Total Duration / Even Occurence	Open

Table 3 Determinate and indeterminate elements of *Variations I*.

Variations II uses a similar line and point system, with some small but significant differences. There are six transparencies each with a single line and five transparencies each with a single point. The sixth line determines the structure of the musical event, whether it is a single sound, an aggregate, or a constellation of sounds: the function that had been determined by the size of the points in *Variations I*.

The orientation of the lines and points is therefore completely open, meaning that there are an infinite set of potential configurations of the score. A performance consists of any combination of configurations and therefore in theory *Variations II* may describe any possible musical work.[40] In this sense it "represents the most flexible composition tool that Cage ever invented."[41]

The Decibel realisation of *Variations I* facilitates study of the work through rapid generation of numerous instantiations. In order to examine the potential morphology of the points generated by Cage's materials for *Variations I*, fifty instantiations of a single reading were generated. The duration of the score was shortened to twenty-five seconds so that all of the points would fit within a single frame. The results showed that although 50% of the instantiations were randomly distributed in appearance, 36% exhibited what I have termed a "rising" morphology, and 14% a "spiral" morphology (see figure 11).

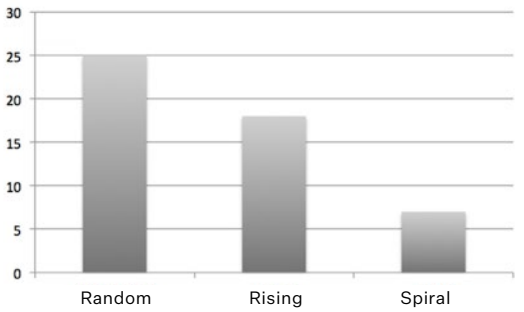


Figure 11 Morphologies of fifty generations of *Variations I* using the iPad-based the Decibel John Cage Variations app for iPad.

Figure 12a shows a single "rising" morphology generated by The Decibel John Cage Variations app and then all eighteen "rising" morphology generations superimposed.

Figure 12 a. A single instantiation of the "rising" morphology and b. The eighteen "rising" instantiations superimposed.

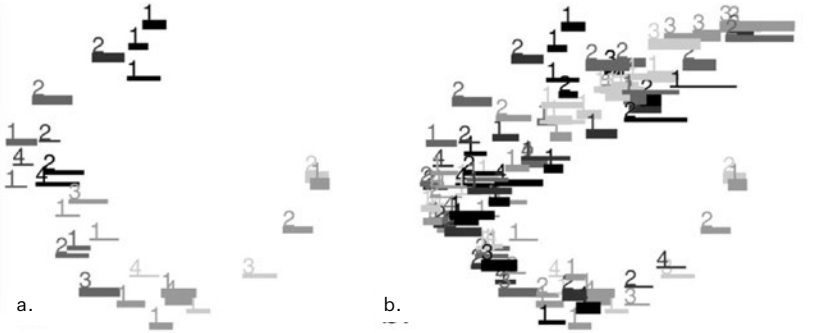


Figure 13 a. A single instantiation "spiral" morphology. b. All seven "spiral" morphology generations superimposed.

These figures suggest that the outcome of a random arrangement of points and lines is equally likely to produce a morphologically random field of events as a morphologically rising or spiral field. It is possible that this limitation upon the indeterminate outcome of the work encouraged Cage to propose a process for generation for *Variations II* that could potentially produce a truly infinite field of outcomes.

Variations III

In *Variations III*, Cage moved to a significantly different score paradigm. Here the "toolkit" comprises two transparencies, one blank, and the other printed with forty-two circles of 24mm diameter that must be individually cut out (see Figure 14). The score is created by dropping the forty-two small squares (each printed with a single circle) onto a 215.9 × 279.4 millimetre (8.5 × 11 inch "American Letter") sheet of paper and removing all but the largest group of circles that are in direct contact with one another and then placing the blank transparency over the shape.

