in the age of information. As the book turns, and turns again, the title of this
extraordinary work broadens its connotations to encompass the dynamic
of renewal that, even as it obliterates traditional novelistic form, institutes
a new typographical ordering based in digital technologies—revolutionary
indeed.

Coda: Machine Reading *Only Revolutions*
By N. Katherine Hayles and Allen Beye Riddell

As a densely patterned work, *OR* lends itself well to machine reading. The
extent of the symmetries between Sam and Hailey, the constraints govern-
ing word choice, the progression of the narrative, and the correlation of nar-
rative, bibliographic, and semantic codes are not only verified but brought
into sharper focus by machine reading. For the most part, our discoveries
reinforced what we had already discovered through close reading, but in a
few instances, they revealed new information that extended and deepened
our understanding of the text.

Our first step was to hand code the entire text[6] and import it into a data-
base, with special categories for cars, plants, animals, minerals, and place-
names, and with every word indicated as originating with Sam or Hailey's
narratives, respectively. With the place-names identified, we then overlaid
them onto a Goggle map. At this point, considerable hand-correction was
necessary, since many of the place-names ("Rochester," for example) had
possible identifications in several different states. The results are shown in
figures 8.4, 8.5, and 8.6. The surprise here is the extension of their westward
journey to Hawaii and Alaska. These place-names occur in the context of a
global traffic jam that they cause, as referenced in Hailey's narrative (Sam's
has a parallel passage, where it is conceived as a wedding present to Hailey):

> Screeching to a standstill. Barring behind US all
> transport modes. Junkers, Grimmers and Tam Bents
> turned here to an impound lot. Dead
> Mulberries & Morels ignored by every horn.
> And no wheel can pass these wheels.
> Sam's Jeep Gluon flung across every start.
> > From Bangor[7] to Los Angeles by
> > > Barrow to Wailuku.
> > > A globally hubbed hork.
> > > (299/H/8 March 2015–300/H/15 November 2015)

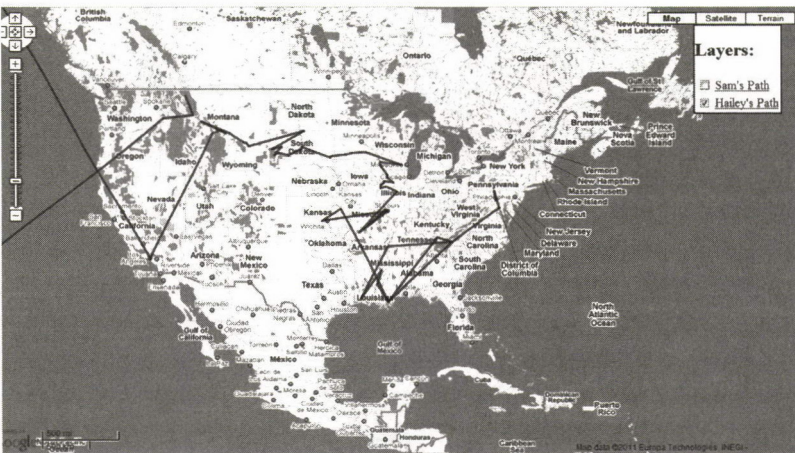Figure 8.4 Map of Sam's place-names.

Figure 8.5 Map of Hailey's place-names.

