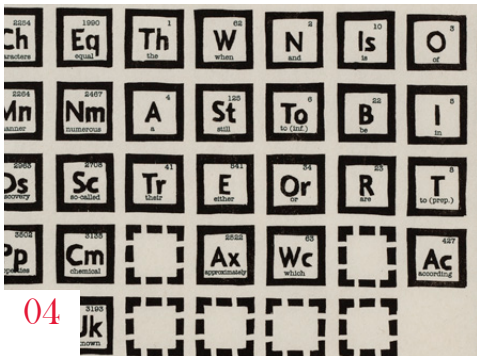
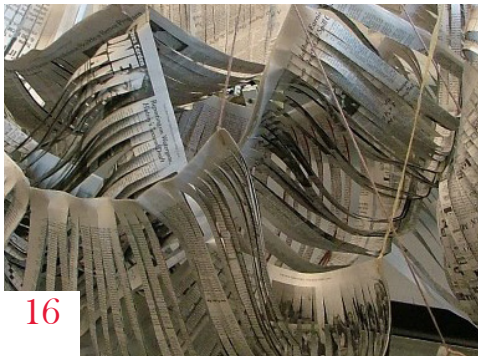
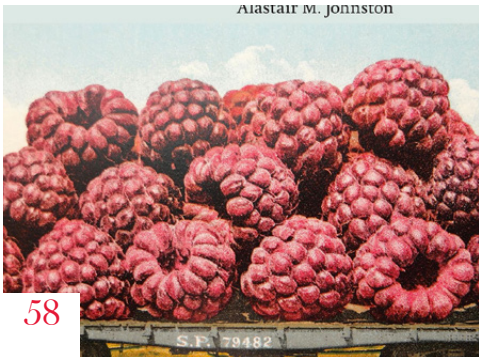
VOL 3 NO 1
JOURNAL OF THE COLLEGE
BOOK ART ASSOCIATION

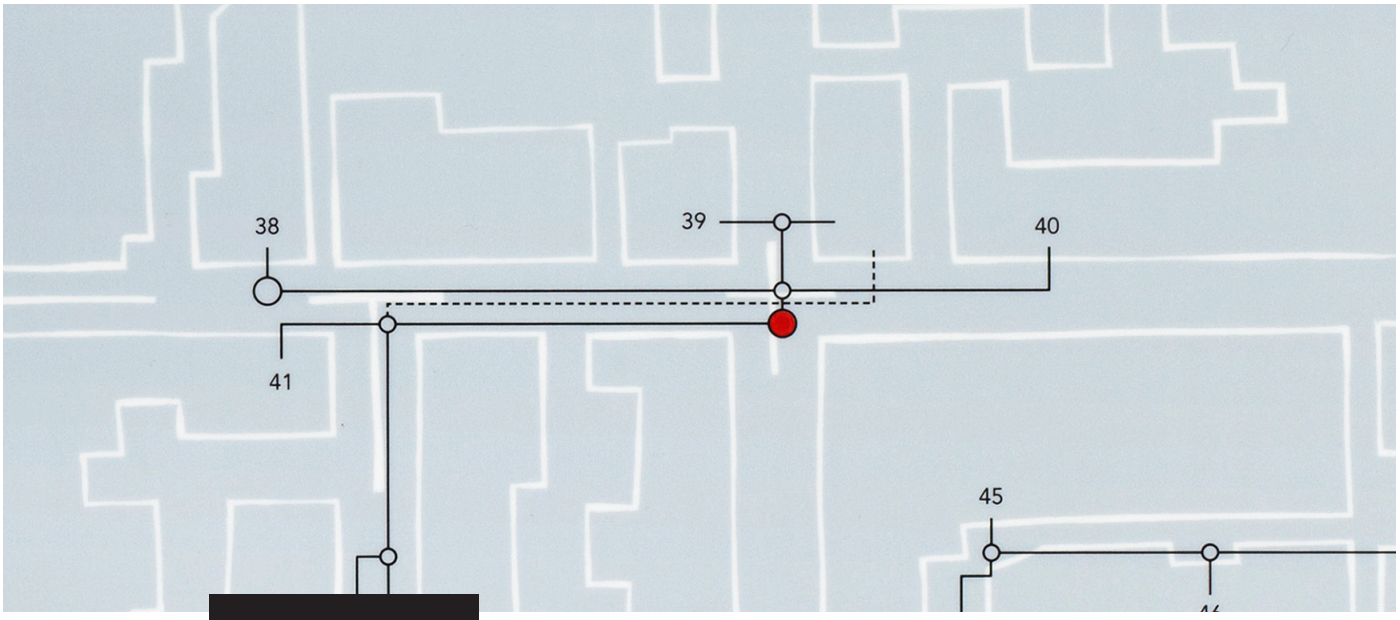
Openings: STUDIES IN BOOK ART

Contents









FROM THE EDITOR

by Inge Bruggeman

THE JOURNAL STAFF AND EDITORIAL BOARD are pleased to present this third volume of *Openings: Studies in Book Art*, the journal of the College Book Art Association (CBAA). This issue focuses on pedagogy in the book arts. It includes articles that examine various approaches to teaching, including the integration of special collections and archives into the curriculum, along with a typology of book arts programs in the United States. My particular interest in this article is that it might lay a foundation for continued discussion about how to integrate the growing field of publication arts with the more established academic book arts programs. We also continue our book reviews and our newer column, From the Maker's Perspective. This article gives an in-depth analysis of an artist's work. More than just a review, this column aims to contribute to critical discussion by analyzing the impetus and ideas behind an artist's body of work while contextualizing it within a larger scope of contemporary and interdisciplinary theoretical practices. We hope this issue will continue to energize artistic practice, stimulate academic study, and encourage more profound and multifaceted thinking in this dynamic field.

Openings STUDIES IN BOOK ART

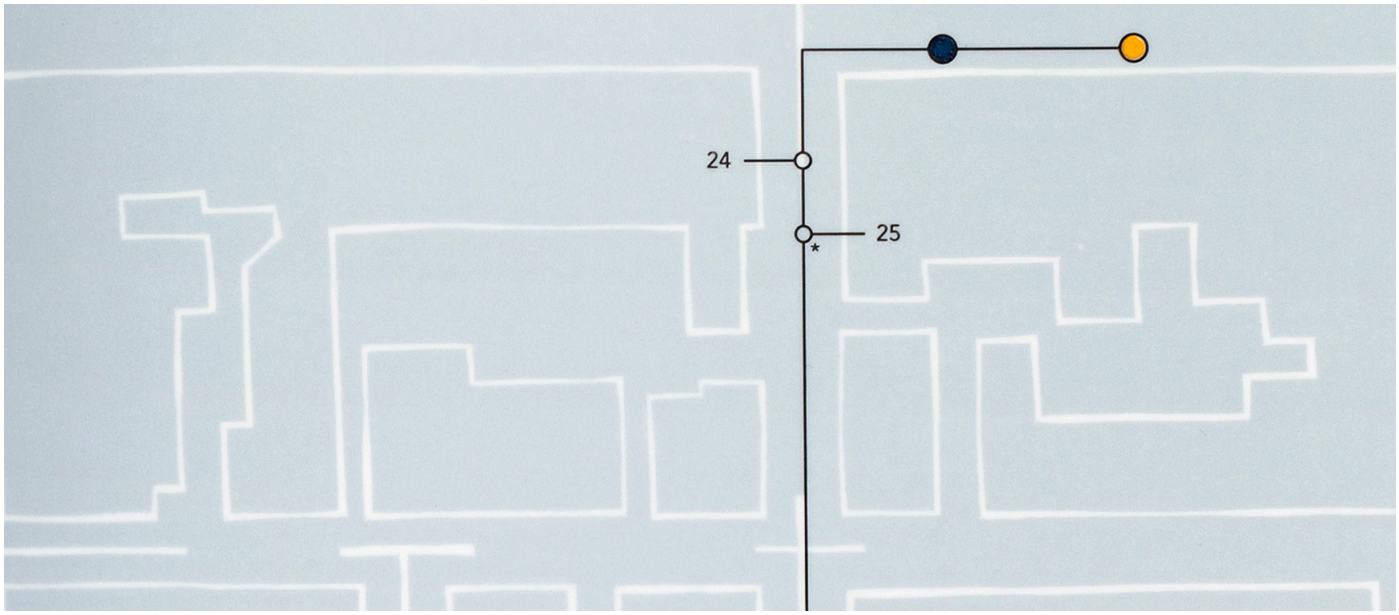
ISSN 2326-0157
Openings: Studies in Book Art is a peer-reviewed journal of the College Book Art Association (CBAA). It publishes critical, historical, and theoretical articles, reviews, and interviews about book art and its pedagogy. *Openings* is published yearly online and is available as a part of membership in the CBAA or through institutional subscription.