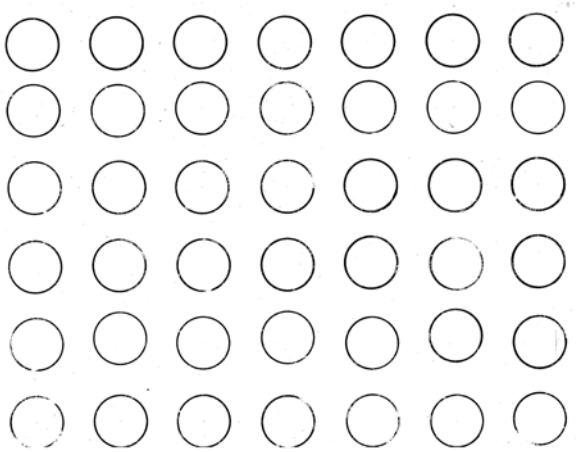


Figure 14 The forty-two circles comprising the score materials for *Variations III*.

To realise the work, the performer begins with any circle, observes "the number of circles which overlap it," and makes "an action or actions having the corresponding number of interpenetrating variables". This process is repeated with "any one of the overlapping circles." Cage does not exclude "measurement and determination" of the complex in terms of "time or space." These comments provide the only parameters by which the work is defined. However Cage also states that "some or all of one's obligation may be performed through ambient circumstances (environmental changes) by simply noticing or responding to them," significantly opening the work to influences beyond what is defined in the score.

Here the composer's focus was on actions rather than sounds. According to Pritchett, Cage's aim was to "enable free and direct action in the performance—one would simply do things and count the actions and variables in performance."[42] In regard to Cage's inclusion of everyday objects and actions in the work, Morris has stated "that Cage's outlook was materialist insofar as it entailed the elimination of any and all transcendent or idealist structures which would serve to alienate art from the plane of everyday existence."[43]

Decibel also created an iPad-based realisation of *Variations III* in their Decibel John Cage Variations app. Figure 15 shows three screenshots of the score being generated: first the random arrangement of circles (leaving the largest group of circles that are in direct contact with one another unfilled and the other circles filled in blue), a second stage in which the "blue circles" are faded, and the third showing the final disposition of the score.

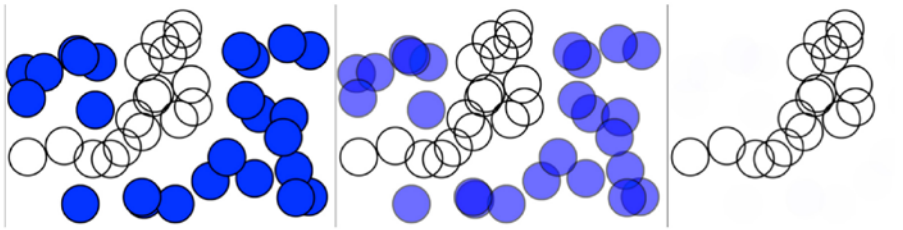


Figure 15 Three screenshots of the score being generated in The Decibel John Cage Variations app. Superfluous circles (coloured blue) are gradually faded to leave the "performance score".

Unlike the performance score for the first two *Variations* in which the data is used to generate a more "traditional" and legible visualization, Decibel's digital version of *Variations III* merely seeks to replicate the conditions of the process outlined by Cage. This is because, particularly given the absence of a "point of occurrence" parameter, any further interpretation of the data implicit in a generation of the score would encroach insupportably upon the choices available to the performer. This realisation then, simply provides the means to (rapidly) regenerate the score, until the performer is content with the resulting graphic, while retaining the indeterminate latitude that Cage affords the performer in the original score. The materials of *Variations I* and *II* give rise to a linear series of events and are therefore most appropriately rendered as a linear score. *Variations III* specifically evokes the

indeterminacy of the two-dimensional score itself. Cage instructs the performer to "start at any circle" and "move on to any circle" only requiring the performer to "observe the number of circles which overlap it."[44]

In practice a particular performer may choose to generate their own realisation for the purposes of precision or legibility. It would be possible, for example, to "unwind" the circles along an arbitrarily determined axis, while retaining the proportions of the points of intersection from the original in order to create a linear horizontal score.

