

VISUAL RECONSTRUCTIONS OF LANGUAGE

by Sarah Hulsey

ABOUT THE AUTHOR

Sarah Hulsey is an artist whose work draws on her background in linguistics to create prints and artist's books that explore the structure of language in a visual domain. She holds degrees in linguistics (BA, Harvard, PhD, MIT) and book arts/printmaking (MFA, University of the Arts). Her work is held in the collections of the Library of Congress, Yale University Haas Arts Library, Columbia University Rare Book and Manuscript Library, and University of California Berkeley Bancroft Library, among others.

Languages are the best mirror of the human mind.—Gottfried Leibniz, 1704

While interpersonal communication bridges space, intrapersonal communication proves to be the chief vehicle for bridging time.—Roman Jakobson, 1974

LANGUAGE IS A SYSTEM remarkable for both its universality and its complexity, two features that would seem at odds. Complex areas of human achievement tend to vary in the degree of their development in particular cultures: metallurgy, agriculture, writing, mathematics, and so on. Language, on the other hand, is found throughout our species: in every culture, every tribe, every cognitively healthy individual, and in each case to an equal degree of complexity—no language is more primitive or basic than any other, despite the wide range of ways in which languages can vary. This is one of the key points about language: it is not something that was invented, like writing, or discovered, like the laws of physics, but rather an inherent part of our biological endowment as human beings.¹ We speak and think in language because we have brains that evolved to do so. Linguist and psychologist Steven Pinker puts it nicely in *The Language Instinct*:

Language is not a cultural artifact that we learn the way we learn to tell time or how the federal government works. Instead, it is a distinct piece of the biological makeup of our brains. Language is a complex, specialized skill, which develops in the child spontaneously, without conscious effort or formal instruction, is deployed without awareness of its underlying logic, is qualitatively the same in every individual, and is distinct from more general abilities to process information or behave intelligently.²

Without being aware of it, we are all constantly applying the systems of sound patterns (phonology), word formation (morphology), phrase and sentence formation (syntax), meaning construction (semantics), and discourse rules (pragmatics), and we do so with minimal awareness of the richness and complexity involved. This knowledge, which we all have for our native language(s), exists almost entirely below the level of consciousness. This is the essence of what fascinates me about language and why I explore the structure of language in my visual art work.

My work now represents a merger of two tracks in my life that ran parallel to each other for a little over ten years. On the one hand, I pursued linguistics academically, eventually conducting research, publishing, and teaching at a university level. On the other hand, I became involved with printmaking and artists' books at the Bow & Arrow Press, at the Print Department at the Fogg Art Museum, and through classes and summer jobs at other arts organizations. For a long time, I considered these two tracks of my life to be unrelated: two deep, but separate, interests. Eventually, I came to feel that there was an underlying link, and I went back to school to get an MFA in book arts and printmaking in order to develop ways to explore that connection.

One thing that has long appealed to me about linguistics is the way that it carefully probes the composition of the units of language (sentences, phrases, words, roots/affixes, syllables, and so on) and identifies their component parts and possible combinations. All languages—whether English, Japanese, Swahili, or Quechua—possess patterns that can be carefully teased apart to reveal elegant, often deceptively simple rules that lie at the core of our linguistic ability. The structures and configurations that have been discovered, though abstract mental objects, appeal to me in something like a visual-spatial sense. I see them as a highly ordered, though dense and complex, matrix of connections and groupings that are ripe for visualization through art.

MY WORKING METHOD

My work generally begins with an image from an outside source such as a historical scientific diagram, which I work from in one of two ways. In some cases, I feel an echo between the source image and something I am reminded of from syntax, my area of specialty in linguistics, and my work lies in trying to carefully tease out and identify the exact points of similarity I feel between them. This is not always a direct process, which can make the development of these pieces complicated and somewhat involved. In the other cases, I make work about other aspects of language, though in those pieces I tend to approach the source images in a slightly different way. Once I have located a diagram or map that appeals to me in a general sense, I methodically look for some aspect of language that could be represented in similar ways. Perhaps counterintuitively, addressing these pieces is often more straightforward because I am generally able to approach them more linearly and systematically.

With either approach, my preferred way of working is to create a representation of the component parts of a phenomenon and then to show those same parts rearranged over and over, to suggest the rich variation possible within those tightly held constraints. My goal is to capture the essence of an aspect of our language capacity and suggest to the viewer something of the richness underlying this remarkable ability.

DIAGRAPHIA

Several years ago I was looking through a catalog of rare scientific books from the Burndy Library, which is now part of the collections of the Smithsonian Institution and the Huntington Library. In that catalog I ran across an image of Nicolaus Copernicus's heliocentric diagram of the solar system. Though the image was familiar, I had recently finished a piece called *Conversations in Syntax* in which I represented syntactic phrases as nested boxes, and suddenly the Copernican diagram held new visual possibilities for me. I began to think about how I could use a system of concentric planetary (and overlapping lunar) orbits to represent syntactic structure.