If you are interested in submitting an article or review to the journal please visit: journals.sfu.ca/cbaa
journal@collegebookart.org

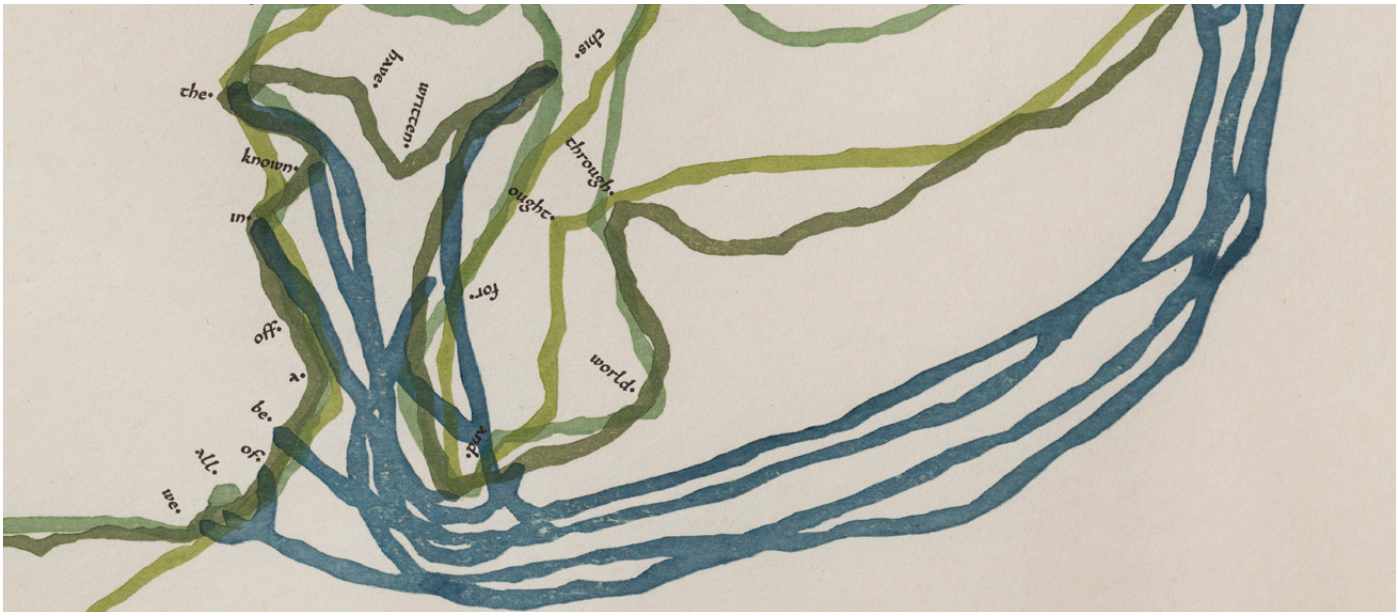
CBAA COLLEGE BOOK ART ASSOCIATION

Openings: Studies in Book Art examines the continually shifting role the book and publication arts play in contemporary culture. It is an expansive field of study, one that gloriously defies definition, breaks boundaries, and reaches into a wide array of studies both within and outside the arts and humanities. I recently had the great fortune of attending the *Booknesses* exhibition and colloquium in Johannesburg, South Africa. In particular, one panel stood out to me. It included a wide range of academics in the humanities whose use of the book as a unique space to explore interdisciplinary creative research projects was astounding. One example discussed was Nick Sousanis' award-winning PhD project in education on visual thinking which took the form of a graphic novel titled *Unflattening*. The attributes of layering and sequencing textual and visual narrative, in the material experience of the physical book, continue to make this media one of the most impactful ways to communicate. It is a fully embodied experience, one we soak in and soak up through all our senses. It was exciting to see these examples of academic inquiry explored within the expressive medium of the book as art. This event also made relevant the artist publication as a tool for social justice and expression, which we now have more reason than ever to recall and make use of. Let us not forget the power of the press to make change. Yes, anyone can publish in this day and age, and what better time than now to exercise that right frequently, poetically, and compassionately? The conference in South Africa and the Artists Books Brisbane Event (ABBE) in Australia, among a myriad of other book arts events nationally and internationally, illustrate the growing interest and breadth of activities within the book arts today. This journal is proud to be at the heart of these conversations.

Remember, however, that the success of this journal depends on you. Your participation in submitting papers, and recommending *Openings* to others as a platform for critical and theoretical investigation, is always greatly appreciated. The journal continues to gain strength and speed, so stay tuned for future issues full of critical and compelling work in the field of book and publication arts. ■



Images from The Space of Poetics *by Sarah Hulsey. See "Visual Reconstructions of Language."*



VISUAL RECONSTRUCTIONS OF LANGUAGE

by Sarah Hulsey

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*:

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.

> 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.

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

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

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 phr-ases, 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.

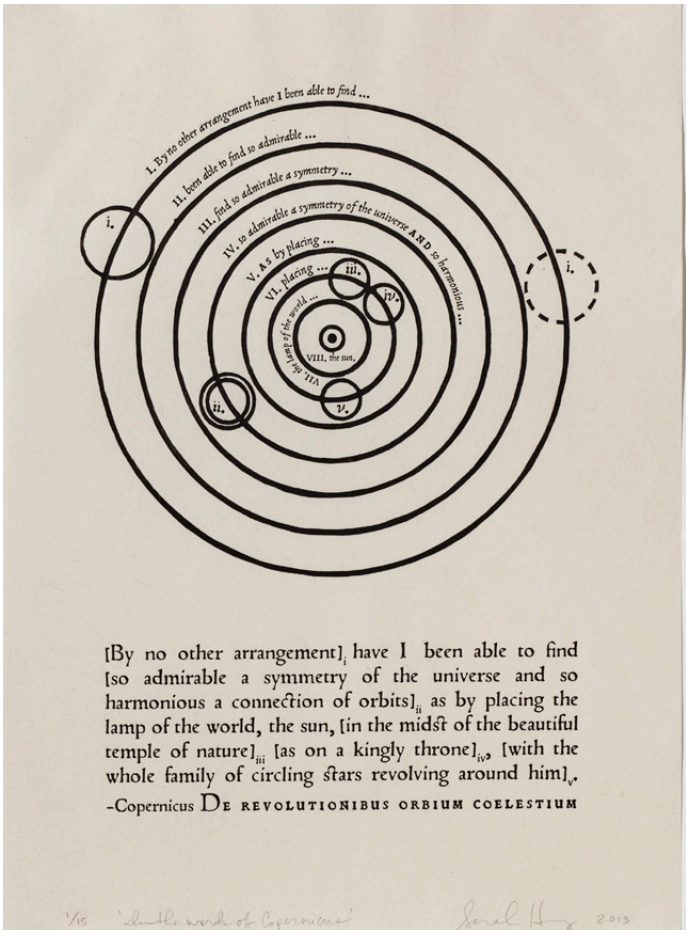
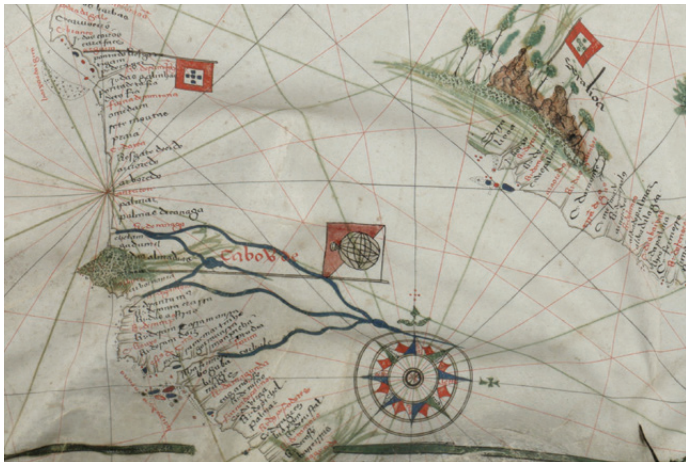


Figure 2. In the Words of Copernicus, *woodcut and letterpress, 2013.*

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.