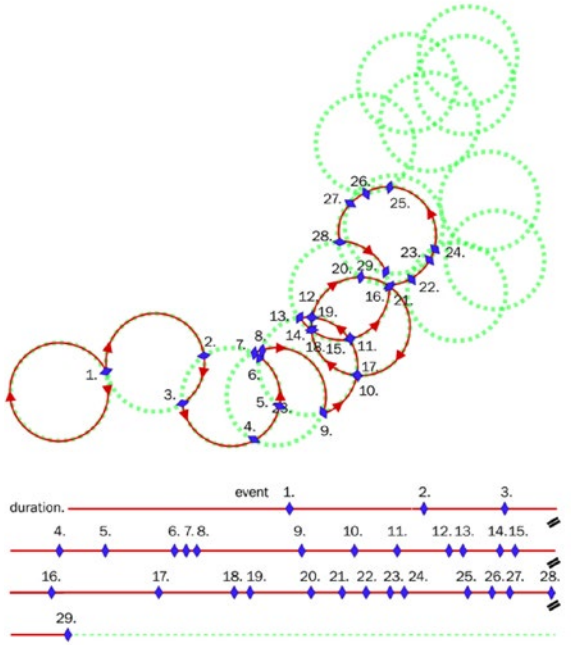


Figure 16 An example of a reading of *Variations III* (above) and a possible "linear realisation" (below).

Realisation of *Variations III* involves chance elements (creation of circle formation, environmental factors) and indeterminate elements requiring performer choice (starting circle, reading direction, actions, and responses to environmental factors). Despite the extreme openness of the score, Cage's compositional choices do appear to play an important role. The digital score for *Variations III* created by Decibel algorithmically mimics the procedure for generating the circle formation: first randomly distributing circles on the

screen, then calculating the distances between them and fading out all but the largest group of overlapping circles. This provides the means to rapidly generate and observe multiple instantiations of the process. Figure 17 plots 100 instantiations of the circle formation (x axis) against the number of overlapping circles that are generated (y axis).

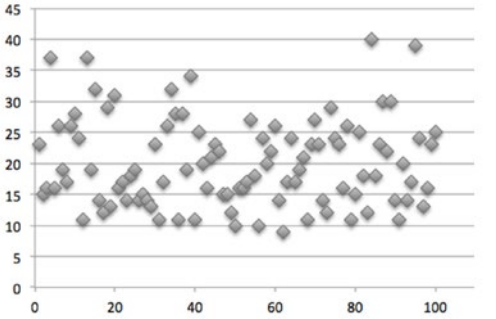


Figure 17 100 instantiations of the circle formation (x-axis) against the number of overlapping circles generated (y-axis) of *Variations III* using the Decibel John Cage Variations app.

Figure 18 summarises the data showing the frequency (y-axis) of the number of overlapping circles (x-axis) in 100 instances of the score. The compositionally fixed elements here are only the number of circles and the boundaries of the score, however these minor restrictions resulted (in this experiment) in circle formations that contained a minimum of nine circles and a median of nineteen circles. While the number of possible variables is extremely large, Cage's choices do seem to ensure a certain minimal degree of complexity will be achieved in any instance.

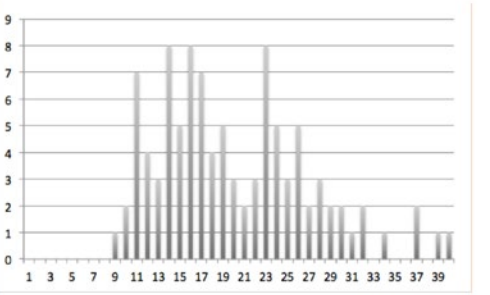


Figure 18 A summary of the data showing the frequency (y-axis) of the number of overlapping circles (x-axis) in 100 instances of the score of *Variations III* using the Decibel John Cage Variations app.

Conclusion

Variations I, *II* and *III* radically expanded the possibilities of the score through the use of superimposable transparencies. In addition to the unprecedented openness afforded by Cage's pursuit of indeterminacy of sound sources, notation, and performative choices, these works contributed signifigantly to substantial new fields of composition: mobility of the score and generative music. In regard to the scores of *Variations I* and *III,* Cage, with limited materials, was able to produce works capable of defining an extraordinary number of instantiations with non-infinite contingent boundaries. In regard to *Variations II*, the number of instantiations just of the score, without considering other indeterminate performative choices, is genuinely infinite.