To explain why this image struck me as a possible way to represent syntax, let me briefly discuss an elegant feature of the structure of sentences. One thing we know about sentences is that they are more complex than simply a string of words, one following the next. Within every sentence, individual words are grouped into phrases that are themselves grouped with other words or phrases into larger phrases and so on until a sentence is formed. This is true of all sentences, both written and oral, formal and informal, despite the fact that speakers usually do not notice this structure within their utterances. Often it takes a special context for people to notice any effects of these phrasal groupings upon meaning. One such context can be found in cases of structural ambiguity, when

a single string of words can have more than one meaning depending on how the words are organized into phrases. Newspaper headlines, with their elided functional words and clipped phrasing, often accidentally result in these kinds of ambiguities, sometimes to humorous effect:

SQUAD HELPS DOG BITE VICTIM
TWO SISTERS REUNITED AFTER 18 YEARS IN CHECKOUT COUNTER
KILLER SENTENCED TO DIE FOR SECOND TIME IN TEN YEARS

The above are some examples that have been cited in textbooks and popular writings on language. In each case, the two readings of the headline depend on how the words are grouped into phrases, one presumably intended by the editors, the other unintentionally humorous or startling. For instance, in the second example, whether we understand a charming story of accidental reunion (reading A) or one of a nightmarishly long checkout wait (reading B) depends on whether “reunited” is modified by two phrases “after 18



Figure 1. Nicolaus Copernicus, *De revolutionibus orbium coelestium* (On the Revolutions of the Heavenly Spheres), 1543.

years” and “in checkout counter” (A) or is modified by only one phrase “after 18 years in checkout counter” (B). To represent this difference, linguists often use brackets to partition off phrasal units: compare (A) *Two sisters [reunited [after 18 years] [in checkout counter]]*, where the two prepositional phrases each separately modifies the verb, and (B) *Two sisters [reunited [after 18 years in checkout counter]]*, where one prepositional phrase is embedded inside the other. Depending on the internal arrangement of the phrases, different readings arise. This tells us that there is more to the interpretation of a sentence than just the meanings of the words and the order in which they occur.

• • •

All sentences are composed of words grouped in this way, and the bracketing notation is a handy way to represent the nested phrasal groupings. But the basic hierarchy of the phrases, represented by brackets within brackets, may just as easily be represented with boxes or circles.

A visual method to represent the structure of language—whether oral or written—is what interested me in the Copernican diagram. Though the syntax of any text could have been diagrammed with circles representing basic phrasal hierarchy, I chose to use an excerpt of Copernicus’s own writing about his heliocentric model of the solar system. Using nesting circles to represent phrases, I built up an image that resembles the original source image but represents a text rather than the solar system.

This print was the beginning of a two-and-a-half-year project entitled *Diagraphia*, in which I explored a range of ways of representing aspects of language by modeling my imagery on the forms of historical maps and diagrams. These were chosen, not because the originals had anything in common with each other historically or thematically, but rather because each had a form that I thought suggestive of some aspect of the structure of language. Each of the eight prints in the portfolio is based on a source image and a text associated with it. As with *In the Words of Copernicus*, I created a representation of the associated texts that was modeled on the shapes, patterns, and colors of the source images. In each case, I decided on the aspect of language to model—ranging from phonetics to morphology to syntax to etymology—based on what the source diagram looked like. I will give an abbreviated discussion of three other prints in the series to show how I used existing source images to model other areas of linguistics.

Figures 3a, 4a, and 5a represent, respectively, historic visualizations of the Mediterranean coastline, the topography of the ocean floor, and the periodic table of the elements. In working with each of these images, I looked for an aspect of language that could be visually represented in a similar way, as well as correlate conceptually.

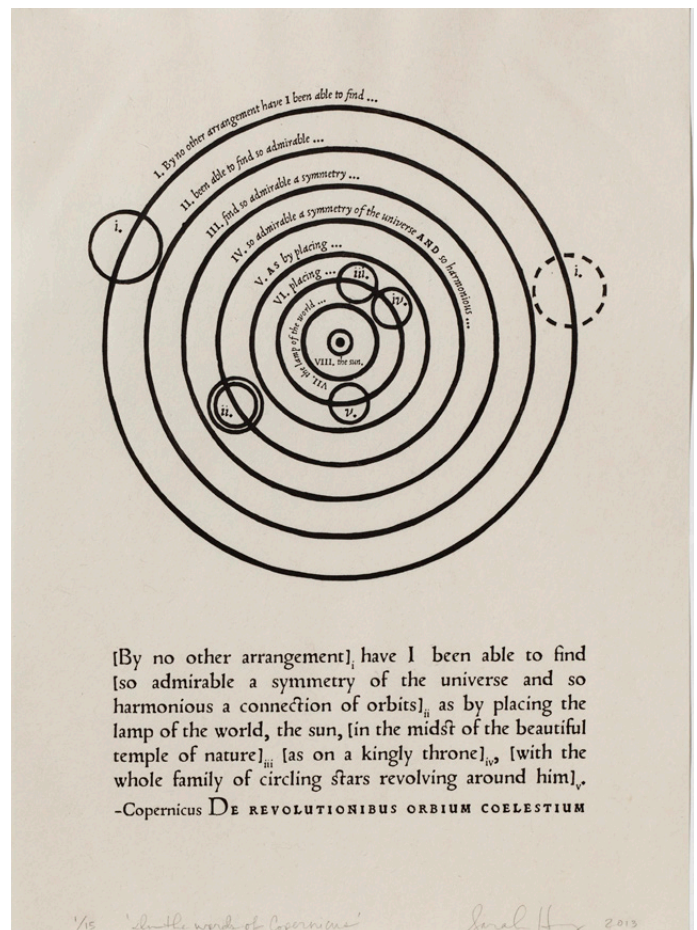


Figure 2. In the Words of Copernicus, woodcut and letterpress, 2013.