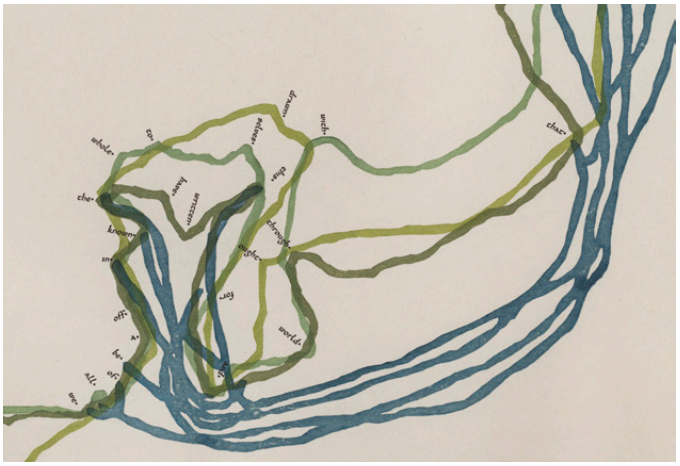
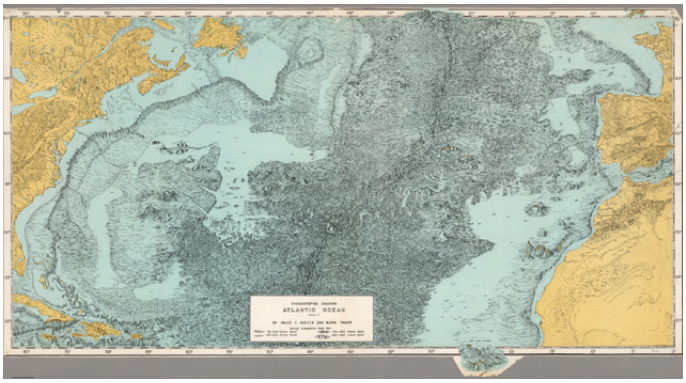


Figure 3a. Portolan chart of Mediterranean by Jorge de Aguiar, 1492, Beinecke Rare Book and Manuscript Library, Yale University (detail); 3b. In the Words of Ptolemy *(detail), woodcut and letterpress, 2014.*



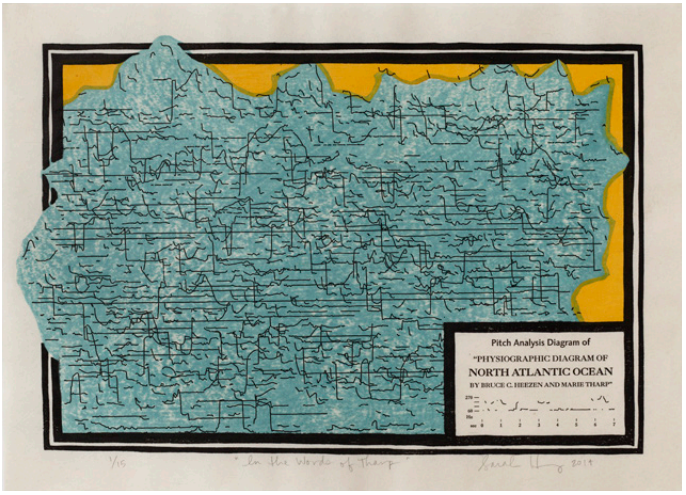
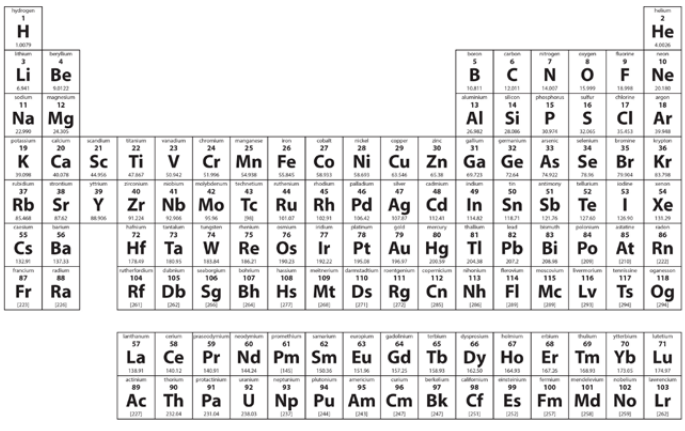


Figure 4a. Physiographic diagram of the North Atlantic Ocean, Bruce C. Heezen and Marie Tharp, 1959; 4b. In the Words of Tharp, *woodcut and letterpress, 2014.*



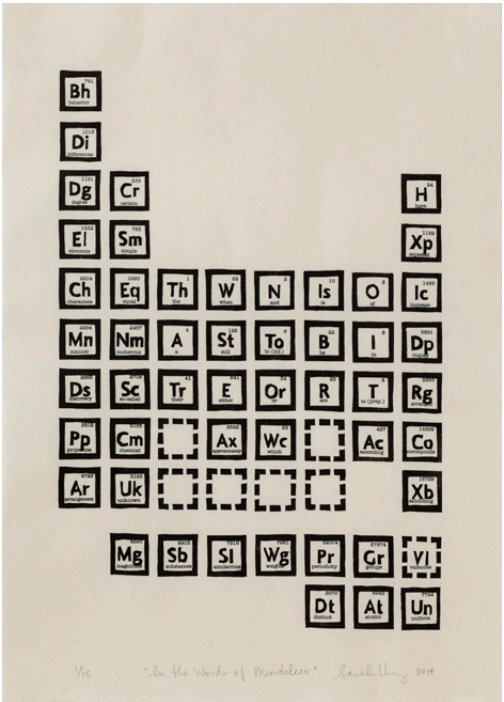


Figure 5a. Modern periodic table of the elements; 5b. In the Words of Mendeleev, *woodcut and letterpress, 2014.*

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).