In all of these works, Cage manages to achieve an activation of the entire page as a space for interrogation by the performer which can be likened to the activated space of a painting. In *Variations III* this space is expanded sonically to include the performance space and the performance environment in general.

The connection between *Variations I* and *II* and the surrealist technique entoptic graphomania, through Cage's development of the "paper imperfection" and "folded paper" techniques, and indeed whether *Variations I* was in fact a "paper imperfection" work, or not, might be impossible to definitely ascertain. The connection between the use of intersections of indeterminate geometry between *Variations III* and the folded paper works, and the evolution of the line generated by the folding technique and the circle, shows an interesting conceptual link in Cage's compositional processes.

The data generated by creating multiple instantiations of *Variations I* using the Decibel John Cage Variations app raises interesting questions about the potential for the structure of the work's six squares to generate versions that are randomly distributed in appearance. Likewise the finding that the number of circles chosen by Cage for *Variations III* ensures a minimal degree of complexity will be achieved in any instance is noteworthy. These findings might be usefully explored in the future with a more precise methodology.

Cage's embrace of the transparency as a tool to allow mobility in a score was a major conceptual step that clearly opened a pathway towards generative music and digital notation in general. In a sense this was a process awaiting a technology that would more explicitly address its challenges in a manner that lends legitimacy to the performance through accurate and legible realisations.

1 Yasunao Tone, "John Cage and Recording," *Leonardo Music Journal* 13 (2003): 11-15.

2 Lindsay Vickery, "Adapting John Cage's Radio Music for a digital score player," *Proceedings of Australasian Computer Music Conference* (2012): 69-77.

3 Excerpt from chapter 6 of James Pritchett, "The Development of Chance Techniques in the Music of John Cage, 1950-1956" (PhD diss., New York University, 1988), http://www.rosewhitemusic.com/cage/texts/DissCh6.html

4 Paul M Camic, "From Trashed to Treasured: A Grounded Theory Analysis of the Found Object," *Psychology of Aesthetics, Creativity, and the Arts* 4, no. 2 (2010): 81-92.

5 John Cage, *Silence: Lectures and Writings* (Middletown: Wesleyan University Press, 1961), 59.

6 John Cage, *Music of Changes* (New York: Henmar Press, 1961).

7 Mark G Jensen, "John Cage, Chance Operations, and the Chaos Game: Cage and the "I Ching"," *The Musical Times* 150, no. 1907 (2009): 97-102.

8 John Cage, *Imaginary Landscape No. 4 (March No. 2)* (New York: Henmar Press, 1961).

9 *Concert* was begun in 1957 and completed shortly after *Variations I*.

10 James Pritchett, *The Music of John Cage* (Cambridge: Cambridge University Press, 1996), 149.

11 Discogs. "John Cage." https://www.discogs.com/artist/262955-John-Cage. Also see Appendix I.

12 Anne Chesky Smith and Heather South, *Black Mountain College* (North Carolina: Arcadia Publishing, 2014), 115.

13 Allan Kaprow, "The Legacy of Jackson Pollock," *Art News* 57, no. 6 (1958): 24-26.

14 Branden W Joseph, "Robert Morris and John Cage: Reconstructing a Dialogue." *October* 81 (1997): 59-69. Miwon Kwon, *One Place After Another: Site-specific Art and Locational Identity*, (Cambridge: MIT Press, 2004), 12.

15 David Miller, "The Shapes of Indeterminacy: John Cage's *Variations I* and *Variations II*," *Frankfurter Zeitschrift für Musikwissenschaft* 6 (2003): 18-45.

16 John Cage, *Variations II* (New York: Henmar Press, 1960).

17 Pritchett, *The Music of John Cage*.

18 Martin Iddon, *John Cage and David Tudor: Correspondence on Interpretation and Performance. Music since 1900* (Cambridge: Cambridge University Press, 2013), 83.