The effect in the narrative is to suspend all traffic as it piles up in a "Transapocalyptics" (301/H/15 November 2015). (The dates indicate that the jam lasts for eight months!) In the *LAist* interview, Danielewski remarks of Sam and Hailey, "What's terrifying about them is that the world withers and shakes and burns to the ground around them, but it doesn't bother them at all. They are so caught up in their affection for each other and their antics that they lose track" (2007a). The global chaos implies that the rest of the
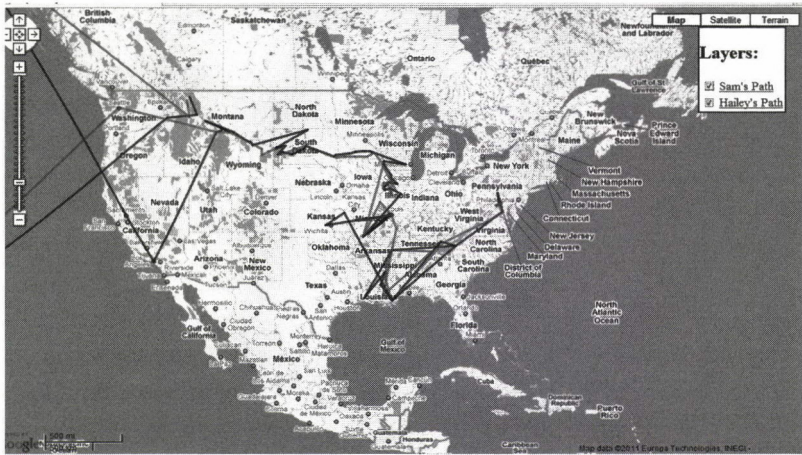
Figure 8.6 Sam's and Hailey's place-names juxtaposed.

world is stopped, jammed to a halt, while only the lovers are free to race ahead and keep moving. When their vehicle spins off the road on ice, however, they are thrown clear and continue on foot up the mountain, where they will meet their respective ends as their wild road trip comes to an end. Nevertheless, the logic of the octet, in which the end of one narrative is the beginning of the other, leaps across this stasis and converts it into a caesura, a temporary pause before the action starts all over again.

Another aspect of the geography of Sam and Hailey's cross-country spree is the numerical coding of its georeferenced points. Portela (2011:53) points out that the dip south into New Orleans follows the longitude 90 degrees west and that the journey west to the mountain largely occurs on Interstate 90. As a factor of 360, 90 connotes a quarter circle; since the 90-degree turn south is followed by a 180-degree turn north and another 90-degree turn west, the complete trajectory forms a 360-degree circle, thus making good the road trip as another manifestation of a "revolution."

Further insight is gained by comparing the word frequency of Hailey's narrative with that of Sam's. The extensive parallels between the two narratives are borne out by the correspondence between paired frequency counts. For example, "now," a word freighted with significance given the temporal separation between the characters, occurs 111 times in both narratives, marking a perfect symmetry between the two and conveying a shared emphasis on living in the present. "Allways," another highly significant term, occurs 111 times in Hailey's, 110 times in Sam's. "Allways" echoes the exten-

sive exploration of "hallway" in *House of Leaves*, making good another mirror correspondence; it also hints at a projection into the future that will not occur in one sense (since the protagonists die) but that is accurate in another sense (because the front-back symmetries enjamb the ending together with the beginning, and more generally because literary narratives are typically taken in critical analysis to exist in an omnipresent present tense). "Never" occurs 72 times in Hailey's and 70 times in Sam's, marking a symmetry that serves to reinforce their mutual vows to one another. Even such nonsignificant words as "and," "the," and "of" show a close correspondence between the two narratives. As noted earlier, Danielewski composed with the two narratives side by side, with corresponding pages both displayed on the monitor, and the parallelism is carefully structured to show the growing love between the protagonists, who initially start far apart, come closer until their residence in St. Louis (the midpoint of the narrative), and then follow each other in declining action until their respective deaths.

Perhaps the most illuminating discovery comes from a hint contained in the "spoiler" poster published in *Revue Inculte* 14 (Danielewski 2007d), a large colored print object measuring about two feet by three feet, constructed from notes that Danielewski prepared for his French translator (see our digitized version with zoom function at http://onlyrevolutions.info/). Along with tables showing the extensive numerical parallels between Sam and Hailey and the factors of 360 that govern the division of the narratives into sections, pages, paragraphs, and lines are schematics of the chronological intervals associated with each narrative, showing again in the sidebars the carefully planned symmetries between the two chronologies. Across the poster's lower half are the thematic clusters worked out through the different sections, indicating the meticulous and extensive planning that went into the narrative progressions. Also included are diagrams showing the narrative progression of each character's "disregard for" (declining) and "esteem for" (rising) the other as the narrative proceeds. A chart of "differences of perception" shows that they start far apart, meet at the narrative midpoint, then diverge again as each character places the other above care for himself or herself.