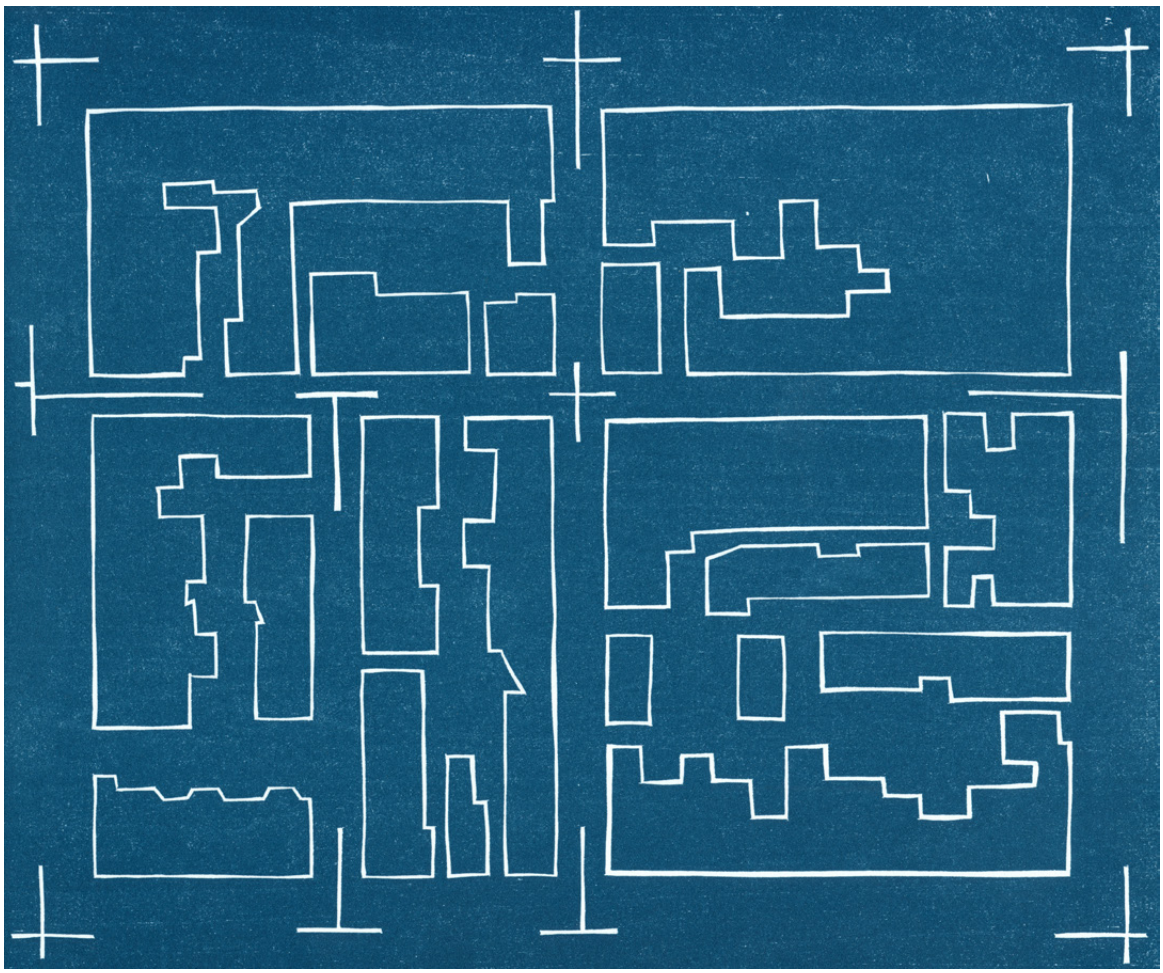


Figure 7. The Space of Poetics *(detail)*, *woodcut*, *2015*.

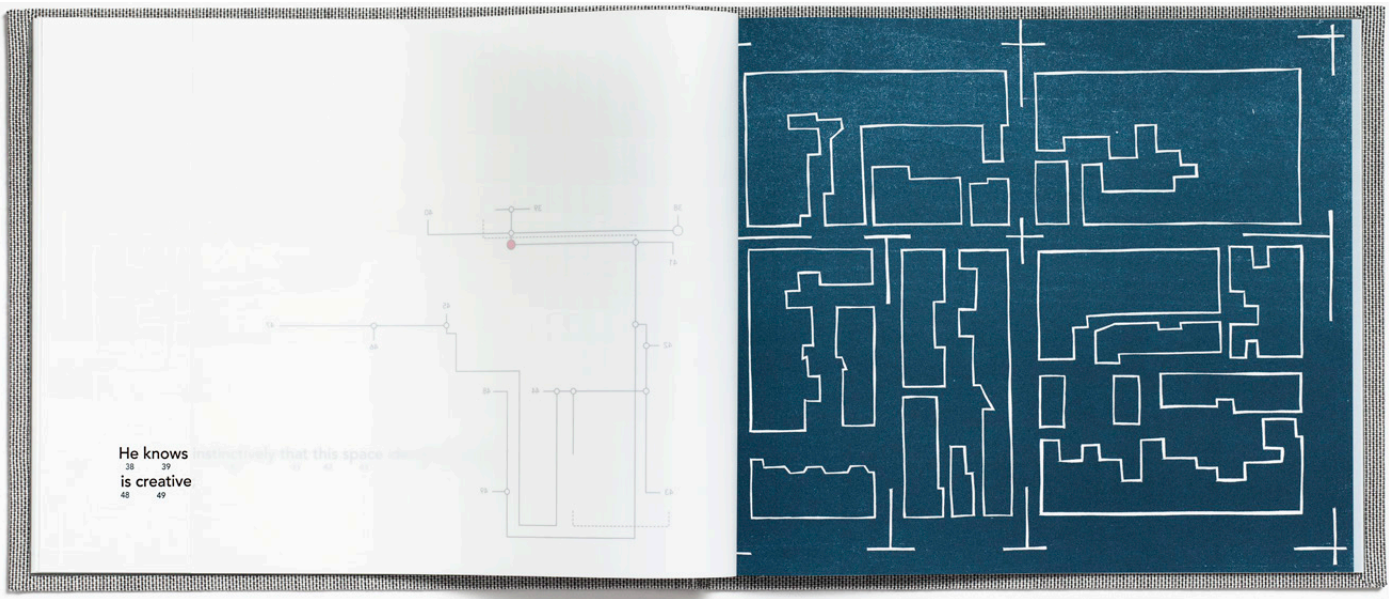


Figure 8. The Space of Poetics, *pages 14–15, woodcut, letterpress, hand-coloring, 2015.*

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.

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.

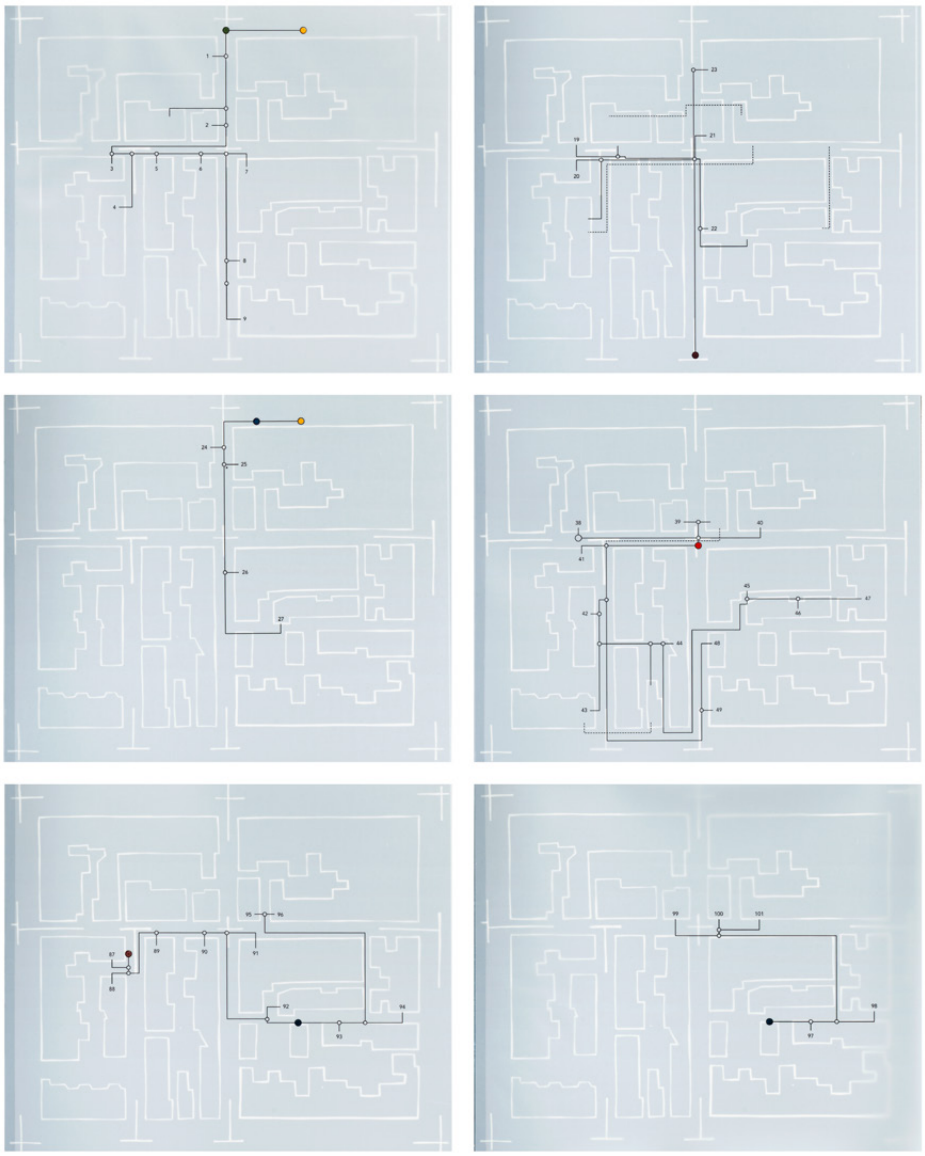


Figure 9. The Space of Poetics, *pages 5, 9, 11, 15, 23, and 25, woodcut, letterpress, hand-coloring, 2015.*

