

Methods for Exploring Indeterminate Textuality in John Cage's Practices of Bibliographic Encoding

The Case of *M*

Zack Lischer-Katz

ABSTRACT

The increasing ubiquity of algorithmically mediated digital texts continues to generate debate about the instability and indeterminacy of texts. The American composer John Cage is well known for disrupting traditional Western aesthetics by incorporating chance operations, algorithms, and indeterminacy into his musical compositions and literary texts. This article analyzes materials found in the pre-print archive of Cage's printed book, M (published in 1973 by Wesleyan University Press), in order to understand how Cage brought his aesthetic of indeterminacy into print. Through analysis of archival materials, it is argued that Cage exercised control over the performance and reading of his texts, even as he ceded authorial control to the aleatory processes of the I Ching — the ancient Chinese book of divination — and to the arbitrary choices of the typesetter/printer. This article offers new understanding about algorithms and indeterminacy in the performance of bibliographic codes.¹

IN THE PRESENT “AGE OF ALGORITHMS” (LYNCH 2017) THAT WE NOW FIND ourselves in, there is increasing concern about how digital texts are produced algorithmically² and their impact on digital culture and preservation,

-
1. An earlier version of this paper, entitled “The *Book of Changes* and Print Fixity: John Cage's Aleatory Publishing Practices”, was presented at the 2014 Society for the History of Authorship Reading and Publishing annual conference in Antwerp, Belgium (September 17–21).
 2. Computer scientist, David Knuth (1996) defines an algorithm as “a precisely-defined sequence of rules telling how to produce specified output information from given input information in a finite number of steps” (5). In the age of social media platforms, algorithms help construct the content that we see, by processing massive databases using input variables derived from analyzing the

particularly with regards to how social media platforms assemble and serve to users assemblages of texts and images (ACKER and KREISBERG 2020). The emergence of new forms of digital texts has continued debates about the instability of texts and the indeterminacy of their production. Alan Galey points out that “even as we design new digital artefacts, we are still learning how books work, as well as manuscripts and other textual materials” (2010, 116). He also questions the assumption that digital texts are inherently less stable than written or printed texts: “As print- and manuscript-oriented textual scholars have long argued, past textual forms were never so immutable to begin with” (GALEY 2010, 116). Clifford Lynch suggests that the use of algorithms and complex interface structures makes digital texts indeterminate, such that a social media feed will produce different outcomes depending on who is accessing it and when: “While the ‘feed’ may be algorithmically generated, in a very real sense it’s not meaningfully reproducible” (2017, para. 10) because it depends on the user’s profile, the interrelations between their friends, and the content of dynamic databases. Looking to histories of indeterminacy and the use of algorithms in printed texts may offer some insight into current developments in our *textual condition* (MCGANN 1991).

In this article I examine how the American composer John Cage (1912–1992) produced his books to understand the role of algorithms and indeterminacy in printed texts. Cage is well known for disrupting traditional Western aesthetics by incorporating chance operations and indeterminacy into his compositions (NICHOLLS 2002). He emphasized that all sounds (even silence) were potential ingredients in performances and sought to remove (to varying degrees) the composer’s intent from processes of musical expression. In each medium he worked in,³ chance and

activities of each user and their interrelationships. It is not always possible to predict the particular output of a complex algorithm, even if you know the inputs (LYNCH 2017).

3. Cage’s musical work has seen extensive scholarly inquiry through a series of books, dissertations, websites (recently the New York Public Library produced an innovative participatory website “John Cage Unbound: A Living Archive”, presenting Cage’s scores, alongside crowd-sourced performances of the scores: <http://exhibitions.nysl.org/johncage/>), forums, and general discussion in academic and popular sites of discourse. His work in other artistic media, such as printmaking, painting, and book publishing, has typically garnered less attention. Some notable exceptions include BROWN 2000, 2001, who writes about Cage’s painting and printmaking activities, as well as an increasing number of articles over the last two decades on his literature, poetry, and word

indeterminacy played important roles in his creative process. These roles are most clearly seen in his use of the ancient Chinese book of divination, the *I Ching*. Analyzing Cage's under-examined book production process (PATTERSON 2002) helps me explore how themes of indeterminacy in textual production were negotiated in print. Cage's literary experiments offer important insights into how an author working within an aesthetic of indeterminacy negotiates the relative fixity of the printed text. How does Cage negotiate his philosophical and aesthetic concerns, guided by the *I Ching*, through the fixity of print? I argue that the answer to this question helps us understand the role of indeterminacy more broadly within the performance of bibliographic codes in printed and digital texts. This has implications for the value of analyzing today's world of algorithmically arranged texts from a bibliographic perspective.

Indeterminacy in Digital Textuality

Looking at Cage's printing practices in the production of his books has implications for textual scholarship concerned with bibliographic analysis in the age of digital texts. First, chance and indeterminacy are relevant to current discussions about digital texts. The variability of computer code is understood to be the foundation of the performance of digital texts' bibliographic codes.⁴ In other words, the production of digital texts introduces new dimensions of variability and indeterminacy to the production and consumption of texts. While digital texts require hardware and software environments that shape how the text appears, and the incorporation of interactivity and aleatory algorithms add variability, printed texts are often seen as relatively fixed.

An important distinction that has been made between print and digital texts involves the relative fixity of bibliographic codes. Printed texts are cast as fixed objects and digital texts are cast as indeterminate processes. From this perspective, a book is a stable object, while an eBook or other text is different each time it is "opened" and displayed on a screen.

art: see, for example, BRAUNE 2012, BROWN 2012, EDMEADES 2016, GILLOTT 2020, PATTERSON 2002, RETALLACK 2015, SPINOSA 2016, THOMPSON 2003, and WEAVER 2012, among earlier studies by PERLOFF 1981 and others.

4. MCGANN 1991 argues "meaning is transmitted through bibliographical as well as linguistic codes" (p. 57), which include non-linguistic, physical elements of texts, including ink, paper, typography, layout, and other elements that facilitate the reader's material engagement with the text.

N. Katherine Hayles (2006) has characterized indeterminacy and instability as distinctive characteristics of the material performance of the digital text that differentiate digital texts from print:

It is true that print texts also are affected by their conditions of production; a printing press with a defective letter e, let us say, will produce different artifacts than a press without this defect. Yet once the artifact is created, it remains (relatively) the same. With digital texts, changes of some kind happen virtually every time the text is performed, from small differences in timing to major glitches when a suddenly obsolete program tries to run on a platform that has not maintained backward compatibility.

(186)

Since a digital text is rendered at the time of its reading, when digital code is processed and displayed, its bibliographic codes can vary each time the text is interpreted. In addition to this inherent indeterminacy in the decoding and display of a digital text, affordances of viewing technologies encourage readers to actively shape bibliographic codes through reading practices. For example, they allow for the resizing of typeface and layout (which may change the pagination). In contrast, the bibliographic codes of a printed book remain little changed, beyond wear and tear each time a book is opened. However, while the material form and the indeterminacy of their bibliographic codes in digital texts are distinct from printed texts, awareness of their continuities has also been increasing.

In his bibliographic investigation of eBooks, Alan Galey (2012) suggested that the same epistemic orientation and concern for the materiality of texts that bibliographic analysis directs at printed texts can also be applied to digital texts. The visual, organizational and interactive components of digital texts have been shown by book historians and digital humanists to have antecedents in earlier printed forms.⁵ Focusing on the materialities of a text and how they become activated as bibliographic codes is increasingly important for understanding digital texts as bibliographic objects. Those materialities allow the textual analyst to go “deep” into the underlying databases, computer code, and software. Galey (2012) argues for the importance of “unveiling” an eBook’s underlying source code using digital tools. This level of analysis provides insights into the political, economic, and cultural factors that shape the text’s transmission, variants, and

5. See DRUCKER 2014 for a historical perspective on visualization and textual forms as *knowledge generators* in print and digital contexts.

forms. Yet, even as digital texts may be suitably analyzed with traditional bibliographic tools, this unveiling is always only partial; the complexity and depth of the layers of computing technology resists full knowability by the senses.