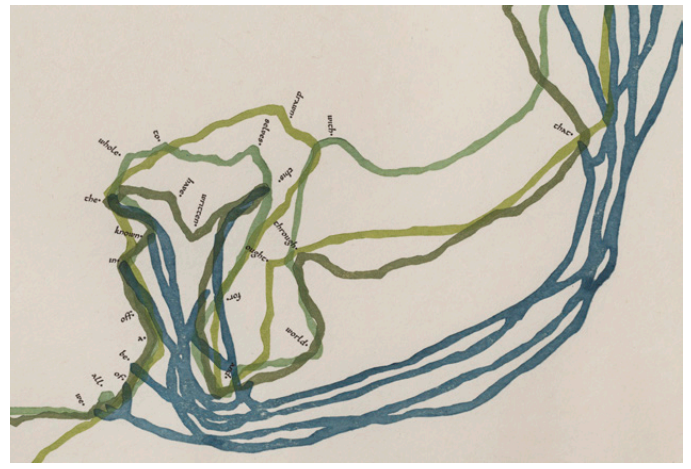
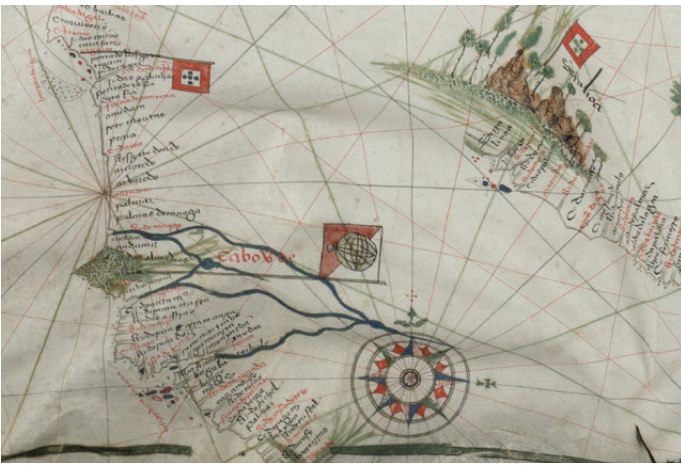


Figure 3a. Portolan chart of Mediterranean by Jorge de Aguiar, 1492, Beinecke Rare Book and Manuscript Library, Yale University (detail); 3b. In the Words of Ptolemy (detail), woodcut and letterpress, 2014.

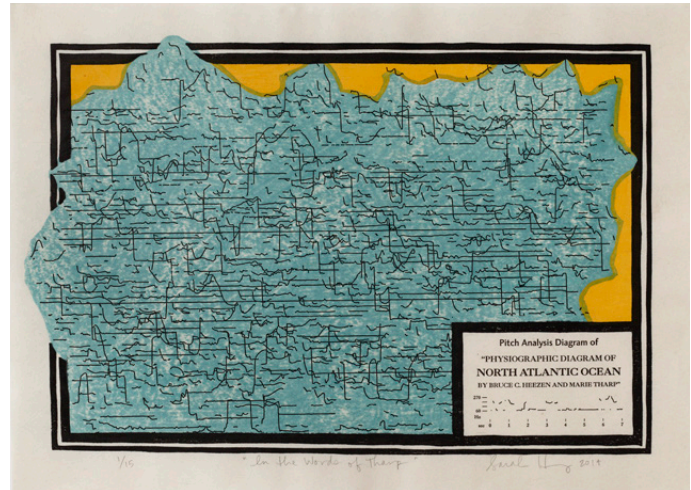


Figure 4a. Physiographic diagram of the North Atlantic Ocean, Bruce C. Heezen and Marie Tharp, 1959; 4b. In the Words of Tharp, woodcut and letterpress, 2014.

Periodic Table of Elements																	
1 H 1.0079																2 He 4.0026	
3 Li 6.941	4 Be 9.0122											5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
11 Na 22.990	12 Mg 24.305											13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.06	17 Cl 35.453	18 Ar 39.948
19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.88	23 V 50.942	24 Cr 52.004	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.38	31 Ga 69.723	32 Ge 72.64	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.798
37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.96	43 Tc 98	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.6	53 I 126.905	54 Xe 131.29
55 Cs 132.905	56 Ba 137.33	57 La 138.905	58 Ce 140.12	59 Pr 140.908	60 Nd 144.24	61 Pm 144.913	62 Sm 150.36	63 Eu 151.964	64 Gd 157.25	65 Tb 158.925	66 Dy 162.50	67 Ho 164.930	68 Er 167.259	69 Tm 168.930	70 Yb 173.054	71 Lu 174.967	
87 Fr 223	88 Ra 226	89 Ac 227	90 Th 232.0377	91 Pa 231.03688	92 U 238.02891	93 Np 237.04817	94 Pu 244.06422	95 Am 243.06138	96 Cm 247.07125	97 Bk 247.07031	98 Cf 251.0825	99 Es 252.083	100 Fm 257.1037	101 Md 258.10386	102 No 259.10396	103 Lr 260.10396	

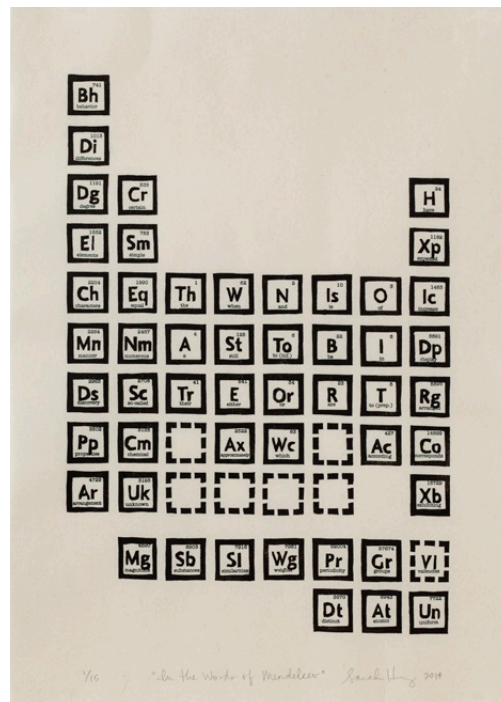


Figure 5a. Modern periodic table of the elements; 5b. In the Words of Mendeleev, woodcut and letterpress, 2014.