19 Leigh Landy, *What's the Matter with Today's Experimental Music?: Organized Sound Too Rarely Heard* (New York: Routledge, 1991).

20 Pritchett, *The Music of John Cage*, 79-80.

21 John Cage, "Four Musicians at Work," *Trans Formation: Arts, Communication, Environment: A World Review* 1/3 (1952): 164-174.

[22] Alastair Williams, *New Music and the Claims of Modernity* (London: Routledge, 1995).

[23] Clemens Gresser, "Earle Brown's 'Creative Ambiguity' and Ideas of Co-creatorship in Selected Works," *Contemporary Music Review* 26, no. 3 (2007): 377-94.

[24] Richard Kostelanetz, *Conversing with Cage* (London: Routledge, 2003), 110.

[25] Steven Johnson, *The New York Schools of Music and Visual Arts* (London: Routledge, 2002), 45.

[26] Dolfi Trost, *Vision dans le cristal: oniromancie obsessionnelle et neuf graphomanies entoptiques* (Paris: Les Editons de l'Oubli, 1945). Author's translation.

[27] Pritchett, *The Music of John Cage*, 92.

[28] John Cage, *Variations I* (New York: Henmar Press, 1960).

[29] Miller, "The Shapes of Indeterminacy," 18-45. Patricia Kopatchinskaja, "CAGE, John (1912-1992): Variations I (1958)," https://en.patriciakopatchinskaja.com/cage.

[30] Nicholas Knouf, "Variations 10b: A Digital Realization of Cage's Variations II" (paper presented at MM'06, Santa Barbara, 23-27 October 2006).

[31] Pierpaolo Leo, "VARIATIONS II: Sound Installation by Pierpaolo Leo (2006)," http://www.pierpaololeo.it/interaction/variations.htm.

[32] Cat Hope, Lindsay Vickery, and Stuart James "Digital Adaptations of the Scores for Cage Variations I, II and III," in *Proceedings of the International Computer Music Conference*, eds., Matija Marolt, Martin Kaltenbrunner, and Miha Ciglar (Ljubljana: International Computer Music Association, 2012): 426-432.

[33] John Cage, *Aria* (New York: Henmar Press, 1960).

[34] La Monte Young, *An Anthology of Chance Operations* (New York: La Monte Young & Jackson Mac Low, 1963).

[35] Earl Brown, *Folio and Four Systems* (New York: AMP/Schirmer, 1954).

[36] David Behrman, "What Indeterminate Notation Determines," in Perspectives on Notation and Performance, eds. Benjamin Boretz & Edward T Cone (New York: Norton, 1976), 74-89.

[37] Thomas DeLio, "Sound, Gesture and Symbol.

[38] The Relation Between Notation and Structure in American Experimental Music," *Interface* 10, no.3-4 (1981).

[39] James Pritchett, "Audio and Video: Variations II (1961)," 2001, http://www.getty.edu/research/tools/guides_biblio graphies/david_tudor/av/variations.html.Michael Fowler, "A structural analysis of John Cage's Variations I," https://www.academia.edu/34856219/A_Structural_Analysis_of_Variations_I.