Analysis of digital texts also faces epistemological limitations imposed by their phenomenology, as Galey (2012) describes:

the different forms of e-books may have no rocky bottom, no absolute Real that serves to anchor the evidence of our senses. The reason is simple: e-books, like all digital texts, require us to interpret phenomena not directly observable by the senses. We must rely on layers upon layers of digital tools and interfaces. [. . .] A purely empirical and forensic perspective assumes that objects speak for themselves and yield up their evidence to the observation of human senses and the inquiry of human reason.

(240)

Galey makes an important distinction between digital and printed texts by using a metaphor of the “veiled” code of digital texts, always mediated by another technical layer at each level of analysis.⁶ He presents an epistemological divide between printed and digital texts that rests on differentiating objects of analysis based on what attributes are directly available to human observation with technical mediation. However, if textual theory acknowledges the archive as a site for recovering the indeterminate performance of the bibliographic codes of print, we can see that Galey’s (2012) claim that digital texts require researchers to “interpret phenomena not directly observable by the senses” (240) remains true for the performance of bibliographic codes in the medium of print.

Digital texts present new types of traces that can be analyzed as evidence of the production process in the form of computer codes and display technologies. However, this article stresses that printed texts also maintain depths of hidden evidence related to their materialization that are not proximate in space or time, up to the moment of reading or interpretation. Colophons are present in both contemporary print and eBooks, specifying some of the choices made by printers and typesetters when designing typography and executing layout. Yet only the eBook

6. See OWENS 2018 for a discussion of digital systems as “platforms layered on top of each other” and the implications of this for researchers and digital preservationists.

carries within or adjacent to itself some of the technological agents by which the text is materialized. The physical book, on the other hand, carries no printing press. Manuscripts are not accompanied by the pen, ink, bones, or flesh of the scribe's hand. For the printed book, the evidence of the activities of production lie elsewhere in space-time, distributed, and perhaps unrecoverable if the materials have been lost or destroyed. They may lie in the printer and the typesetter's offices, the pre-print archive, or in the editors and author's notes on the proofs.⁷

Considering more closely the genesis of a text's bibliographic codes — regardless of temporal and spatial displacement — offers a new methodological approach to compare printed and digital texts. The bibliographic codes of the digital text can be conceptualized as being performed in the present, at (or very close to) the time of reading. The printed text is partly indeterminate as well, but the performance of its bibliographic codes is temporally and spatially distanced from the materialization of the text into human readable form while reading. Recovering this aspect of the indeterminacy of print requires going beyond the extant text to its archive.⁸

The traces of the pre-print archive of a printed text can be analyzed in terms of its traces of the encoding and performance of bibliographic codes. In this way, my analysis opens a horizon for textual analysis by accounting for the displaced nature of textual performance. This feat involves different skills and activities than those required by digital texts, which may involve media archaeology or digital forensics over traditional archival research. But by acknowledging the continuity of an underlying, indeterminate

-
7. This is not to say that eBooks contain a complete archive that contains all traces of all agents involved in the performance of a text. A range of agents, from the code of the eBook authoring software and the human agents responsible for properly formatting the eBook file, may or may not leave discoverable traces within the code of an eBook. Thus, while an eBook does not necessarily offer more potential traces of its production open to analysis than a printed book, the material fixity of bibliographic codes and the moment of interpretation of those codes in the case of the eBook can be seen to be proximate, offering a rich site for analysis for eBooks that is only recoverable in the print world through a trip to the pre-print archive.
 8. What this means is that print can only be said to be fixed when speaking from the space-time of the printed page, which is always a past process (*printing*) sedimented within the present material of an object (*page*), and thus, investigating the history of the text's production can recover lost moments of indeterminacy in the production of bibliographic codes.

source or archive of bibliographic codes in both digital and printed texts, the analytic models of analysis for each can be brought closer together. Uniting these methodologies thus allows for clearer theoretical and empirical investigations into the nature of textuality, such as the question of indeterminacy within the performance of bibliographic codes.

In order to recover Cage's techniques for integrating an aesthetic of indeterminacy into the fixity of print, the following sections will examine John Cage's archive from his book *M* (published by Wesleyan University Press in 1973). Specifically, I'll interpret Cage's techniques for encoding bibliographic codes by analyzing his instructions to the printer found on the edited typescript of *M* and contextualizing these techniques within his general aesthetic philosophy. To lay the groundwork for conducting a closer analysis of *M*, I'll first discuss Cage and his aleatory aesthetic practices.

How Cage Uses Indeterminacy

By integrating chance and indeterminacy as generative aesthetic forces in composition, Cage questioned the traditional construction of authorship and the supposedly determinate relationship between musical notations and sounds. He blurred distinctions between music and noise, sound and language. He also mingled and merged distinct literary forms such as poetry, word art, essays, and experimental prose. For instance, "Indeterminacy" (1959) is composed of ninety short stories, each of which is supposed to be read in the space of sixty seconds. It was recorded and released by Folkways Records as a record (Vinyl LP), in which Cage read the stories and David Tudor provided piano accompaniment. It was also published by Edition Peters in the form of a score, consisting of a booklet with instructions and a set of ninety cards (one for each story) that could be reordered to modify the performance. Barry Alpert (1975) discussed Cage's performance in the context of "post-modern oral poetry", but confining Cage's work to a single genre is problematic. Through his practice, Cage himself questioned the role of the composer/artist/writer in "authoring" an aesthetic work. Cage even took steps to remove authorial intention from certain aspects of the production of his texts by using "chance operations" — algorithmic processes that produced randomly-generated outputs — while maintaining strict authorial control over other aspects.

Cage frequently used the *I Ching* to bring chance into his compositions and explore how to remove the decisions or tastes of its creator. His use of the *I Ching* began in the 1950s and continued throughout his career.

Cage said that he was initially introduced to the *I Ching* by composer Lou Harrison as early 1936, but he did not use it for generating random values in his compositions at that time (CAGE 1988). Around 1950, Christian Wolff gave Cage a copy of Cary F. Baynes's translation of the Richard Wilhelm edition (WOLFF and PATTERSON 1994; CAGE 1988), which inspired Cage to use it in his compositions, greatly contributing to his 1951 *Music of Changes* (SMITH 2012).

The *I Ching* was traditionally used as an oracle. Important questions about an individual's life and political decisions could be asked of this "ergodic text". Espen Aarseth (1997) coined the term "ergodic literature" to refer to literature in which "non trivial effort is required to allow the reader to traverse the text" (1). In fact, Aarseth cites the *I Ching* as one of his prime examples of *ergodic literature*, since real work is necessary (i.e., the throwing of coins or yarrow stalks, the calculation of the hexagrams, and use of the index to locate the appropriate section in the book where that hexagram's prophesy is located) to make the text function and become interpretable. In conjunction with randomly generated numbers, it would present statements of wisdom to the inquirer/reader (SMITH 2012). The traditional Chinese practice of divination utilized a bundle of yarrow stalks, but the common Western version adopted the practice of tossing three coins a total of six times to produce the six marks of a hexagram (SMITH 2012).⁹ Once the hexagram has been visually identified on the included chart (a foldout between the index and the flyleaves of the Wilhelm/Baynes edition), a number between 1 and 64 is generated (CAGE 1961). This number is used to locate the place in the book where a description of that hexagram's "wisdom" is located — the oracle's answer to the question posed in the form of enigmatic prose — and is open to interpretation (SMITH 2012). Thus, the numbers generated through the process served a basic indexing function for linking randomly generated hexagrams with numerically associated "wisdoms" within the pages of the book.