CONCLUSION

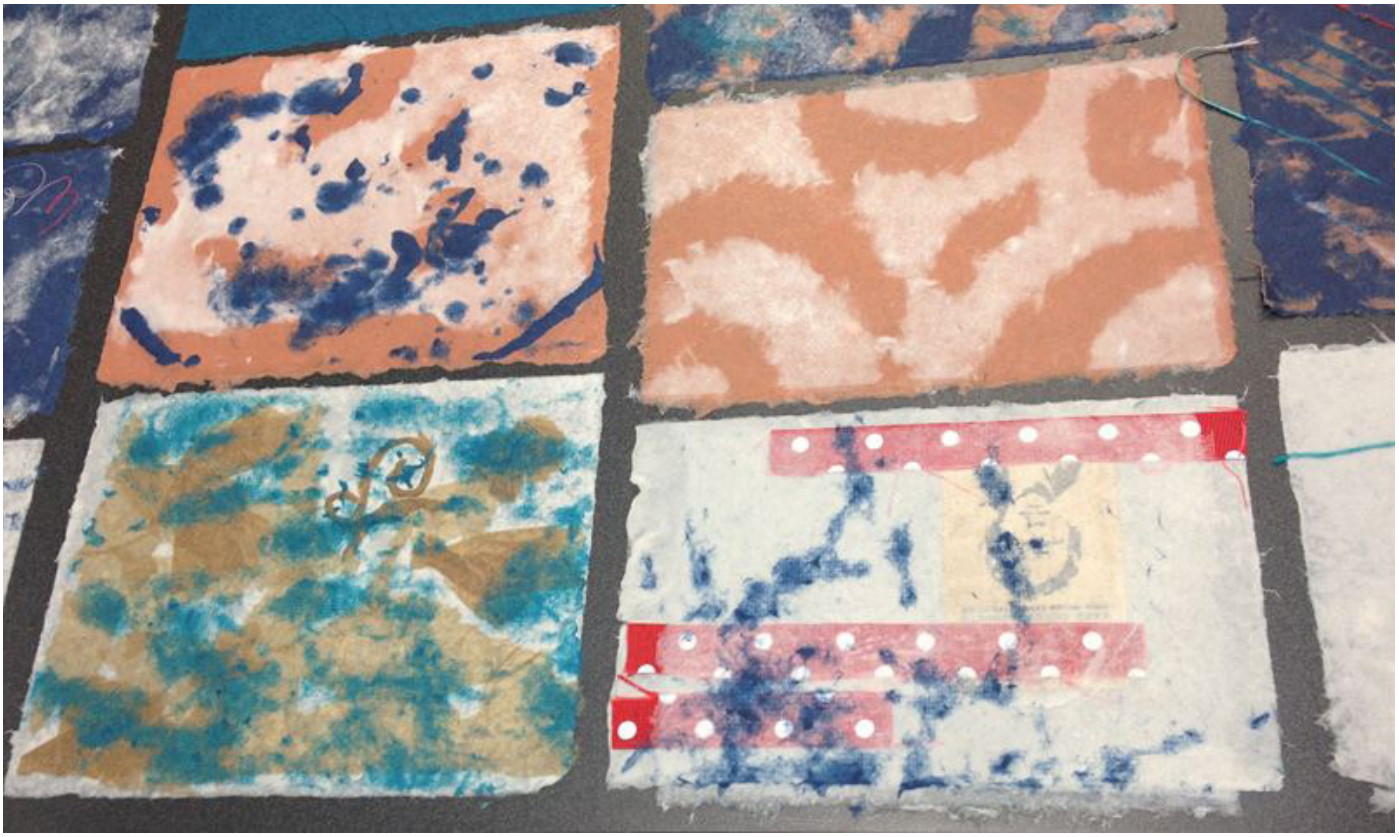
The core of what fascinates me about language as a visual artist is its intricate, interworking systems and the resulting configurational possibilities they suggest. Through a balance of regularity and variability, endless permutations of basic forms are possible, which is one of the true beauties of 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.



PAPER AS LENS: USING THE MEDIUM'S CULTURAL SIGNIFICANCE TO INTRODUCE FIRST-YEAR STUDENTS TO HIGHER EDUCATION PRINCIPLES

Jae Jennifer Rossman investigates Elana Herzog's Paper seminar

ABOUT THE AUTHOR

Jae Rossman is Director, Department of Area Studies and Humanities Research Support, at Yale University Library. She was previously the Associate Director for Special Collections and Public Programs at the Yale Arts Library.

THE MEDIUM AND TECHNOLOGY OF PAPER serve as the focal point for a seminar-style course at Yale University that introduces first-year students to foundation concepts in higher education, such as research methodology, critical thinking, and creative problem solving. Additionally, the course introduces the multitude of resources on campus. As a librarian who presented one of the course modules, I had the opportunity to be directly involved, albeit in a small role. As a curator, my natural inclination is to look for interesting things to share with a wider audience, and because of my personal interest in pedagogy, particularly experiential and

object-based learning, I was intrigued by the course and decided to engage its professor, Elana Herzog, by e-mail and an in-person interview, regarding her goals and the design of the course. I found that the model would be adaptable to other institutional settings and academic levels, and thus aspired to introduce Herzog's ideas to a wider audience. She generously allowed me to observe and participate in additional class sessions so I could get a fuller sense of how the course worked. This ongoing conversation and observation motivated me to reflect on the pedagogical underpinnings to better understand why the course works. Below, I present the course's current structure and the permutations tried by Herzog over the past five years of its development. Additionally, I hope the generalized model I have distilled from several years of observations can be adapted to other institutional settings.

HISTORY OF THE PAPER SEMINAR'S DEVELOPMENT

The Paper seminar was conceived in 2009 by Jessica Stockholder and Daphne Fitzpatrick, former professors in the Yale School of Art. It is cosponsored by the Sculpture Department in the School of Art and Yale College (the undergraduate portion of the university) and intended as an introduction to contemporary art and the potential of paper as a contemporary art medium, yet is not restricted to art majors. The course also uses the world of contemporary art as a springboard to investigate larger societal and cultural themes. It is restricted to first-year students and is part of the Freshman Seminar Program. With an undergraduate population of around fifty-five hundred, Yale can provide small class sizes and direct contact with professors but often only in a student's major. The Freshman Seminar Program was developed to provide greater access to professors and to foster peer interaction early in students' academic careers. Because the program has limited availability and is filled by application and then lottery, students come to freshman seminar courses with enthusiasm and a desire to participate.

The first iteration of the course was led by Siobhan Liddell, for two years, and the course has been led by Elana Herzog since 2012. In its current iteration, the course calls for the participation of multiple staff members and visiting artists and curators, who vary from year to year.[1] Herzog strives to take the greatest advantage of university resources by engaging with material presented in current exhibitions at Yale's museums, galleries, and libraries and other timely campus events. Each freshman seminar is limited to eighteen students and meets twice a week. Freshman seminars normally meet for 1.25 hours each session for fourteen weeks. Because the Paper seminar is considered a studio class, it meets for one long (2-hour) and one short (1.25-hour) session each week. The long sessions are active studio time, while the short sessions are usually site visits, to view a library or collection, an exhibition, or a conservation lab. A major challenge for the professor is deciding which venues to visit, in which order, and what to show at each venue. The course also takes advantage of the school's location, especially its proximity to New York City. In four of the past five years, the class has made a trip to New York to visit an artist's studio, current exhibitions, and Dieu Donné papermill, a nonprofit organization with gallery space, an education center, and production facilities. During the spring of 2014, the class visited the Josef and Anni Albers Foundation in Bethany, Connecticut, where they saw works by both artists. Classes have also visited exhibitions at local galleries in New Haven.