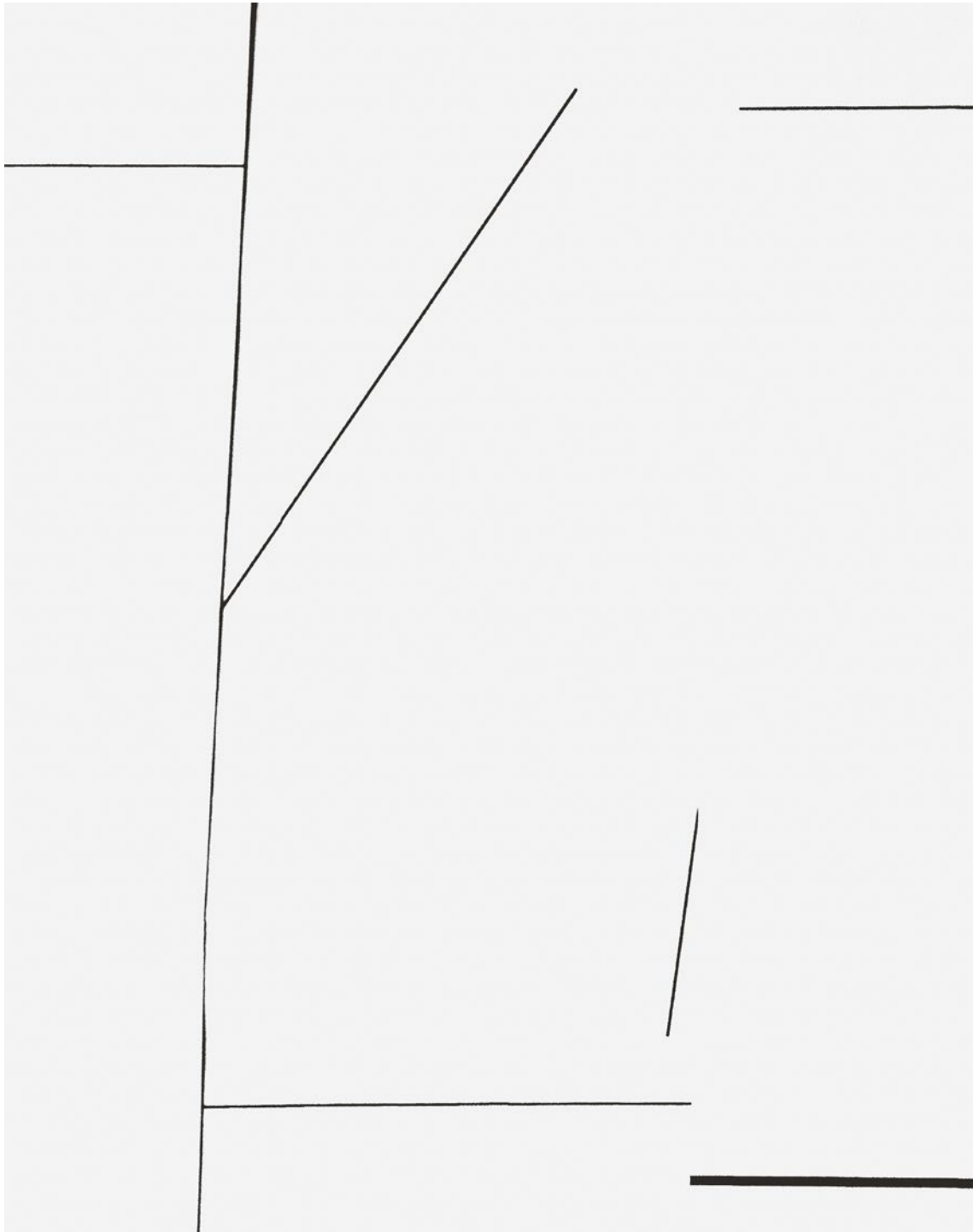
[40] Miller, "The Shapes of Indeterminacy," 42.

[41] Pritchett, *The Music of John Cage*, 136.

[42] Pritchett, *The Music of John Cage*, 149.

[43] Joseph, "Robert Morris and John Cage," 59-69.

[44] John Cage, *Variations III* (New York: Henmar Press, 1963).



The Complete John Cage Variations Project

Decibel

On *The Complete John Cage Variations Project* recordings, Decibel members all perform electronics and other sounds. In addition:

Cat Hope
[Artistic Director,
flutes, electric bass];

Lindsay Vickery [reeds,
score protoyping];

Stuart James [piano, drums,
program protoyping];

Aaron Wyatt [viola, iPad
programming];

Tristen Parr [cello].

Collaborators in these performances of *Variations V* and *VII* include Guy Fleming, Timothy Tate, Joel Stern, and movement artists Silvia Giuffrè, Laura Boynes, Rakini Devi, and Jan Baker Finch.

Recording, mixing, and mastering at Soundfield Studio. Theremin design and construction by Meg Travers. Light Sensors and pick up construction by Karl Ockelford.