For Cage, the *I Ching* was a mechanism for generating random number values to guide the composition of his works (SMITH 2012). Randomness was part of his effort to remove some aspects of his intentionality (and psychological baggage) from the creative process (SHULTIS 1995) and generate new aesthetic properties (TURNER 2013), unexpected sonic events

9. The hexagram is drawn out from bottom to top as a series of broken and unbroken lines, with the potential for change lines, which are broken lines that may be in the process of changing to complete lines and complete lines that are in the process of changing to broken lines (see SMITH 2012).

and arrangements of sounds that the composer could not predict in advance. According to Kyle Gann (2002), Cage was primarily concerned with the number-generating capacity of the *I Ching* over its mystical dimensions. In describing the composition of his 1951 musical pieces, *Music of Changes* and *Imaginary Landscape No. 4*, Cage explained that the *I Ching* enabled him “to make a musical composition the continuity of which is free of individual taste and memory (psychology) and also of the literature and ‘traditions’ of the art” (CAGE 1961, 59). For Cage, the ritual of throwing the coins became increasingly irrelevant to his creative process. At times he would use a computer program, developed by Ed Kobrin of the University of Illinois, to produce the *I Ching* hexagrams and values (KOBKIN 1970).

Cage’s use of chance operations reveals an essential part of Cage’s creative process. It relied on establishing a system in which *I Ching*-generated values could produce effects, rather than determine precisely what effects would occur. For instance, he might associate certain sections of a piano keyboard with *I Ching* hexagrams 1–8. Then he could assign playing techniques (for instance, plucking the piano strings) to hexagrams 9–16, particular dynamics to 17–25, and so forth (CAGE 1961). And then, he would consult the *I Ching* to generate values that determined how these elements would be assembled. Different compositions would involve the *I Ching* in various ways, but its function as a random number generator was central to the process. The generation of certain *I Ching* hexagrams would produce variations in the generation of sounds following a pre-designed plan linking sound parameters to numerical inputs. In this way, Cage established an algorithmic system of composition that takes randomly generated numbers for its input. Cage’s constitutive authorial gesture lies in his selection and assembly of certain quantitative and qualitative musical parameters that could be varied using the discrete values produced as output from the *I Ching* procedures.

Christopher Shultis (1995) has explored Cage’s approach to “nonintentionality”, seeing his use of chance operations as stripping away the author’s intention by remaking words into sounds or music. By analyzing his texts more closely, Shultis (1995) shows how Cage’s creative process works against attempts at nonintentionality, re-introducing structure in significant ways:

Thus what initially appears to be an improvised and haphazard text is actually extremely well-organized. Some aspects of form are the result of chance operations and some aren’t. The contents, on the other hand, are clearly the result of trying to meet the extraordinary demands of

numerical form, subject matter and personal taste. Even though the juxtapositions, as Cage points out, are chance-derived, the composer's role is so pervasive that the resultant collage of text is, if not completely determined, at least predictable.

(336)

Cage takes similar care in the production of his published books. Cage's books, as compilations of his textual experiments, offer an important way to examine how he negotiated the tensions between the fixity of print, avant-garde aesthetic practice, and the role of performance in textual production. Between 1961 and 1983, Cage published five full-length books with Wesleyan University Press: *Silence: Lectures and Writings* (1961, 276 pp.); *A Year from Monday: New Lectures and Writings* (1967, 167 pp.); *M: Writings '67-'72* (1973, 217 pp.); *Empty Words: Writings '73-'78* (1979, 187 pp.); and *X: Writings '79-'82* (1983, 187 pp.). His third book, *M*, is the focus of this essay because it was published in the middle of this series and offers an inflection point in Cage's writing practice. As noted by Arthur Sabatini (1989), within his first two books published with Wesleyan, *Silence* and *A Year from Monday*, "Cage still remained within the bounds of conventional linear form and the writings employ ordinary syntax. [. . .] With *M*, Cage's writings become more minimal, graphic, and harshly disciplined" (86). *M* also offers a cross section of Cage's main literary innovations — the diaries and mesostics¹⁰ — which provides a sample of his creative process at this important point in his career.

Archival Investigations of Cage's *M*

M contains writings by Cage from 1967–1972 and was published in 1973 by Wesleyan University Press. I chose *M* for closer study because of the availability of pre-print materials related to it within Cage's archive and because it offers insight into Cage's philosophic approach to textual

10. Shultis (1995) notes that Cage's writings, for the most part, are not formally innovative from a literary or poetic point of view, except for his mesostics and his diaries. He analyzed Cage's notebooks to show the process of writing the diaries, including the role of the *I Ching* and other chance operations to produce the form of the diaries. These diaries would appear in various forms in the 1960s in academic journals, exhibition catalogs, and in small press pamphlets and university press books, including reprints in three of his WUP books, *A Year from Monday* (1967), *M* (1973), and *X* (1983).

production in the middle part of the series of books he published with Wesleyan. As noted earlier, Arthur Sabatini (1989) sees *M* as an important transition in Cage's literary approach. Looking at Cage's turn towards the more extreme, literary analysis of *M* provides a case for how far the "encoding" of printed typography can be pushed by presenting the author as "composer" of the indeterminate performance of the text's form by the printer. The pre-print archive for *M* offers the typographic "source code" for the printed book, giving insight into the role aesthetic indeterminacy can play in the performance of bibliographic codes.

At first glance, *M* appears to be a collection of essays, poetry, and word art, at home alongside other texts in the history of experimental literary works. Examining the edited typescript of this book makes manifest Cage's efforts to introduce chance operations and algorithms into his text. Behind the scenes, they often frustrate the requirements of print fixity even as Cage rigorously encoded a system for specifying the final form of the printed book. Three sections of this book will serve as exemplars of Cage's process: "62 Mesostics re Merce Cunningham", "'Diary: How to Improve the World (You Will Only Make Matters Worse)' (continued 1968; revised version)", and "'Diary: How to Improve the World (You Will Only Make Matters Worse)' (continued 1970–71)". Analysis of these sections will help identify the range of strategies that Cage employed in producing the final form of his printed book.

The piece "62 Mesostics re Merce Cunningham" appears in Cage's *oeuvre* as both a musical score and a written text. "Mesostics" is a term coined by Cage that refers to a modified version of the familiar word play known as "acrostics", wherein the first letter of each line (or other division) of a poem or other literary composition spells out a word, sentence, or the alphabet. In Cage's mesostics, a selection of words is made from other texts. They are arranged in a column by using the *I Ching*, such that their middle letters spell out a new word if read vertically from the top of the column to the bottom. Cage has stated that "62 Mesostics re Merce Cunningham" is meant to be sung, not just read. Cage explained the reason for his typographic complexity in a note on the typescript for the musical score version of "62 Mesostics" (held by the New York Public Library): "To raise language's temperature we not only remove syntax: we give each letter undivided attention setting it in unique face and size; to read becomes the verb to sing."¹¹ Looking at this sequence of 62 mesostics distributed

11. John Cage, "Sixty-two Mesostics Re Merce Cunningham, For Voice Unaccompanied Using Microphone, 1971" [typescript] (1971), JPB 95–3, Folder 479, John Cage Manuscript Collection, New York Public Library, New York, NY.

throughout the pages of *M*, constructed and dispersed based on *I Ching*-activated chance operations,¹² the typography disrupts reading and makes singing difficult.