In the Words of Ptolemy (fig. 3b) borrows the meandering coastline and waterway shapes of portolan charts to represent etymologies of the words in an English translation of Ptolemy's second-century AD text on cartography.³ The words in the text are plotted using two data points for each word, both drawn from the *Oxford English Dictionary*: the word's first documented occurrence in English (on the y-axis), and the oldest known language of origin (on the x-axis), ranging from Proto-Indo-European on the left to modern English on the right. The plotted words are connected as they occur in three key sentences of the text, represented in shades of green; the fourth color, blue, traces connections between words with shared Indo-European roots, running through and across the green "texts." Though etymology is not, strictly speaking, a subdiscipline of modern, generative linguistics, it seemed to me that the wandering, overlapping, and sometimes knotted threads of word origins it traces would be the most apt linguistic counterpart of the kinds of shapes and connections found in early coastline maps.

In the Words of Tharp (fig. 4b) takes as its starting point a 1959 text by Marie Tharp and colleagues describing Tharp's groundbreaking work mapping the elevation of the floor of the Atlantic Ocean using sonar soundings.⁴ Her map is physiographic, using contours and shadings to "show the terrain as it would look from a low-flying plane."⁵ This unusual perspective resembles many close-packed, jagged mountain shapes. To emulate these shapes with language data, I turned to pitch, which is an acoustic correlate of tone and intonation (essentially what we perceive to be the rise and fall of the voice during speech). I recorded myself reading Tharp's text and used a pitch analysis program created by University College London's Division of Psychology and Language Sciences to graph it. By breaking the jagged line representing pitch into many segments and overlapping them, I created an image that referenced Tharp's physiographic ocean-floor map both in its form and in its origins in sound-based data.

In the Words of Mendeleev (fig. 5b) explores lexical and morphological patterns in Dmitri Mendeleev's 1869 description of the periodic law of the elements.⁶ In this piece I wished to reference the format of the periodic table, for which I needed a linguistic feature that could be ranked numerically. This led me to word frequencies, the relative frequency with which certain words are found in a large, representative selection of the language.⁷ Taking the words of Mendeleev's text, I gave each a box and an invented symbol based on the word (e.g., Bh for "behavior," Di for "differences," Cr for "certain," and so on). These I grouped into eight columns by function (nouns, prepositions, etc.) and, within each column, into rows by frequency. In order to create an elevation of the table that would be similar to the periodic table, I placed the groups with the largest numbers of words on the outsides: nouns and adjectives on the left, verbs on the right. In fact, over one-third of the words in the text were nouns, so I continued the noun column into two additional rows at the bottom, a nice opportunity to reference the periodic table's lanthanide and actinide series. Gaps at the end of shorter numbered columns are outlined with dashed lines, suggestive of possible but missing words, paying homage to Mendeleev's predictions of expected elements that were later shown to exist.

When I began *Diagraphia*, I thought I might, over the course of the project, find a visualization method I wanted to use for multiple future projects. Instead, I found not one kind of preferred diagram but rather a method of working that gave me a great deal of flexibility in source imagery, a pretext for moving freely between areas of linguistics according to the needs of the piece, and a way to understand a text's connection to the image representing it.

THE SPACE OF POETICS

I would like to turn now to a discussion of this way of working in the extended form of an artist's book. One of the marvelous things about language is the ability we all have to take a finite number of memorized lexical items (i.e., words) and arrange them into an infinite number of sentences allowed by the rules of our language. I am drawn to printmaking and book arts as media precisely because they so closely relate to this notion conceptually, both in their replicative techniques and in the arrangements of individual items into larger configurations: one print, an edition of a print, a series of prints in an edition, one book (with multiple, different prints/pages), an edition of a book, a series of books in an edition. This relationship of individual elements to larger structures, along with the possibility for variation within fixed constraints, resonates strongly with how the component parts of language combine. In my book *The Space of Poetics*, I explored the idea of variation within a defined field by referencing the imagery of architectural plans.