Informative as the poster is about narrative structures, word choices, and chronologies, it is reticent on one point: included is a large column labeled "Nix List" that has been blanked out, suggesting that Danielewski provided his French translator not just with conceptual clusters but specific words that he wanted not to appear in the translated text. This presents an intriguing problem: how do you find the words that are not there? Our solution is

to compare the word frequencies in *OR* with the Brown corpus, a database of one million words carefully selected to be statistically representative of twentieth-century American prose. To assist our comparison, we calculated a chi-square statistic for each word in *OR*, which provides a rough measure of how noticeable the difference is between the observed frequencies in *OR* and the Brown corpus.[8] For example, *in*, one of the semantic values of the "inwardness" cluster, appears 21,402 times in the Brown corpus, 0 in *OR*; *into* occurs 1,789 in Brown and 0 in *OR*. Other nonoccurring words with high chi-square values are *was, were,* and *been*; it is remarkable that these past tenses of *to be*, the most frequent verb in English prose, are entirely absent in *OR*, a choice (and a constraint) emphasizing that the protagonists live vibrantly in the present. Also absent are *as* and *like*, indicating a preference for neologisms and adjectives over similes or analogies, a choice that vivifies the action and refuses the reflective pauses (for the narrator and reader) associated with such literary tropes as epic similes. *They* and *people* are also absent, showing the lovers' disregard for the social collectives that would restrain their freedom and delimit their choices. *Said* also does not occur, showing the lack of a narrator who reports on the lovers, as distinct from them speaking their own thoughts and the Greek-chorus comments of the animals and plants.

One puzzling nonoccurring word is *or*, represented on the endpapers as its own circle enclosed with a series of ellipses consisting of very tiny repetitions of "or." We conjecture that *or* is forbidden because it is the acronym that Danielewski (and others) typically use for *OR*. One of the forbidden clusters has do to with self-reflexivity, in the sense that the text cannot refer to the textual components prominent in its composition, such as *novel, pattern,* and *poem*. Thus *self-reflexivity has been banished from the semantic register and displaced onto the topographic*, another indication of how important the spatial aesthetic is to this text. As discussed earlier, the text's topographic complexity serves as an analogy that extensively interrogates the text's existence as a novel, a linguistic artifact, and a material object instantiated in a codex. In the *LAist* interview, Danielewski commented, "A lot of *Only Revolutions* is interested in the mechanisms that are underlying things . . . the grammar, the physics of things. We're not talking about particular words but the relationship between words. Not the particular names of planets, but the nature of an ellipse and the effect of gravity on the orbit" (2007a).

We believe it is fitting that we use digital computers to analyze *OR*. In a certain sense, as Portela observes, *OR* employs the resources of the codex as an aesthetic, bibliographic, and material form to exploit the digital nature

of alphabetic language. In this sense, the numerical codes implicit in numbers of words, lines, paragraphs, pages, and sections compute the text's own conditions of possibility. Forbidden to refer to itself through the semantic register of *or*, *OR* nevertheless functions as a series of recursive algorithms whose operations produce the text as a print artifact and as a two- and three-dimensional object, while simultaneously inviting readers to increase its dimensionality exponentially through the multiple reading paths and page symmetries it offers. Commenting on the text's deep recursivity and numerical codes, Portela argues that "*Only Revolutions* links the digitality inherent in human language and in alphabetic writing, as permutational devices based on recursive structures, to the system of differences that sustain the material and conceptual space of the codex. . . . Instead of the common figure of the computer as a book, i.e., as an extension of the informational structure of the codex, Danielewski's work gives us the book as a computer, i.e., as a calculating machine that generates algorithms and geometrizes the plane and the space of writing and reading" (2011:71) With this coda, *How We Think: Digital Media and Contemporary Technogenesis* concludes with an instance of technogenesis redefining the codex as a digital technology that, in cycles of continuous reciprocal causation, both influences and is influenced by the functionalities of networked and programmable machines. To grasp fully the dynamic now in play between print forms and digital technologies, we must consider them as mutually participating in the same media ecology.