The explosive, seemingly random arrangement of typographic faces, sizes, and weights disrupts silent reading, breaking down linguistic codes and requiring greater focus on the part of the reader to engage with each individual letterform as they attempt to read the text (see Fig. 1, below). Cage's mesostics appear as destabilized texts that oscillate between image and sound, graphic form and linguistic signifier. Here, Cage describes his intentions to shift the page as a site for reading — an often silent, linguistic activity — to a musical performance that engages with (formerly) linguistic signifiers stripped of most of their syntax.¹³ By vocalizing the words, the reader becomes a performer of the text, and the results are compositionally

4



Figure 1. Mesostic #1, from “64 Mesostics for Merce Cunningham” (*M*, 4). © C. Peters, Inc. and Henmar Press.

12. These 62 mesostics appear separately on the following pages of *M*: 4, 6, 9, 11, 14, 19, 23, 29, 39, 53, 58, 62, 64, 66, 68, 71, 73, 79, 82, 85, 87, 89, 92, 93, 97, 100, 104, 108, 112, 123, 125, 130, 131, 135, 136, 138, 139, 143, 146, 148, 150, 151, 154, 155, 159, 162, 163, 169, 173, 179, 182, 184, 185, 189, 191, 193, 194, 200, 202, 203, 208, & 214. Their random distribution offers evidence of further *I Ching*-guided assembly of Cage's book.
13. Cage's readings of his own works were also often framed as musical performances, as in the case of the recording of “Indeterminacy” discussed earlier.

indeterminate. That is, the reader/performer is given latitude to read or perform the letter forms at their liberty. Cage does not provide indications for pitches or tempo, for example.

In “62 Mesostics” Cage is attempting to free vocalized sounds from the deterministic realm of conventionalized linguistic codes by stripping them of their semantic meaning and transforming letters to graphic forms. However, the text of the mesostics is difficult to read without added effort, which Cage himself acknowledged. For instance, in the performing notes for the musical score version of the piece, Cage provides a version of the “Mesostics” in which the bibliographic codes are normalized to the same typeface, size, and ink weight. Normalization helps to, in his words, “facilitate study”,¹⁴ and yields a performance in which the performer is less likely to fumble when reading the difficult typography. Because there is no notational convention for interpreting this typography for musical performance, each performer’s performance of “62 Mesostics” becomes highly indeterminate and unique.

Cage’s remarks to Daniel Charles about “62 Mesostics” suggest that we may freely interpret the varying typography as akin to the range of symbols that dot his musical scores, through performative enunciation and/or ludic reading: “Typographic changes, like the ‘mosaic’ [*sic, likely intended* ‘mesostic’] form are noises which erupt in the book! At one and the same time, the book is condemned to nonexistence and the book comes into being. It can welcome everything.”¹⁵ The types of performances and readings allowed by Cage’s mesostics can be seen as indeterminate from the positions of authorial intent or notational convention. However, the notes he made on his corrected typescript for the following sections of *M* reveals an artist closed to liberated interpretation. He was very precise in his communications with the printer, showing how he dealt with indeterminacy differently in the production of bibliographic codes than in the freedoms given to performers/readers to interpret texts. In fact, his comments at the proof stage are fairly conventional and do not deviate much from the corrections that other authors might make at this stage in book production. Cage provides more freedom to the compositor and printer in early stages, as will be discussed in the next section.

14. John Cage, “Sixty-two Mesostics Re Merce Cunningham, For Voice Unaccompanied Using Microphone, 1971” [typescript] (1971), JPB 95–3, Folder 479, John Cage Manuscript Collection, New York Public Library, New York, NY.

15. Cage, quoted in SABATINI 1989, 85.

Encoding Bibliographic Codes

Further analysis of the edited typescript for M initially reveals other conventional notes concerning layout and typeface. For instance, the title page of the corrected typescript specifies “14/18 Times Roman set as three centered lines.” However, the following sections of the typescript reveal an increasingly complex array of notes to the printer. In the case of “‘Diary: How to Improve the World (You Will Only Make Matters Worse)’ Continued 1968 (revised version)”, the margins of the pages are dotted with unusual, circled numbers (ranging from 1 to 12) in red pencil, with various percentages (ranging from 10% to 100%) running along the right margin (see Fig. 2, below), likely written by Cage. Cage also drew precisely spaced vertical lines (in pencil, drawn with the aid of a ruler or T-square) to precisely align the otherwise seemingly arbitrary placement of lines of text.

These precise vertical lines give the horizontal lines of text a metric quality akin to a musical score, graph, or timeline. However, the intended effect of the placement of symbols is to produce indeterminate results; the meaning of the notational system is not specified, nor does it follow a known conventional scheme. The apparently arbitrary alignment to very precise lines suggests that Cage may again be utilizing the chance operations of the *I Ching* to align lines of text as well as to generate the numbers and percentages along the margins of the edited typescript. The percentages running along the right margin of “‘Diary: How to Improve the World (You Will Only Make Matters Worse)’ (continued 1968)” are likely ink weights, while the circled numbers seem to refer to different typefaces. In a note written on the right margin in Cage’s hand we find the following instruction: “10/14 line for line, align vertically [,] see code sheet for type face changes.”¹⁶ The first half of this instruction refers to type size and alignment using conventional printing instructions, while the second half indicates that the bibliographic codes of M have an underlying encoding schema. The aforementioned “code sheet” could not be found in Cage’s archive, so it is unclear whether Cage provided it to the printer, or if the printer generated it.

16. John Cage, “‘Diary: How to Improve the World (You Will Only Make Matters Worse)’ (continued 1968)” [edited typescript], Box 8, Folder 23, John Cage Papers, Special Collections, Olin Library, Wesleyan University, Middletown, CT.

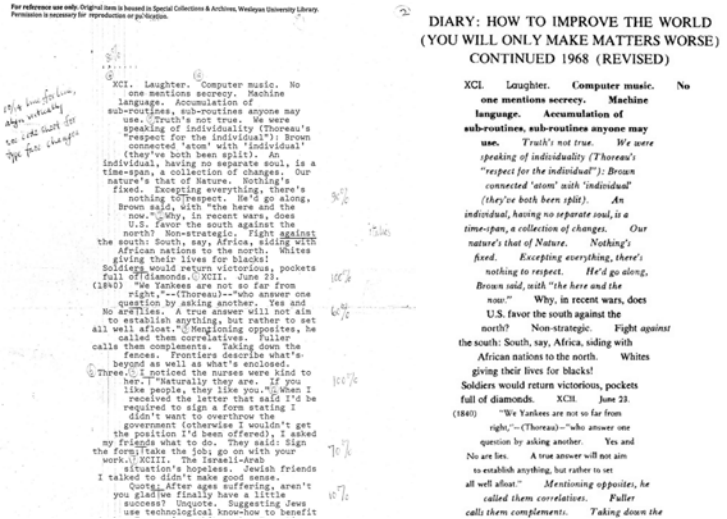


Figure 2. “Diary: How to Improve the World (You Will Only Make Matters Worse)’ Continued 1968 (Revised)” Typescript [Left] and Final Printed Layout [Right] (M, 3). © John Cage Trust.

In the case of our third example, “Diary: How to Improve the World (You Will Only Make Matters Worse)’ (continued 1970–71)” (see Fig. 3, below), we find the following text scrawled in Cage’s hand on the title page of the corrected typescript: “Note for Printer: Without reference to the text, choose + number 12 different type faces (having more less the same size) then set text following the circled red numbers. Ink percentages (10–100%) are given marginally + take effect after a T mark.”¹⁷ Cage drew the rigid arrangement of equally spaced vertical lines down the page to show how the precise alignment of his text was a counterpoint to the freedom he afforded to the typesetters/printers to “perform” the finished textual product as they see fit, by assigning numbers to typefaces. For this text, Cage demanded precision in his words and their execution in text but left the specific selection of typefaces — their bibliographic encoding — to the discretion of the printer.