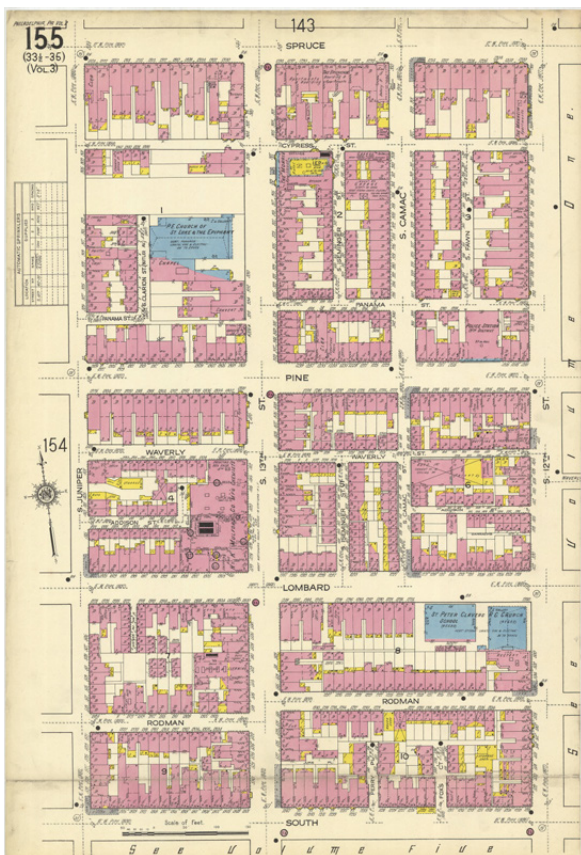


Figure 6. Sanborn Fire Insurance Atlas of Philadelphia, Pennsylvania, volume 2, sheet 155, 1916.

The Space of Poetics represents an excerpt from Gaston Bachelard's 1958 philosophical text *The Poetics of Space*.⁸ Bachelard's influential book explores the role that lived experience plays in our understanding of buildings and spaces. The excerpt I chose is a meditation on the importance of seclusion in creative life and the enduring mark left by a time of solitude. As a model for imagery, I turned to a genre of map I had been thinking about for some time: the fire insurance map.

Several years ago, I became interested in the Sanborn Fire Insurance Atlases of Philadelphia, a set of which is held at the Free Library of Philadelphia. These atlases, published between the 1860s and 1970s, were created for over twelve thousand cities and towns in the United States, Canada, and Mexico. As the Library of Congress puts it, "The maps were designed to assist fire insurance agents in determining the degree of hazard associated with a particular property and therefore show the size, shape, and construction of dwellings, commercial buildings, and factories."⁹ Philadelphia is a planned city originally laid out in a grid of lots roughly the same size and equally distributed around four main parks. Because of this, the maps of Philadelphia's Center City contain orderly and structured groupings of four quadrants, which are divided into major blocks, which are in turn divided into smaller blocks by minor streets, which are further divided into row houses, which are segmented into rooms (see fig. 6).

This nested configuration of boxes inside boxes inside boxes strongly reminded me, like Copernicus's diagram, of the recursive syntactical methods by which words are combined into phrases and sentences. For several years I had wanted to use Sanborn maps as a template for showing the way linguistic phrases are built up, and in the excerpt from *The Poetics of Space* I found a text that related to these maps conceptually, in part because of its architectural subject matter. Moreover, this excerpt from Bachelard's text explores the role that seclusion plays in creativity throughout the course of an individual's life; the Sanborn maps' composition of individual, separate pieces that build into larger and larger configurations seemed to me to speak directly to this idea of solitude within a larger society.

Before showing how I translated this image into a visual representation of the text, let me digress somewhat and give two sets of examples to demonstrate how nuanced our

knowledge of syntactic structure is and, hopefully, why I find it so compelling. As I showed above in the ambiguous newspaper headline examples, we all have knowledge of linguistic structure of which we are generally unaware. In fact, that knowledge is much more detailed and complex than the recognition of ambiguity. First, consider this pair of examples given by Noam Chomsky:

- (1) a. I wonder who [the men expected to see them].
 b. [the men expected to see them].

Chomsky uses this pair to show the complexity of phrase structure rules and, specifically, that the kinds of rules involved are never explicitly taught to the child; they are not even pointed out in detailed grammar manuals of the language. He explains,

Without instruction or direct evidence, children unerringly use computationally complex structure-dependent rules. . . .

Both [1a] and [1b] include the clause bounded by brackets, but only in [1a] may the pronoun *them* be referentially dependent on the antecedent *the men*; in [1b] the pronoun is understood as referring in some manner indicated in the situational or discourse context, but not to the men. . . . How does every child know, unerringly, to interpret the clause differently in the two cases? And why does no pedagogic grammar have to draw the learner's attention to such facts?¹⁰

Constraints like these on pronoun reference (what is called “binding theory”) are present in all languages and yet are not taught to anyone. Speakers must know that such rules govern their language without ever having to be told. This is strong evidence that certain properties of language are hard-wired into our cognitive system.

An even more astonishing case is found in 3b, another example from Chomsky.

- (2) a. John ate an apple.
 b. John ate.
- (3) a. John is too stubborn to talk to Bill.
 b. John is too stubborn to talk to.