Guest speaker Winnie Radolon visits Paper seminar. All photos by Elana Herzog.

SCAFFOLDING LEARNING

As the course is designed for beginners and nonmajors, Herzog scaffolds the lessons to introduce both studio techniques and the world of contemporary art. She structures the class with supports that build toward a research paper and final critique of studio projects. Some have criticized this more general use of the term "scaffolding" when one is not specifically using calibration and fading as components of the scaffolding process.[2] However, as the idea of stepping learners incrementally through a subject has become a popular pedagogical tool, I believe it is appropriate to use the term to describe the course's structure for both the studio and historical components. Additionally, Herzog's approach does have elements of scaffolding, such as personalizing support based on each student's capabilities (i.e., calibration) and modeling behaviors.

The first unit is about the world of contemporary art and paper's role in it. Herzog starts the semester with a lecture "showing the range and potential of paper as primary material in contemporary art" and class discussion on "paper as a material and an idea."[3] In the same week, the first site visit views an exhibition on campus or in the local community to discuss the role of paper in the artworks. A reading by Ian Sansom, "Can Paper Survive the Digital Age?" (from the *Guardian*, November 9, 2012), and the introduction of the semester-long assignment of collecting and documenting found paper round out the first week. Through these activities, Herzog introduces the opposing ideas of paper as a precious commodity and as a ubiquitous part of our culture. Herzog says that "the majority cultural disposition views paper as a mass-produced commodity. In other words, paper is generic, nonprecious, and disposable."

In week 2, Herzog uses the work of artists Tom Friedman and Thomas Demand as examples of how artists can manipulate the ubiquity of paper to transcend its physical qualities. Through assigned readings of interviews with the artists, students learn how both artists use paper as a critical part of their art practice but not in a precious way or even in a way that expressly draws attention to its physical qualities. Demand, a photographer, constructs detailed colored paper tableaux based on real (sometimes historically significant) scenes—such as an image of the Oval Office that was commissioned by the *New Yorker* after Obama's inauguration—only to photograph them and destroy the "sets" afterward. Friedman has used paper in a more varied way. His work verges on obsessive trompe l'oeil. Herzog notes that his piece *1000 Hours of Staring* (1992–97), which consists of a blank piece of paper that he claims to have stared at for one thousand hours, always provokes amazement and inspires a rich discussion. According to Herzog, both artists raise questions for students about how we "define art, value labor, and embody the intangibles in symbolic structures."

During the same week, Herzog addresses paper as a medium and as something with inherent structure, through the act of folding. First, students watch a documentary on origami, *Between the Folds* (2008), which introduces the idea of engineering. Then students practice Josef Albers's now classic Bauhaus exercise using paper as the substrate in the transformation of a two-dimensional surface into a three-dimensional object. This exercise is a good introduction to the multifaceted incarnations of paper that will be presented during collection visits, and it emphasizes an important core concept vital to academic success: exploration. To further emphasize exploration, Herzog also introduces a semester-long project called the "nonlinear book." This is essentially a sketchbook/journal but one that will be publicly presented and critiqued at the end of the course.

In week 3, Herzog introduces the work of John Cage to illustrate how contemporary artists employ chance operations in the production of art. As with Demand's and Friedman's, Cage's work challenges, according to Herzog, "the idea of the precious unique object and the artist as genius." She also notes that his work especially challenges the idea of control in art making. Herzog wishes to emphasize that many strategies can be employed in the production of form: "choice, intentionality, and chance are all critical aspects of the artistic process." To open the conversation about the way history is written and to challenge the conventional wisdom about how it is taught and learned, Herzog has selected the work of Miriam Schapiro and Melissa Meyer. Through the work of these feminist artists, the professor can ask: "What is the dominant cultural narrative? And what are other views?" These conversations raise the students' consciousness about point of view as an underlying determinant of meaning and cultural constructions of knowledge.

During the first three weeks of the semester, Herzog introduces the ideas of critical discussion of a work of art as well as how works of art can contribute to larger societal discussions. She also introduces the multifaceted nature of paper: how it can be the star attraction, play a supporting role, or be almost invisible. The introduction of historically significant artists at the beginning of the semester sets up themes or conversations that are revisited through new lenses during later site visits. Now that the students have basic skills for understanding paper and communicating about it and artworks, Herzog can move on to adding specific technical skills the students can employ in their own work. Simultaneously, the students are, through visits to campus resources, introduced to primary sources that exemplify the issues and questions they are exploring. For the remainder of the course, two parallel but interrelated sets of activities take place: studio exploration and resource visits. These are discussed separately below; the overarching relationship can be seen in the course outline in appendix A.

STUDIO EXPLORATION

Studio projects introduce students to traditional processes such as hand papermaking and bookmaking, as well as basic principles of three-dimensional design and sculpture, through exploration of material and form. Herzog's course is structured so an idea is introduced in the studio session at the beginning of the week, and a related site visit happens during the second meeting later in the week. With the studio component first, students can develop an idea of how the techniques work before they see the primary sources. Of course, this could be done in reverse, if needed, with students then trying out techniques after seeing historical and/or contemporary examples. The exception to this general pattern is the first site visit, to a conservation lab, which is really a continuation of the introductory sessions in weeks 1–3.

Herzog continues to scaffold techniques in order to establish a repertoire students can use for their final projects. First is the idea of the papermaking screen, before students touch any slurry. Applying the idea of "symbolic image making" to the screen, students create a watermark to be used in the introductory papermaking session during the next week. Of note is the fact that first-time students make paper only after they have been impressed with the work of a paper conservator and the work of contemporary book artists who use handmade paper. In Herzog's quest to introduce students to a variety of professionals, as well as to campus resources, she invites a professional papermaker to lead the one-session workshop on papermaking basics. This is, of course, the minimum amount of time one

would want to devote to teaching these skills. Herzog's course is designed around haptic (touch-based) experience, to reinforce learning, but is not a high-level studio course, so mastery of technique is not the primary goal. Subsequent weeks augment the base skill of papermaking by introducing variations and additions. Topics include pulp sculpture with an armature; pulp dip; painted sculpture; paper and pressure: embossing, relief printing, monoprints, and frottage. The last three weeks of the semester involve in-class work time under the description "transformative acts." In these sessions, students are directed to think, while they work on their projects, of larger themes such as "production and reproduction," inspired by the Jasper Johns quote: "Take an object / Do something to it / Do something else to it. [Repeat.]"[4]

RESOURCE VISITS

The resource visits commence at the end of week 3. The visits at the beginning of the semester have a preferred order that builds knowledge; later visits tend to be varied based on availability. In this case, student learning will happen in a less linear fashion but may also reinforce earlier lessons. Below, I have categorized the visits by general purpose, and a brief description along with a few specific examples is provided for each. The site visits serve multiple purposes. As mentioned earlier, they provide opportunities to be introduced to campus resources, material and human. In addition to learning what holdings libraries and museums have, as well as the procedures for accessing those materials, students learn that a host of staff members are eager to assist them with their research and learning. Herzog also points out that interactions with cultural-heritage professionals provide windows into worlds that many students did not know existed, providing an introduction to potential careers that require highly developed skills and knowledge. These site visits also employ object-based learning, which has been defined as "learners' active engagement with museum collections within a student-centred framework."[5] I will expand upon this more fully in the pedagogy section.