17. John Cage, “Diary: How to Improve the World (You Will Only Make Matters Worse)’ (continued 1970–71)” [edited typescript], Box 8, Folder 23, John Cage Papers, Special Collections, Olin Library, Wesleyan University, Middletown, CT.

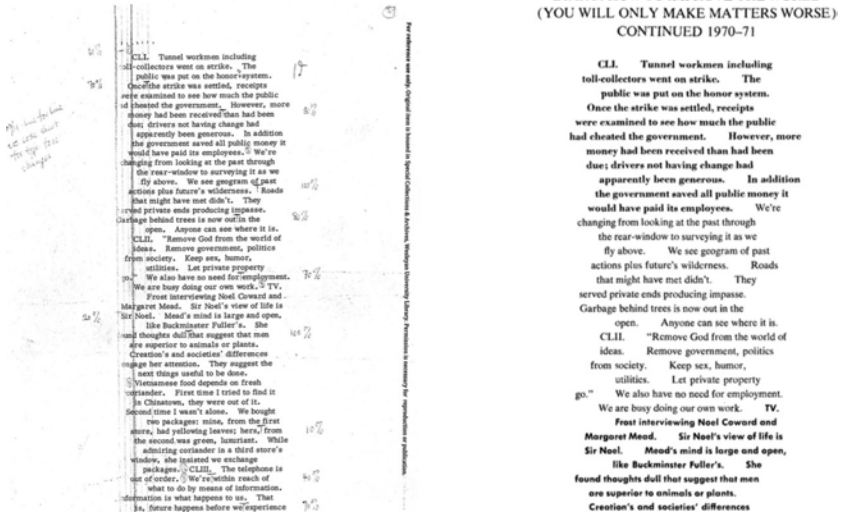


Figure 3. "Diary: How to Improve the World (You Will Only Make Matters Worse)" (continued 1970-71). Typescript and Final Printed Layout (CAGE 1973, 96). © John Cage Trust.

Printing as Performance

While Cage assigned the indeterminate encoding of bibliographic codes to the printer, he did not give them complete freedom, nor did he allow for any errors in their work. For Cage, chance and indeterminacy are only acceptable when they unfold within the confines of the rules he establishes. Printers' errors were unacceptable deviations from Cage's copytext, even though they too were products of chance. This letter of complaint to the printer, issued by Cage after the printing of his later book *Empty Words* (published in 1979 by Wesleyan University Press), shows how even minor inconsistencies between text and his corrected typescript and galleys would not be tolerated: "[Dated Sept. 1, 1979 (returned Sep 04 1979)] I have just noticed that the mesostic on pg. 122 of *Empty Words* is incorrect. I then checked the galleys which are correct. Something went wrong [sic] after that. The first line should read 'She', not 'She does this'. And the eighth line should read 'and She does this', not 'and She'. Should there be

another printing please have this correction made.”¹⁸ While Cage sought to collapse distinctions between chance and authorial purpose, this shows that unacceptable errors (to Cage) could emerge when the printer acted outside the rules that Cage specified.

These sorts of printing errors operated outside of the acceptable dimensions of indeterminacy sanctioned by Cage (and one might wonder if Cage meant to misspell “wrong” as “wront” in his complaint?). In his corrections to the typescript for the earlier book, *Silence* (published by Wesleyan University Press in 1961), we see only a few changes requested by Cage. For instance, he requested replacing “psychoanalysis” with “psychology”, and some other minor proofreading marks in his essay, “Experimental Music”.¹⁹ Besides his notes on alignment and typography, the bibliographic codes and the text change little in his corrected typescripts. He also did not appear to welcome any changes made by the printer, since there were no instructions similar to those on the typescript for *M* that would give the printer permission to modulate the typography.

Cage’s efforts to lock his aleatory processes into the regular layout of the material page positions Cage alongside other modernist authors who were very concerned with the layout and typography of their books (e.g., Ezra Pound), but who did not use random or automatic processes. In fact, his efforts seem less experimental than the avant-garde of the earlier 20th century, embodied by the Dadaists, Surrealists, and other movements that sought to manipulate the form of the book in more extravagant ways. What mattered to Cage was injecting chance into the construction of his books in precise ways and at precise times, all the while ensuring that those bursts of randomness were tightly constrained and regulated within the systems that he devised. Chance was allowed to enter into the parts of the book where Cage allowed it in, producing texts that followed his instructions, but were still unpredictable in some ways. Even though chance operations played an important role, Cage’s writing could be better characterized as “algorithmic”, rather than “automatic”, i.e., the result of the interplay between a carefully constructed set of instructions for data processing and a carefully curated linguistic corpus, rather than the emergence of subconscious or otherworldly writings.

18. John Cage, “Correction to Printing of Empty Words” [Letter], Box 5, Folder 7, John Cage Papers, Special Collections, Olin Library, Wesleyan University, Middletown, CT.

19. John Cage, “Experimental Music (*Silence*)” [corrected typescript], (Winter 1957), Box 5, Folder 8, John Cage Papers, Special Collections, Olin Library, Wesleyan University, Middletown, CT.

While the precise visual forms that his words take in their bibliographic encoding have some degree of indeterminacy, the printer's performance must otherwise strictly conform to the author's intent. Similarly, in his musical compositions, Cage often maintained strict control over the visual qualities of his scores by employing photographic printing techniques. While the corrected typescript for *M* has the appearance of a set of experimental instructions directed towards a printer who Cage constructs at times as a "performer", the typescript's formal specifications are precisely structured, allowing for improvisation only when selecting the set of typefaces to be used for several sections of the book. This follows Cage's compositional strategies in his scores, in which he gives the performers freedom to make decisions in the execution of various musical parameters, such as leaving the choice of instrumentation open but precisely specifying the notes.

In other compositions he would specify the instrumentation and timing, but leave the choice of such parameters as pitches, durations, and dynamics up to the performers. Thus, while the construction of the book is guided by Cage's preoccupations with chance operations activated by the *I Ching* — from the placement of the mesostics on particular pages throughout the book, to the alignment of lines of text and the distribution of codes and font weights — the performance of the text into a fixed form remains highly constrained by the author's design. The process of producing the form of his books, as the playing out of instructions of the author by the printer, itself becomes a performance that is mediated by random numbers generated by the *I Ching*. This performance remains concealed within the text, observable only when accessing the book's archival materials.

Cage's Indeterminacy within the Fixity of Print

These cases drawn from *M* and contextualized within Cage's other writings show that at times, Cage took more control over the form of the book. While incorporating chance and indeterminacy into some aspects of book production, his edited typescript for *M* also shows that he exercised considerable authorial control over the final bibliographic codes of the book. Cage took steps to maintain his authorship by working to constrain the process of socialization inherent to all texts and allowing indeterminacy into only certain aspects of his works.²⁰

20. MCKENZIE 1999 encourages bibliographers "to consider the human motives and interactions which texts involve at every stage of their production, transmission, and consumption" (15). See also BROUDE 2011.

These findings from an examination of M support Arthur Sabatini's (1989) suggestion that Cage's printing practices ran counter to the discourse of his radical aesthetics. He argues that Cage naively mobilizes his aesthetics of indeterminacy to create a system that ignores the complex relationship between the author and the reader:

As for certain techniques Cage selects, the utilization of common typographic materials serves to collapse the reading/writing process — by implying that the commercial intermediaries (editors, publishers, printers, distributors) between author and reader are nonexistent. But, ultimately, these meanings are part of the invisible operations that constitute the history of a book [. . .]