You can download the Decibel John Cage Variations app for iPad from:
decibelnewmusic.com

Decibel acknowledges the contributions of many music and dance collaborators in The Complete John Cage Variations Project performances in Australia, Malaysia, and Italy. In particular, we would like to recognize the contributions of Lelio Giannetto at Curva Minore, Palermo, Italy where the project was premiered, Laura Kuhn at the Cage Trust, Alvin Lucier, Brian Brandt, Gene Caprioglio at Peters, Tos Mahoney at Tura New Music in Western Australia, as well as Clocked Out, Andrea Valle, Stefano Bassanese, Paulo Zavagna, Pietro Politto, Dario Sanfillipo, Laura Boynes, Stephen Adams, Laura Kuhn, Edith Cowan University, and Warren Burt.

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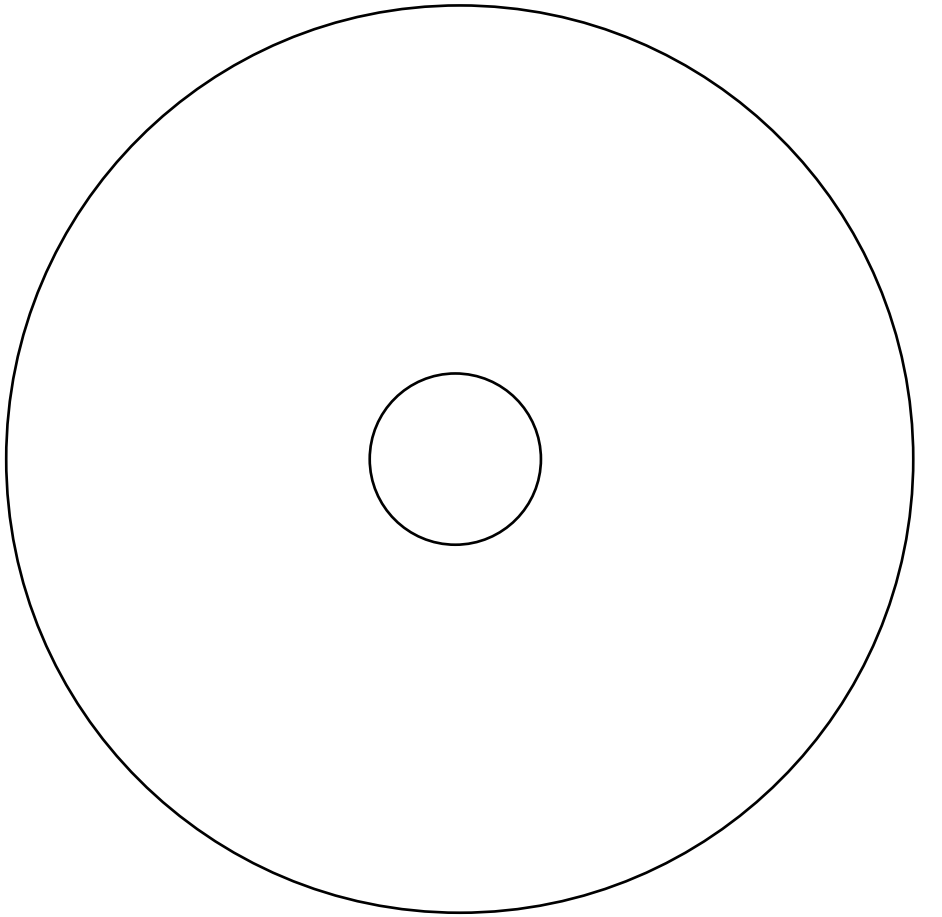
The Complete John Cage Variations Project

1. *Variations I* [bass clarinet, bass flute, and cello]
2. *Variations II* [alto saxophone, flute, viola, piano, and cello]
3. *Variations III* [drum set and a.m. radio]
4. *Variations IV* [cello, flute, viola, bass clarinet, and environmental sounds]
5. *Variations V* [reel to reel tapes and oscillators]
6. *Variations VI* [electric bass guitar and analogue effects, electric cello, and digital effects]
7. *Variations VII* [mobile phones, tablet computers, and laptops]
8. *Variations VIII* [no input feedback bass clarinet]



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