1. Conservation / History

The first resource or site visit is with a paper conservator; on Yale's campus this takes place at the Yale Center for British Art. This visit covers "papers' origins and uses with evolutionary tales," such as the development of papermaking in China circa 105 AD and the dispersion of the technique via the Silk Road to the Middle East and eventually to Europe. Students also have an opportunity to see the tools used to examine and repair paper and to learn more about its properties. Introducing the students to the conservation of paper gives them a sense of connection to the history of the medium and the cultural pursuits it has supported, such as the printing revolution. A student comment from a course evaluation provides evidence of success in teaching the valuable lesson about the roles of staff on an academic campus. The student wrote that this visit was the most important because it gave insight into the ways that university staff provide support to students and professors and referred to the conservators as "unsung heroes."

2. Historical Research / Artist-Made Books

This visit has two purposes: an introduction to resources for research on hand papermaking and to view artists' books that incorporate handmade paper in a significant way. These components could be separated pedagogically. However, in the structure of Yale University both are well represented in the special collections of the Robert B. Haas Family Arts Library, which allows the two components to be combined into one session. The session commences with an introduction to contemporary resources. The journal *Hand Papermaking* and its portfolios are highlighted as well as other journals related to artists' books. Next, examples of historical works on the history of paper, such as those by Dard Hunter and Bird & Bull Press, are reviewed. The class also sees pre-twentieth-century books such as *Art de faire le papier* by Joseph Lalande (circa 1776) and Matthias Koops's *Historical Account of the Substances Which Have Been Used to Describe Events, and to Convey Ideas, from the Earliest Date, to the Invention of Paper. Printed on the First Useful Paper Manufactured Soley* [!] *from Straw* (London: T. Burton, 1800). While the focus of the course is on the Western papermaking tradition, a few examples of pre-twentieth-century Asian books are shown in contrast. The goal of this portion of the visit is to emphasize that the students have resources available if their research papers take them in this historical direction.

The second section of the session is a hands-on component with artists' books that incorporate handmade paper in a significant way, such as work produced by John Gerard, Peace Paper Project, John Risseeuw, Robbin Ami Silverberg, Claire Van Vliet, and Women's Studio Workshop (WSW). Since one of the major themes of the semester is artists investigating societal issues, many of the artists and artworks selected for this visit focus on how handmade paper can be used in artistic commentary. For example, students see Risseeuw's *The Paper Landmine Print Project* (2001–7), which brings attention to the global problem of land mines. Examples from Peace Paper Project and its archive allow the students to view work made by artists as well as by participants in Peace Paper's outreach projects. Silverberg's work draws attention to political happenings through a personal lens; her work is also often sculptural and so ties into the class's consideration of three-dimensional paper forms. The WSW ArtFarm project also delves into the sculptural properties of paper as well as issues of sustainability. Artists like John Gerard and Claire Van Vliet illustrate the drama pulp painting can bring to a work of art. As this session is paired with the making of watermarks in the studio, the session also features the *Hand Papermaking* portfolio *Watermarks in Handmade Paper: Modern and Historic* (2001). The synergy between the topics can be enhanced through object selection to ensure that readings discuss one or more of the artists whose books will be viewed in the session. The focus of this session is artists' incorporation of paper into the art-making process and historical documentation of these trends, so it could be taught with a focus on concrete art or mail art, for example, based on the strengths of the collections available.

2A. Visual Literacy Exercise

An optional component of the hands-on session with artists' books is a visual literacy exercise; this can be done with any collection where handling of material is permitted. The students work in groups to examine an object from the collection and answer a short series of questions based solely on their visual experience of the object. The groups then informally present their findings, and the moderator (professor or librarian) uses the ideas generated as a segue to introduce library materials that could further research and exploration. Ideally, this exercise is done very quickly and can take from fifteen to thirty minutes depending on the class size and session goals. It has proven an invaluable tool that helps

students engage with materials quickly and encourages discussion. This active-learning practice counters the classic problem of students politely (but quietly) listening to descriptions of objects and informs them that they are welcome contributors to the session. While all the site visits employ some degree of object-based learning, a hands-on exercise enhances the learning experience further by adding the haptic component not always available in special collections or museum visits.

3. Cultural Manifestations of Paper

The course is designed to focus on papermaking and art in its early meetings, as is appropriate for a course sponsored by the School of Art. However, an important aspect of the course's conception is evidenced in its title, Paper—in other words, not Papermaking. After the students have an understanding of the physical properties of paper and how those properties have been manipulated by artists, Herzog widens the scope of their exploration to paper's role as a less obtrusive substrate. This zone of inquiry is supported by interaction with working documents on paper, specifically historical documents preserved in an archive. However, should access to an archive not be available, these pedagogical points could be made with contemporary paper-based documents, such as a birth certificate, marriage license, or paper currency. This could also be accomplished through exhibitions that feature paper-based documents. The studio component paired with this examination of paper's everyday and historical uses is the papermaking workshop, where students interact with pulp for the first time.

The resources of the Beinecke Rare Book and Manuscript Library (BRBL) provide an exceptional opportunity to look at historical documents and their substrates. This session focuses on "paper as a material object through time—cultural change and material exchange." The session is arranged thematically, with examples of culturally and historically significant paper-based documents illustrating the themes of slavery, redemption, devotion, and creation. These themes are illustrated with examples such as a bill of sale for a slave, printed indulgences, and a missal. For creation, they see evidence of the creative process of a writer, viewing a manuscript version of a famous literary work and letters from the author concerning her work on the book. The students also view sample books, both commercial and made by artists, to emphasize the technological aspect of paper.

Herzog has found that younger generations often have difficulty understanding how technologies that are no longer part of everyday life were used. Paper is still foundational to the way society functions, although that is certainly starting to change. Understanding the role paper has played in the creation of books and documents helps students understand discussion about the death of the book and the continued reverence for it despite its supposed demise. Additionally, students gain a better understanding of historical reverence for the sanctity of the document and the physical object itself, which is all but erased in an era of multiple digital copies.

4. Paper in Art and Literature

Art and literature are major focuses on the Yale campus, and this is reflected in Herzog's implementation of the course. Three resource visits are devoted to this theme: two to the Yale University Art Gallery (YUAG) and a second to BRBL. At YUAG, the class views "contemporary artworks in which paper is used to build up or create the image, rather than just acting as a substrate onto which to apply media." Works viewed include those by Sam Gilliam and Claes Oldenburg. Students also look at historical examples in which

paper has a supporting role, such as Rembrandt etchings. The students expand their knowledge of Josef and Anni Albers by viewing some of their paper-based works, which of course relates to the Albers-style folded paper exercise from early in the course. These two YUAG visits correspond with the "pulp sculpture" and "pulp dip" studio components.

The second visit to the Beinecke library focuses on the Yale Collection of American Literature, especially collaborations between poets and artists. Selections viewed emphasize how paper can be both medium and ground as a critical component in engaging the artist and author to collaborate. The students also explore the idea of expectations about who reads poetry and how it is published, by looking at non-paper-based media and non-book formats such as lapel pins, vinyl bumper stickers, and refrigerator magnets. This visit marks a transitional moment in the studio, where students move from learning techniques for making paper to modifying its surface.

5. Paper-Related Campus Events

As mentioned above, Herzog strives to take full advantage of campus events. As the course has become established as a recurring offering, she has been able to develop campus relationships and thus make planning for the inclusion of such events more integrated and less opportunistic. In 2014, through my role as director of the Yale University Library Bibliographical Press, I arranged a visit from Margaret Mahan of Peace Paper Project to give a talk about her work on the Panty Pulping project. Herzog welcomed an additional day of papermaking during one of the flexible days in the syllabus, so Mahan also visited the seminar, teaching the students about the pulp stenciling technique that she and Drew Matott frequently employ in public demonstrations. Also in 2014, the Yale Program in the History of the Book brought parchment maker Jesse Meyer, North America's only producer of parchment and an expert on historic leather and parchment-making procedures, to campus for a hands-on demonstration that took place in the School of Art building. Most recently, in 2016, Herzog arranged for Amy Jacobs, master papermaker from Dieu Donné papermill, to present a lecture that addressed papermaking as an artistic practice and highlighted several papermaker-artist collaborative projects.