(85)

Thus, Cage's use of indeterminacy to circumvent authorship and unconscious biases assumes a modernist ontology that dichotomizes social and natural phenomena, even as it attempts to break it down by removing authorial intent. Benjamin Piekut (2013) explains, "like any good experimentalist of the modern era, he claimed to have attenuated his own role in his musical trials so that we might have direct, unmediated access to this world. And yet, his compositional practice contradicted this modernist ontology of nature at every turn by actively *forming* that world that he purported merely to discover" (135). In his work, Cage uses the algorithmic *I Ching* to overcome the division between nature and culture by putting nature into the authorial role. Linking chance and indeterminacy shapes the outcome of musical and textual performance. However, by reifying nature and assuming the tools of artistic production are pure conduits for artistic events to unfold, he reproduces this modernist division. Furthermore, just as digital algorithms are misleadingly promoted by their creators as efficient and unbiased mediators that produce fairer results, insulated from the prejudices of human decision making,²¹ Cage's "algorithm" also turns out to be a human construct. The process of selecting what inputs and outputs to utilize shows the taste and biases of the users of the algorithm.

21. Recent critics point to the ways that algorithms, in fact, embed human biases in hidden and pernicious ways that resist transparency and accountability. For example, see NOBLE 2018 and O'NEIL 2016 for discussions on current concerns about racism (among other biases) in the deployment of algorithms into policy-making and institutional evaluation and decision-making practices.

This analysis of the archive of *M* also suggests that Cage was aware of the contingencies in book production that shaped a book's bibliographic codes. However, he worked to conceal this messiness of printing within a closed system of textual transmission that he constructed and maintained control over. We can see that the few degrees of freedom that Cage offered to the printer are minimal in comparison to the strict guidelines he provided and enforced. Instead of proposing radical new printing techniques, Cage used the traditional materials and forms available to him. He effaced the social processes of bibliographic performance by using a variety of aleatory techniques to give the appearance of a radical text. In fact, he produced a text amenable to printing practices — it still fits within the margins of the page, is bound, and can be shelved next to other books — and to authorial control over the resulting bibliographic codes. The five books he published with WUP also share similar covers and formats.

Cage provides some explanations in *M* about the printing process, but he keeps most of it hidden. For instance, in the Foreword of *M*, Cage explains the process of selecting the title of the book: "The title of this book was obtained by subjecting the twenty-six letters of the alphabet to an I Ching chance operation. As I see it, any other letter would have served as well, though *M* is, to be sure, the first letter of many words and names that have concerned me for many years (music, mushrooms, Marcel Duchamp, M.C. Richards, Morris Graves, Mark Tobey, Merce Cunningham, Marshall McLuhan" (1973, ix). Cage puts the traditional acknowledgement of the design and printing of the book into tension with the generative agency of aleatory machinations when he writes, "this book was printed by the Halliday Lithograph Corporation and bound by Stanhope Bindery. Designed with the aid of I Ching chance operations" (1973, 219). By explaining some elements of his process (the selection of typefaces for several pieces), but concealing others (the notes to the printer only appear on the edited typescript), Cage reveals only what he wants to reveal, precisely defining where in the process of the text's socialization he wants to position the reader and what he allows them to observe.

Sabatini (1989) suggests that Cage's use of italicized notes throughout his books to introduce and explain his texts delimits the text's interpretation and controls the reader: "Reading is only truly reading, the italics imply, when it follows Cage's rules (e.g., each story in 'How to Pass, Kick, Fall, and Run' [in *A Year from Monday*, published in 1967 by Wesleyan University Press] takes one minute to read)" (80). A critique of control fits into a commentary on Cage's art in general, in which his conceptions of chance and indeterminacy — as methods of liberation from oppressive formulas

of Western aesthetic convention — are in tension with his heightened authorial control (SHULTIS 1995; PIEKUT 2015). Cage subverts artistic intentionality through the algorithm of the *I Ching* and other techniques even as his taste and aesthetic interests still guide the selection of texts, how the chance operations will activate the bibliographic codes, and the final arrangement of textual products in each book (including his efforts to correct any printer errors).

Even as Cage exercised more control over the text in many ways, the randomness that he incorporated into his writing had the effect of dispersing authorship between the algorithmic processes of the *I Ching*, the databases that held textual elements, and the performance of the reader of the text. As Spinosa (2016) suggests in regard to the Cunningham mesostics:

the poems are written by a sort of collective involving Cage, who asks the questions, and Cunningham, whose work dictated the source texts Cage would choose from and which books he ultimately chose, but also including the *I Ching* and the Letraset typefaces, all working together. Finally, we must also include the reader in this collaborative view of the poems' production. As the reader enters in the comunis of communication with the texts and takes value from the intensities of the noise produced in the asyntactical poems, she engages in this production in a manner that Cage, as author, can neither control nor predict.

(37)

It is also clear that Cage assembled his texts using algorithmic logics (based on the procedure and random values assigned by the *I Ching*) and database logics (breaking down collections of literary sources into individual units that could be assembled and “processed” through the *I Ching* and his instructions and selection process). Together, these logics gave him great control over how his systems of texts functioned, even if he was unable to predict how the final output would appear. Cage maintained control over the selection of his source materials and processes of assembly, and in the final edit, selected texts that fit with his taste and aesthetics.

Examination of Cage's *M* suggests that indeterminacy may best be conceptualized as a relative rather than absolute attribute of texts and can emerge in a range of bibliographic practices. Such an adjusted concept of indeterminacy fits within the history of other avant-garde literary practices that employed chance. Jonathan Baillehache (2013) sees parallels between the aleatory text-generating practices of 1930s avant-garde artists and more

recent experiments in randomized, algorithmic assembly of electronic texts: “Whether using computational algorithms to create generative poetry, shuffling bags to produce Dada poetry, mixing various print techniques to craft Futurist poetry, or creating new writing protocols to generate Surrealist prose, avant-garde literature performs a misuse of our most familiar media that brings forth their respective materiality” (54). The surrealists employed cutups, random word grab bags, and automatic writing techniques to incorporate randomness and indeterminacy into the production of texts. Similarly, hypertext, electronic poetry from the 1990s–2000s, and more recent glitch-based and digital texts constructed from unpredictable computer algorithms continue to play with the relationship between chance, textual performance, and the constraints of the medium of expression. Aesthetic indeterminacy can thus be seen as a hybrid mode of engaging with the expressive affordances of the landscape of available media formats to produce artistic works that simultaneously remove the will of the creator, promoting new and unpredictable aesthetic elements to emerge, while at the same time putting the creator in the role of creating the rules and systems by which those elements may emerge. The creation of those rules and systems is social as much as it is aesthetic and aleatory.

Conclusion

Analyzing Cage’s *M* brings new insights about indeterminacy into the performance of bibliographic codes. Cage’s practices of assembling this book suggest that a key distinction between printed and digital texts may lie between the space-time configuration of the indeterminacy of bibliographic performance and that of reading/interpretation. While the indeterminacy of digital texts can be attributed to the fact that their bibliographic codes are performed *at* the space-time of reading/interpretation, the indeterminacy of printed texts often remains hidden away in the archives of print production. The indeterminacy of a printed text can thus be conceptualized to unfold not just at the time of reading, but earlier — during the printer’s interpretation of copytext as a bibliographic performance. This bibliographic performance is indeterminate to some degree in the production of all types of texts — after all the compositors and printers may make mistakes, errors might crop up, paper quality might fluctuate, etc. However, the degree of indeterminacy is intensified for experimental texts that actively work

against conventions and that may require that the printer take an active role. The fixity of print, seen as a process that occurs over time-space, is thus indeterminate — given to chance and the unpredictable and contingent actions of human and machinic actors — both in terms of its bibliographic codes (which typically appear fixed) and its linguistic codes that emerge at the time of reading. These tensions play out in all books, but experimental texts often use indeterminacy as part of their aesthetic, and often this is foregrounded and made apparent to shape the time of reading. These tensions play out in different ways over time, with indeterminacy of bibliographic performance and the indeterminacy of reading having different meanings in different historical moments. Marjorie Perloff (1981), for instance, defines the anti-Symbolist poetry that emerged in late 19th and early 20th-century, “from Rimbaud to Stein, Pound, and Williams by way of Cubist, Dada, and early Surrealist art”, as a mode characterized by its “indeterminacy and undecidability” (vii). Indeterminacy in linguistic codes thus has a history of its own, but it begs the question of how these different forms of indeterminacy, especially with the rise of digital texts, can be understood and contextualized within particular historical configurations.