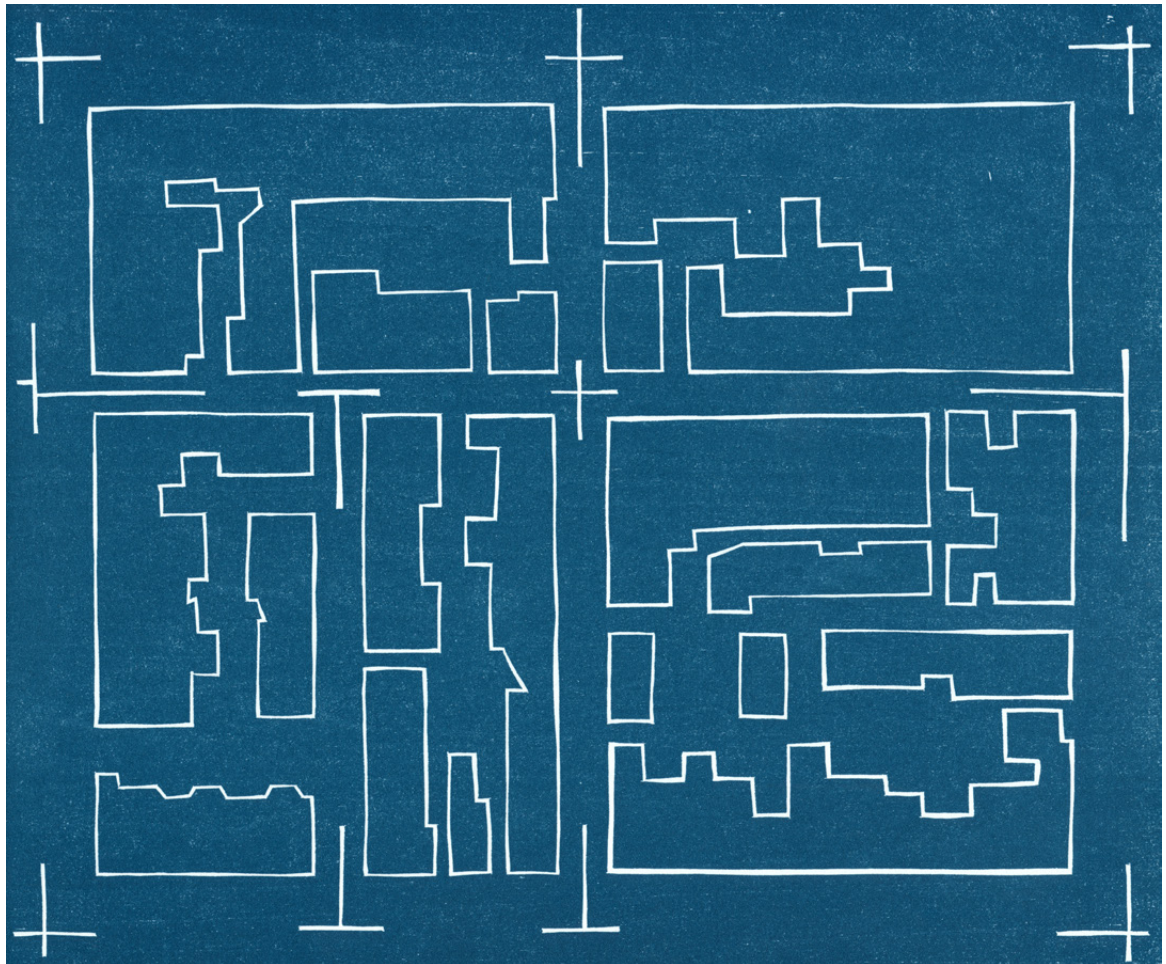
We would expect to understand a meaning for 3b analogous to that of 2b, but we do not, and no one has come up with a convincing way to explain the absence of this expected meaning without making reference to innate linguistic knowledge. Chomsky describes it thus:

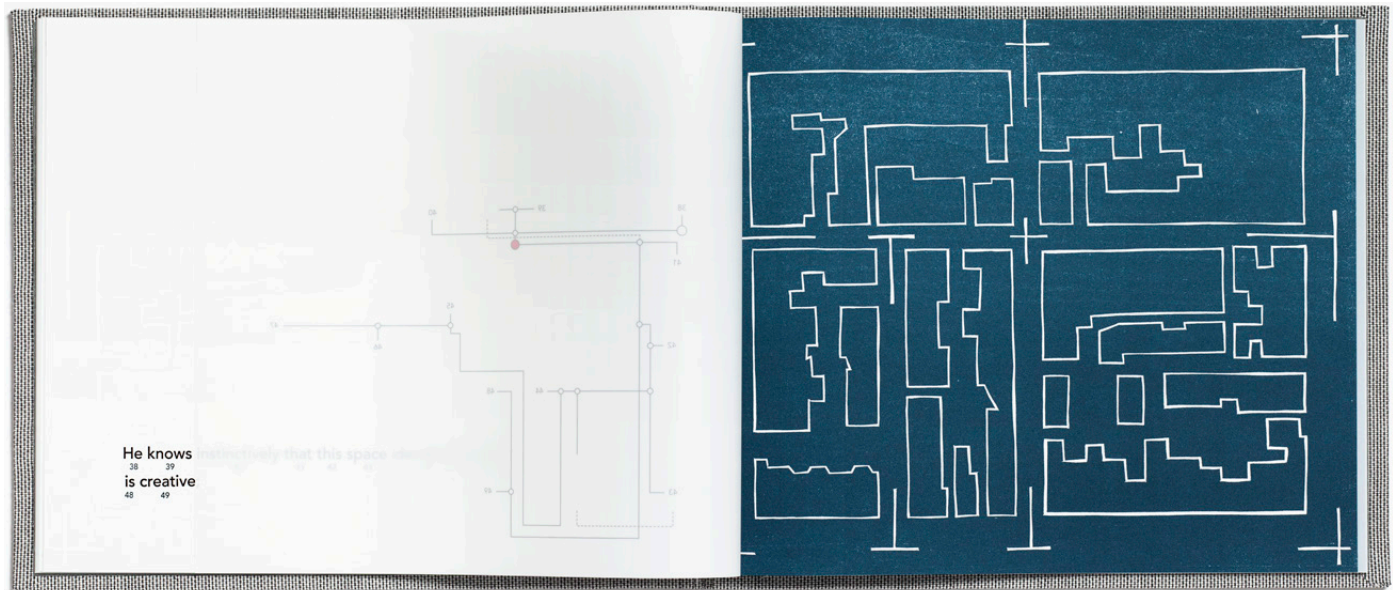
Turning to examples [2 and 3], sentence [2b] means that John ate something or other, a fact that one might explain on the basis of a simple inductive procedure: *ate* takes an object, as in [2a], and if the object is missing, it is understood as arbitrary. Applying the same inductive procedure to [3], it should be that [3b] means that John is so stubborn that he (John) will not talk to some arbitrary person, on the analogy of [3a]. But the meaning is, in fact, quite different: namely, that John is so stubborn that some arbitrary person won't talk to him (John). Again, this is known without training or relevant evidence.¹¹

These and other examples have been used by Chomsky to show that the language system has many features that all speakers know but which are never explicitly taught to them.¹² I give these examples to show that our knowledge of language and its structure is rich, detailed, and largely unconscious.