Time and space, narrative and database, institutional programs and the history of digital and print technologies are the sites that have been explored in this book that, in recursive fashion, partakes of digital media even as it also reflects the practices of print scholarship. The rich conceptualizations and intricate patterns of *TOC*, *RST*, and *OR* show that technogenesis has a strong aesthetic dimension as well as neurocognitive and technical implications. They demonstrate that in this cultural moment fraught with anxieties about the future, fears for the state of the humanities, and prognostications about the "dumbest generation," remarkable literary works emerge that can catalyze audiences across the generations. These works vividly show that the humanities, as well as our society generally, are experiencing a renewed sense of the richness of print traditions even as they also begin to exploit the possibilities of the digital regime. In my view the humanities, far from being in crisis, have never seemed so vital.

the name of Sherlock Holmes's elder brother, described in Arthur Conan Doyle's "The Adventure of The Bruce-Partington Plans" ([1908] 1993) as serving the British government as a kind of human computer: "The conclusions of every department are passed to him, and he is the central exchange, the clearinghouse, which makes out the balance. All other men are specialists, but his specialism is omniscience" (766). This, combined with his distaste for putting in physical effort to verify his solutions, makes him a suitable namesake. The reference is reinforced when Clio tells the First Eric that when she was hospitalized for cancer, she read Doyle stories until she was sick of them.

2. The name Ward, and the reference to him as a "thing," suggest a conflation of two H. P. Lovecraft stories of body snatching and mind transfer, *The Case of Charles Dexter Ward* ([1941] 2010) and "The Thing on the Doorstep" ([1937] 1999). Certainly, there is a Lovecraftian dimension to the fusion of technoscience and the occult in Ward's scheme. I am indebted to Rob Latham for drawing this parallel to my attention.

3. We are told that Mycroft Ward wants to take over the Second Eric because it knows that the Ludovician is hunting him and it needs the Ludovician in order to expand its standardizing procedure without limit (S. Hall [2007] 2008a:282–83). Although we are not told why the Ludovician would enable this expansion, it seems reasonable to conclude that the personalities of the node bodies put up some resistance to being taken over, and overcoming this resistance acts as a constraint limiting the number of node bodies to about a thousand. Apparently the idea is that the Ludovician will be used to evacuate the subjectivities that Ward wants to appropriate, annihilating the resistance and enabling Ward's expansion into the millions or billions.

4. Hall follows the convention of omitting periods after Mr, Dr, etc.

5. See Barbara Hui (2010:125) for a mapping of these locations.

Chapter Eight

1. As a registered member of the website, I received this e-mail, from which I am quoting.

2. The notation indicates the page number, the narrator (Sam or Hailey) and, since the language is synchronized with the vocabulary current on the indicated date, the chronological heading to provide historical context.

3. The words "The/Now Here Found" are struck because they appear in the text; they are thus in a different category than the rest of the words on the endpapers. "Concordance" is not struck through because it does not appear in the text proper; neither do all the words on the endpapers other than those few in special locations, as noted in the following discussion.

4. The words "Beauty," "Brood," Choose," "Devotion," and "Grace" appear in the circle with a black background, white perimeter, and black lines striking through tiny red words, "Found Once, Once Here" on one side, and on the other, "Found Once, Once There." As this cryptic message suggests, these words, in addition to naming some of the categories, are found once and only once in each narrative of Sam and Hailey (hence "Found . . . Here" and "Found . . . There").

5. For a summary of quantum effects as they are currently understood, see Tom Siegfried, "Clash of the Quantum Titans" (2010).

6. Our thanks to Abraham Geil for performing the laborious task of entering every word into a spreadsheet.

7. In the interest of clarity, we did not map Bangor, Maine, in our representation.

8. The chi-square test (from which the statistic gets its name) is proposed as a test to determine whether two samples come from the same theoretical distribution. While the test requires a number of assumptions that are unmet here, the statistic itself offers a serviceable indicator of how divergent are two observed word frequencies. For a fuller discussion of methods of comparing two corpora, see Kilgarriff (2001).