The case of Cage’s book publishing offers an intriguing way to investigate practices of aesthetic indeterminacy in printed texts, and for exploring how the pre-print archive can be incorporated into conceptualizing the encoding of bibliographic codes and their performance as print. Investigating Cage’s practices of bibliographic encoding through an examination of the documents available in his archive offers insight into how pre-print archives can be used to recover the hidden “source code” of printed books. Since the bibliographic codes of Cage’s books are shaped by elements of indeterminacy and chance generated through the algorithms of the *I Ching*, analyzing them helps to further conceptualize the continuities and discontinuities between printed and digital texts around the role of indeterminacy in shaping a text’s bibliographic performance and its underlying code.

Applying a blend of bibliographic and historical analysis to Cage’s *M* helps identify new directions for considering how avant-garde aesthetics of indeterminacy and chance may negotiate the restrictions of the fixity of print. Notes from the author to the printer are important evidence of negotiation between philosophical concerns and the materialization of bibliographic codes. This helps us reconsider the continuities and discontinuities in bibliographic practices around printed and digital texts. While eBooks and other digital media have greater complexity

in terms of the technical operations required to properly render them for human viewing, they can offer greater potential for recovering the context of the performance of the text because material traces are present within the substance of the eBook and its sites of manifestation. At the same time, for print, while the moment of textual performance may be recovered through archival research, its origins are typically absent from the substance of the printed book and the time-space of reading. In terms of temporality, the bibliographic codes of a printed text are performed at the site of printing and then disseminated to readers, while digital texts can be seen to be distributed and then “performed” at the time of reading, as the underlying code is used to generate an image on the screen of the digital viewing device. Thus, a key distinction between digital and printed texts lies in the varying degree of temporal displacement between a text’s bibliographic performance and the time of its interpretation/reading. The temporality of the *I Ching*’s algorithmic performance in Cage’s work places it further in the past (days, months, or years between drafting the manuscript and printing instructions, approving proofs, and printing the book) than the temporality of the rendering of digital texts on a mobile device or computer screen (in the milliseconds of digital transmission, storage, and display).

While clearly Cage’s work draws on aleatory processes in the production of bibliographic codes, we can also see other layers of indeterminate processes occurring throughout a text’s “circuit of communication” (Darnton 1982). Every reading of every text for every reader is indeterminate, from the historical contingencies of binding, distribution, and purchasing, up until the point of reading. Thus, avant-garde practices that incorporate chance operations and indeterminacy into the encoding of bibliographic codes can be seen as one type of indeterminacy, perhaps best described as *aesthetic indeterminacy*, when randomness, chance operations, or unpredictable systems are used as expressive aesthetic elements within an artist’s aesthetic practice. On the other hand, we can acknowledge the social and historical contingencies by which all texts are socialized and the indeterminate and unique interpretive event of each reading. Investigating the pre-print archive and the underlying “code” used to perform a printed book’s bibliographic codes shows that printed texts and digital texts perhaps have more in common than is often acknowledged. Thus, bibliographic analysis needs to consider indeterminacy as a property of all texts, emerging at different points throughout a text’s performance and transmission.

Analyzing Cage's archival materials reveals a process of bibliographic encoding that is algorithmic and determined by chance, yet also highly aesthetic and driven by Cage's personal taste. This fusion shows how printed texts often embed some of the same tensions we see being discussed in the context of digital texts: the relation between code and text, and the role of human and non-human agents in the production of bibliographic codes. The algorithm that determines those codes (even when hidden in a "black box") remains enmeshed in the social landscape in which algorithms, data sources, and the results of algorithms are selected by and interacted with by human agents. We need to ask the question, who chooses the datasets and the algorithms, and determines what forms those outputs will take to be human-readable?

Nick Seaver (2018) suggests that an anthropological approach to algorithms can help to overcome the myth that they are "powerful, inhuman, and obscure" (377). While algorithms in contemporary discourse are constructed as autonomous technical agents, Seaver (2018) points out that they are constantly being changed and refined by humans, and that "by attending to the ordinary life of algorithmic systems, anthropology can contribute some much-needed empiricism and particularism to critical discourses on algorithms" (381). Seaver's approach can perhaps be expanded by a bibliographic approach that consider the algorithms as texts. Malte Ziewitz (2016) describes the mythology of algorithms as founded on what he calls the "algorithmic drama", constituted by three themes that he identifies in discourses on algorithms: *Agency* (algorithms are agents or participants in social life), *inscrutability* (algorithms are difficult to observe or fully know), and *normativity* (algorithms engage in the "political, ethical, or accountable") (2016, 8). These are important dimensions to consider for the study of the figure of the algorithm in scholarly investigation, but each is fraught and its meaning unsettled, which for Ziewitz is precisely the point: "Once converted to an object of critical inquiry, however, the figure tends to disappear into a range of other concepts and relations. In light of this multilayered contingency, the goal cannot be to come up with an ultimate recipe, a set of more or less detailed instructions, for studying algorithms [. . .] Rather, the goal should be to keep our inquiries generative enough to invite us to revisit some of our own assumptions and beliefs of what an algorithm actually is" (2016, 10).

The aleatory aspects of algorithms in today's information platforms have been downplayed in favor of their predictive capabilities in a wide range of systems (determining who gets loans, who gets hired, who goes

to jail, and who is a national security risk). A sociology or anthropology of algorithms can give insight into these trends and can be complemented by bibliographic approaches that examine archival materials. In the case of algorithms, this archive could include the code repositories used to construct them and the writing and editorial process that is often tracked through version control and commenting systems. The databases that feed the algorithms can also be studied bibliographically and socially, as data is “cleaned” and datasets are “curated”. In research and industry, data may be “massaged” or even potentially fabricated as demonstrated in the recent #SpiderGate controversy involving irregularities in datasets describing spider behavior (leading to numerous paper retractions from prestigious academic journals) (Kozlov 2022).

Thinking about algorithms in the context of printed books also helps us to explain why algorithmically produced non-book texts have flourished in the current post-Web 2.0 era. We see the displayed outputs, but not what went into them. If we can unpack these algorithms by looking at their inputs and outputs and their shaping by human and non-human agents, we can gain insight into the human agency at work in the design and selection of algorithms and databases. This will not be easy for many platforms, given the care taken by corporations in protecting their proprietary algorithms. Still, my invitation is for textual scholars to develop a set of tools for unpacking the algorithm and identifying what traces of human and non-human agents can be studied in the current universe of digital texts, an approach guided by engagement with printed and hand-written texts, a close reading of their materiality, and engagement with new types of archival collections.