Returning to the Sanborn map in figure 6, I wanted to use this format to express, not the carefully chosen linguistics examples above, but the incredible intricacies and structural elegance of even syntactically ordinary sentences. In planning the book, I considered creating a different Sanborn-style map for each sentence or phrase, with the grouped and nested boxes representing words and phrases, somewhat like the circles in *In the Words of Copernicus*. For several reasons this was infeasible; given the phrases' variety of complexity, the drawings either ended up being quite different sizes or the building blocks had to be scaled differently; either way, the result did not resemble the homogeneity of the Sanborn maps. Instead, I decided to reference the idea of rooms and buildings with a single woodcut image that would be the same throughout the book. This I based on a portion of the Sanborn sheet shown above in figure 6. I edited out all but the stand-alone buildings and printed it in a color meant to suggest architectural blueprints (fig. 7).

Figure 7. The Space of Poetics (detail), woodcut, 2015.





In each of the book's eleven main spreads, I use a portion of Bachelard's text from *The Poetics of Space*, printed letterpress on the left-hand page. Facing this, on the right-hand page, is an image consisting of the woodcut in figure 7 overlaid with translucent Yupo paper printed with a line diagram suggestive of an architectural wiring diagram. These line diagrams contain numbers, each of which overlays one of the room-like boxes and corresponds to the numbers printed beneath the words on the facing page (fig. 8). The general idea is to think of the boxes in the street plan as containers to hold the words of the text and to connect those words with the wiring diagrams according to their syntax. Though wiring diagrams are not part of the original Sanborn maps, I adopted this form as a way to connect the shapes that represent each word, as well as to create a path or sense of movement for the viewer throughout the space of the image.

Figure 8. *The Space of Poetics*, pages 14–15, woodcut, letterpress, hand-coloring, 2015.

I arrived at these diagrams by the bracketing method described above, then translated each bracketed phrase into a small, circular node connecting to the words it contains and also to the node that contains it. Since each page only contains part of a sentence, color-coded dots provide a way to match up phrases that cross from one page to a later one. With repetition and variation, the two-part images act both as a template of possibilities and a vehicle for individual variation. Together, the text and visual representation of it lead through the book in ways suggestive of solitary meditation and creative exploration (fig. 9).

Though the “code” to read the syntactic connections is provided in the numbers running under the text and matching those on the overlay, decoding is not the only—or even a necessary—way for the viewer to access the meaning of the images. Instead, the repetition and variation within the image system developed here suggest, probably more immediately and instinctively than this more lengthy exposition, the great range and degree of structural complexity that we can understand with ease in a text. Through their substantial variation within a set pattern, the images are meant to elicit the deeply human forms of knowledge we all have as speakers but of which we are barely aware.