University of Arizona

Works Cited

Manuscript and Archival Sources

- Middletown, CT, Wesleyan University, Olin Library, John Cage Papers, Box 5, Folder 7.
Middletown, CT, Wesleyan University, Olin Library, John Cage Papers, Box 5, Folder 8.
Middletown, CT, Wesleyan University, Olin Library, John Cage Papers, Box 8, Folder 23.
New York, Public Library, John Cage Manuscript Collection, JPB 95–3, Folder 479.

Printed and Digital Sources

- AARSETH, Espen J. 1997. *Cybertext: Perspectives on Ergodic Literature*. Baltimore, MD: Johns Hopkins University Press.
- ACKER, Amelia and Adam Kreisberg. 2020. "Social Media Data Archives in an API-driven World". *Archival Science*, 20: 105–23. <https://doi.org/10.1007/s10502-019-09325-9>.
- ALPERT, Barry. 1975. "Post-Modern Oral Poetry: Buckminster Fuller, John Cage, and David Antin". *boundary 2*, 3.3: 665–82.
- BAILLEHACHE, Jonathan. 2013. "Chance Operations and Randomizers in Avant-garde and Electronic Poetry: Tying Media to Language". *Textual Cultures*, 8.1: 38–56.
- BRAUNE, Sean. 2012. "Cage's Mesostics and Saussure's Paragrams as Love Letters". *Postmodern Culture*, 22.2. <https://doi.org/10.1353/pmc.2012.a494801>.
- BROUDE, Ronald. 2011. "Performance and the Socialized Text". *Textual Cultures*, 6.2: 23–47.
- BROWN, Kathan. 2001. *John Cage: Visual Art to Sober and Quiet the Mind*. San Francisco, CA: Crown Point Press.
- . 2002. "Visual Art". In *The Cambridge Companion to John Cage*, edited by David NICHOLLS, 109–27. Cambridge: Cambridge University Press.
- BROWN, Richard H. 2012. "Reading Cage". *American Music Review* 41.1: 6–9.
- CAGE, John. 1961. *Silence*. Middletown, CT: Wesleyan University Press.
- . 1967. *A Year from Monday: New Lectures and Writings*. Middletown, CT: Wesleyan University Press.
- . 1973. *M: Writings '67-'72*. Middletown, CT: Wesleyan University Press.
- . 1983. *X: Writings '79-'82*. Middletown, CT: Wesleyan University Press.
- . 1988. "Tokyo Lectures and Three Mesostics". *Perspectives of New Music* 26.1: 6–25.
- DARNTON, Robert. 1982. "What is the History of Books?". *Daedalus*, 111.3: 65–83.
- DRUCKER, Johanna. 2014. *Graphesis: Visual Forms of Knowledge Production*. Cambridge, MA: Harvard University Press.
- EDITION PETERS. 2021. "Indeterminacy". *EditionPeters.com*. <https://www.editionpeters.com/product/indeterminacy/ep68142>
- EDMEADES, Lynley. 2016. "Affect and the Musication of Language in John Cage's 'Empty Words'". *Comparative Literature*, 68.2: 218–34.
- GALEY, Alan. 2010. "The Human Presence in Digital Artefacts". In *Text and Genre in Reconstruction: Effects of Digitalization on Ideas, Behaviours, Products and Institutions*, edited by Willard McCARTY, 93–117. Cambridge: OpenBook Publishers.
- . 2012. "The Enkindling Reciter: E-Books in the Bibliographic Imagination". *Book History*, 15: 210–47.
- GANN, KYLE. 2002. "No Escape from Heaven: John Cage as Father Figure". In *The Cambridge Companion to John Cage*, edited by David NICHOLLS, 242–60. Cambridge: Cambridge University Press.

- GILLOTT, Brendan C. 2020. "Random Poetry?: Reading Chance, Randomness and the Non-compressible in Gertrude Stein and John Cage". *Textual Practice*, 34.11: 1865–83.
- HAYLES, N[ancy] Katherine. 2006. "The Time of Digital Poetry: From Object to Event". In *New Media Poetics: Contexts, Technotexts, and Theories*, edited by Thomas Swiss and Adalaide MORRIS, 181–209. Cambridge, MA: MIT Press.
- KNUTH, David. 1996. *Selected Papers on Computer Science (CSLI Lecture Notes Number 59)*. Stanford, CA: CSLI Publications, Center for the Study of Language and Information.
- KOBRIN, Ed. 1970. "I Ching". *Source*, 8: 1–7.
- KOZLOV, Max. 2022. "How a Scandal in Spider Biology Upended Researchers' Lives". *Nature News*. <https://www.nature.com/articles/d41586-022-02156-2>
- LYNCH, Clifford. 2017. "Stewardship in the 'Age of Algorithms'". *First Monday*, 22.12. 10 August. <https://doi.org/10.5210/fm.v22i12.8097>
- MCGANN, Jerome J. 1991. *The Textual Condition*. Princeton, NJ: Princeton University Press.
- MCKENZIE, D.F. 1999. *Bibliography and the Sociology of Texts*. Cambridge: Cambridge University Press.
- NOBLE, Safiya Umoja. 2018. *Algorithms of Oppression: How Search Engines Reinforce Racism*. New York: New York University Press.
- O'NEIL, Cathy. 2016. *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy*. New York: Broadway Books.
- OWENS, Trevor. 2018. *The Theory and Craft of Digital Preservation*. Baltimore: Johns Hopkins University Press.
- PATTERSON, David W. 2002. "Words and Writings". In *The Cambridge Companion to John Cage*, edited by David NICHOLLS, 85–99. Cambridge: Cambridge University Press.
- PERLOFF, Marjorie. 1981. *The Poetics of Indeterminacy: Rimbaud to Cage*. Princeton, NJ: Princeton University Press.
- PIEKUT, Benjamin. 2013. "Chance and Certainty: John Cage's Politics of Nature". *Cultural Critique*, 84: 134–63. <https://doi.org/10.5749/culturalcritique.84.2013.0134>.
- RETAILLACK, Joan. 2015. "The Radical Curiosity of John Cage — Is the Word 'Music' Music?". *Contemporary Music Review*, 34.5–6: 373–84.
- SABATINI, Arthur J. 1989. "Silent Performances: On Reading John Cage". In *John Cage at Seventy-Five*, edited by Richard FLEMING and William DUCKWORTH, 74–96. Lewisburg, PA: Bucknell University Press.
- SEAUER, Nick. 2018. "What Should an Anthropology of Algorithms Do?". *Cultural Anthropology*, 33.3: 375–85.
- SHULTIS, Christopher. 1995. "Silencing the Sounded Self: John Cage and the Intentionality of Nonintention". *The Musical Quarterly*, 79.2: 312–50.
- SMITH, Richard J. 2012. *The I Ching: A Biography*. Princeton, NJ: Princeton University Press.

- SPINOSA, Dani. 2016. "Cagean Silence and the *Comunis* of Communication". *Canadian Review of American Studies*, 46.1: 22–41.
- THOMPSON, Chris. 2003. "Voicing Joyce: Crossmess Parzels from Cage to Beuys". *Performance Research*, 8.1: 5–22.
- TURNER, Fred. 2013. *The Democratic Surround: Multimedia & American Liberalism from World War II to the Psychedelic Sixties*. Chicago: University of Chicago Press.
- WEAVER, Andy. 2012. "Writing through Merce: John Cage's Silence, Differends, and Avant-Garde Idioms". *Mosaic: a journal for the interdisciplinary study of literature*, 45.2: 19–37.
- WOLFF, Christian and David PATTERSON. 1994. "Cage and Beyond: An Annotated Interview with Christian Wolff." *Perspectives of New Music*, 32.2: 54–87.
- ZIEWITZ, Malte. 2016. "Governing Algorithms: Myth, Mess, and Methods". *Science, Technology, & Human Values*, 41.1: 3–16.