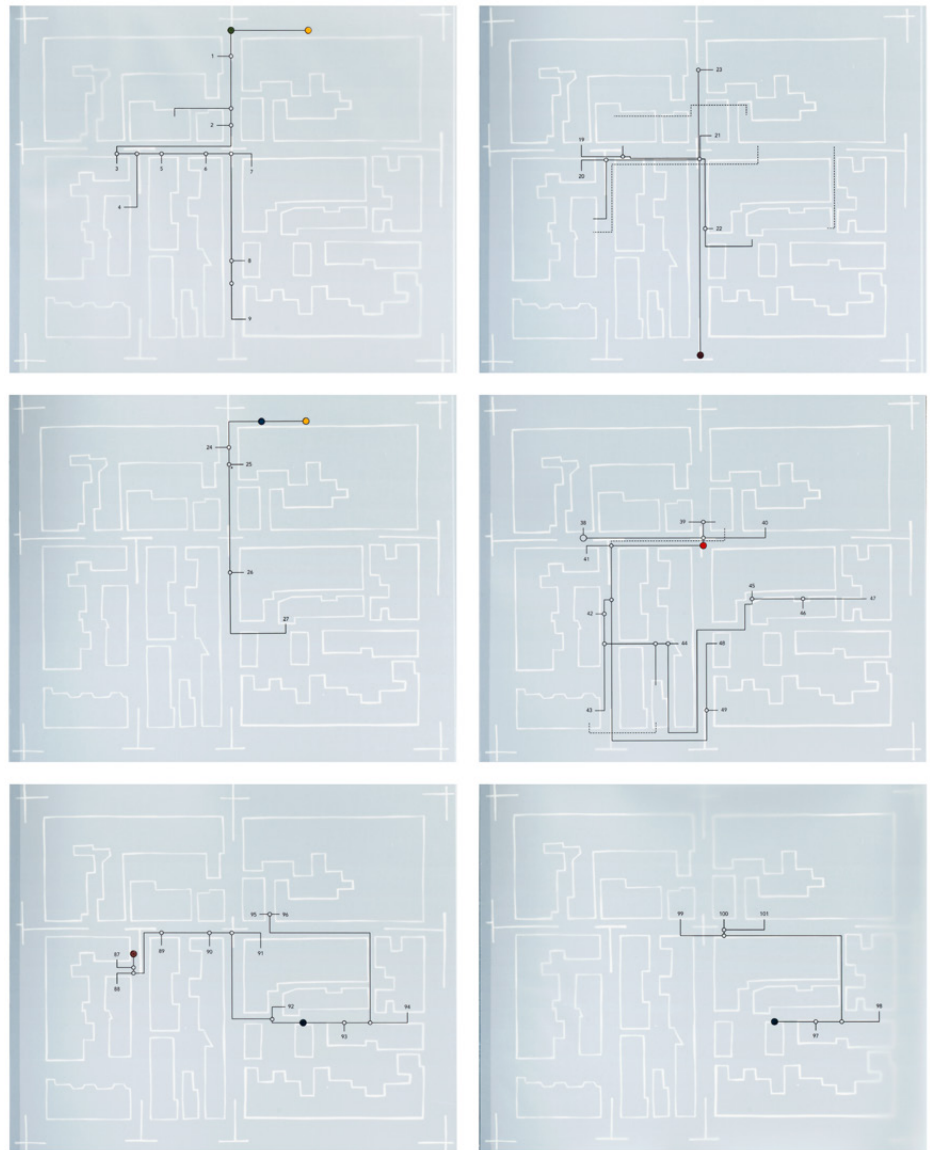


Figure 9. *The Space of Poetics*, pages 5, 9, 11, 15, 23, and 25, woodcut, letterpress, hand-coloring, 2015.

CONCLUSION

The core of what fascinates me about language as a visual artist is its intricate, interworking systems and the resulting configurational possibilities they suggest. Through a balance of regularity and variability, endless permutations of basic forms are possible, which is one of the true beauties of language. All languages have elaborate and elegant constraints on allowed combinations of sounds, syllables, words, and phrases, and each of these systems has rich possibilities for visual correlates.

The universality of our capacity for language—present in every speaker of every language across the planet—makes it a fundamentally human ability, all the more amazing because its workings are essentially hidden from us. Without explicit training, just by virtue of being human and being surrounded by language during the critical developmental age in early childhood, every cognitively healthy person on the planet develops a highly sophisticated language ability that is used in every aspect of life. We spend our lives steeped in language, and in doing so rely heavily on unconscious knowledge—we know the forms and patterns of our language (in one sense), but we do not know that we know them.

I hope that the visual representations I make offer something beyond the appeal of visual patterns, that an echo of language also resonates with the viewer. Using the structure of language as the basis for imagery in my work, I try to access patterns deep in the mind, to spark moments of recognition of linguistic forms that are familiar on an unconscious level, and to capture a sense of the wonder of this deeply human system. ■

NOTES

1. This holds not just for hearing people but also for members of the Deaf community. We now have volumes of evidence that sign languages such as ASL are not simply gestural systems but true languages with as much richness and structural complexity as any spoken language.
2. Steven Pinker, *The Language Instinct: How the Mind Creates Language* (New York: Harper Perennial, 1995), 18.
3. J. Lennart Berggren and Alexander Jones, *Ptolemy's Geography: An Annotated Translation of the Theoretical Chapters* (Princeton, NJ: Princeton University Press, 2002), 81–82.
4. Bruce C. Heezen, Marie Tharp, and Maurice Ewing, *The Floors of the Ocean, vol. 1, The North Atlantic: Text to Accompany the Physiographic Diagram of the North Atlantic* (New York: The Geological Society of North America, 1959).
5. Marie Tharp, “Connect the Dots: Mapping the Seafloor and Discovering the Mid-Ocean Ridge,” in *Lamont-Doherty Earth Observatory of Columbia: Twelve Perspectives on the First Fifty Years 1949–1999*, edited by Laurence Lippsett (Palisades, NY: Lamont-Doherty Earth Observatory of Columbia University, 1999).
6. Dmitri Mendeleev, “On the Correlation between the Properties of the Elements and Their Atomic Weights” (1869) in *Mendeleev on the Periodic Law: Selected Writings, 1869–1905*, edited by William Jensen (Mineola, NY: Dover Books, 2002), 18–37.
7. I used a list of the frequency of the hundred thousand most common English words compiled by Mark Davies. This list is based on the 450-million-word Corpus of Contemporary American English, supplemented with data from the 400-million-word Corpus of Historical American English, the British National Corpus, and the Corpus of American Soap Operas (for very informal language). See www.wordfrequency.info.
8. Gaston Bachelard, “The House. From Cellar to Garret. The Significance of the Hut,” in *The Poetics of Space*, translated by Maria Jolas (Boston: Beacon Press, 1994), 10. Originally published in English translation in 1964.
9. Library of Congress, *Fire Insurance Maps in the Library of Congress* (Washington, DC: Library of Congress, 1981), ix.
10. Noam Chomsky, *Knowledge of Language: Its Nature, Origin, and Use* (Westport, CT: Praeger, 1986), 7–8.
11. *Ibid.*, 8.
12. These kinds of examples form one part of what is called the “poverty of the stimulus” argument, which formed the foundation of Chomsky’s successful arguments in the 1960s against behaviorism, the prevailing theory of language acquisition at the time. For an expert discussion of this argument, its detractors, and its importance to the study of language, see Stephen Laurence and Eric Margolis, “The Poverty of the Stimulus Argument,” *The British Journal for the Philosophy of Science* 52, 2 (2001): 217–76.