Exhibitions on campus also provide an opportunity to see examples of paper in use as well as to introduce students to the variety of resources on campus. For example, two exhibitions on view during the spring 2016 semester were manifestations from different disciplines that reinforced a major idea of the course: paper as a carrier of cultural meaning. The exhibitions also looked at significant uses of ephemera and the "archiving impulse" in the construction of both artistic and scholarly meaning. The 32 Edgewood Gallery at Yale's School of Art sponsored the exhibition *Black Pulp!* Artists William Villalongo and Mark Thomas Gibson curated the exhibition, which featured magazines, literary journals, novels, comics, and contemporary art from the black diaspora. The curators aimed to showcase the creative use of print media to challenge racist narratives and draw attention to the black experience in America.[6] The title itself reinforced that the documents on display were paper based. The second exhibition was *Out of the Desert: Resilience and Memory in Japanese American Internment*, curated by American studies graduate student Courtney Sato.[7] The items on display were drawn from Yale's extensive collection of materials related to the internment of Japanese Americans during World War II. Rich in internee correspondence, artwork, and literature, this exhibit underscored the importance of everyday creative production and alternative narratives of internment. These non-course-centered activities broadened the conversation about paper and showed the students that this is not a boutique topic.

ASSIGNMENTS

As this is a course for first-year students, and an art course designed for non-art majors, the assignments are not extensive or complicated. Two minor projects progress throughout the semester: paper collection and the already mentioned nonlinear book (sketchbook/journal). These projects are meant to increase awareness by having students think about paper in their daily lives through small, manageable, and frequent actions. Weekly readings and responsive blog posts are also recurrent assignments throughout the semester. The students must write three posts (three hundred words minimum) in response to the weekly readings and an additional nine posts (one hundred fifty words minimum) responding to their classmates' posts. This engages the students in written dialogue in addition to the verbal in-class dialogue. Herzog coaches the students through the common pitfall of unsupported arguments with these words of advice in the syllabus: "If you express an opinion, positive or negative, regardless of how obvious or widely accepted it seems to be, you must explain it. Do not rely on superlatives to make your point."

The two major projects for the semester are an eight-to-ten-page research paper and a final critique. Both projects are executed in small steps over the semester, to ensure completion; these steps are part of the scaffolding process. The research paper has two earlier supporting assignments: an annotated bibliography and an outline. Of note is that a component of the outline assignment is to document "contacts made with specialists." By making it a requirement to interact with experts on campus, not restricted to those met in class, Herzog reinforces the idea of people on campus as an important resource for research support. The final critique is a staple of studio classes, but as one can imagine, is a new experience for first-year students with no previous art background. Herzog stresses that participation in discourse about art is required throughout the semester. She defines discourse in the syllabus as "ways of talking about art and artists and their influences," which "includes close observation," as well as sources and citations for influences. Herzog emphasizes that the instructor will "model" these skills; additionally, she coaches the

students on this specific skill throughout the semester, as is consistent with the practice of scaffolding learning. The final critique is the place for students to show their new skills, not only in production, but in reflection and discussion about art.

Through the assignments, Herzog can assess students in their achievement of the learning outcomes for the course: developing skills in research methodology, critical thinking, and creative problem solving. The research paper is a traditional assignment to assess research capabilities. The two earlier assignments, the bibliography and outline, are essential to assessing the development of the supporting methodological skills necessary to complete the paper. The final critique, along with the blog posts and research paper, is a way to assess the development of critical thinking over the course of the semester. The physical products created by the students will be used to assess their problem-solving capabilities. The goal is not mastery of the techniques but how they can be used or adapted to express the ideas intended by the students. This may, in fact, require more problem-solving strategies for those with minimal studio skills, as they will need to modify their ideas to work within their skill range. Herzog clearly states on the syllabus that work "is graded in terms of effort, as everyone will be at a different level."

PEDAGOGICAL CONSTRUCTS

Herzog has developed a course model that uses haptic experiences to start the experiential learning cycle. The haptic experiences are achieved through studio practice and object-based learning (OBL) interactions in museums, galleries, and libraries. "Experiential learning" is a general term that has been used to mean learning experiences that engage with an aspect of real life, something outside the classroom and especially in contrast to the lecture.[8] The experiential learning cycle was developed by David A. Kolb in the early 1980s as part of his experiential learning theory, which also addresses learning styles. The cycle is composed of four stages, which a learner must progress through for successful knowledge acquisition. The learner can enter the cycle at any stage but should progress in order through the stages. For this course, the learning cycle starts most often with concrete experience in the studio or during a site visit. After this, the stages are reflective observation, then abstract conceptualization and active experimentation. The names of the stages give indications of what happens in each.

Kolb's experiential learning cycle is also important to the theory of object-based learning. Helen Chatterjee, a leading researcher in OBL, and her colleagues describe Kolb's cycle in this way:

> Kolb advocates that in order to gain real knowledge, the learner must go through a cycle of learning by being actively involved in the experience. Next the learner must reflect on the experience, use analytical skills to conceptualise the experience and undertake problem solving in order to apply new knowledge gained from the experience through a process of experimentation.[9]

The experiential learning cycle describes the experience of a typical studio class quite well, and Herzog designed her seminar for first-year, non-art major students based on this method of learning, traditional to the visual arts. In Herzog's course, four components (studio practice, primary sources, site visits, and interaction with professionals) are the methods for providing concrete experiences that can start the cycle. The conversations or themes that run throughout the course (paper's role in society and the art world, how

history is created, artists' roles as societal commentators, etc.) provide the structure that aids the students, along with guidance from the professor, to complete the circuit. Each successive pass through the circuit builds knowledge, and the students may go through the circuit multiple times focused on the same "issue" as they increase their knowledge and skill. I have attempted to illustrate the relationships between the four concrete experiences, conversations/themes, and their impacts on each other and student learning in the model in appendix B.

The success of the site visits in contributing to student learning can be understood through the theory of object-based learning, as mentioned previously. OBL is multisensory. Obviously it engages touch and sight, but sound and smell are also part of the equation. Taste is possible but uncommon. An example might be Angela Lorenz's *Chewing Tsu: The Rumination Book* (1993), in which readers are asked to chew gum. An important component of OBL is the emotional response to our sense of touch or haptic experience in addition to purely physical responses. In fact, Herzog calls the emotional responses that students have to paper-based items, particularly for books, "cultural nostalgia." One student wrote:

> I enjoy the feeling of having a book in my hands, flipping pages, dog-earing the edges for bookmarks, bending the spine of a new book backwards in the attempt to break it in. There is really nothing like a worn-out book. It has character. It has memories . . . That book, whichever one I happened to be reading at the time, was mine. It adds a character and a stronger sense of attachment to the story. You can't get that from a Kindle.

The visits give students connection to these feelings, while the critical-thinking and research-skills components of the class provide them with tools for how to explore their ideas further.

Object-based learning comes out of a larger area of pedagogy that highlights learning from the body, called somatic or embodied learning. This method of gaining knowledge aims to avoid Western culture's dominant view of privileging the mind, and thus can promote global views.[10] This supports Herzog's aim to look at the cultural construction of viewpoints. Additionally, OBL is well suited for dealing with diversity in the classroom because of the importance of group interaction and a variety of perspectives contributing to the creation of knowledge about the objects under discussion.[11] Herzog finds that students enter the classroom with myriad unconscious, and therefore unquestioned, assumptions. Bringing awareness to these assumptions and how they influence thinking and decision making is important to Herzog's pedagogical goals. Using a focus on art and the naturally exploratory nature of the studio, Herzog aims to challenge assumptions about what art is and to broaden awareness about what it might be. Of course, these lessons apply well beyond the studio.

Because the studio course is not geared toward mastery of technique, Herzog designed the projects with "a scale that is intimate and with processes that are fairly low tech, which seems to be appealing to students." With both a research paper and a final studio product, the seminar aims to help the students investigate the relationship between research and making. How do they inform each other? How can the historical and cultural investigation of an object in the university's collections become inspiration for or inform the process of work in the studio? How does one's work in the studio relate to the campus

community, as well as to its specific place in the historical continuum of human manufacture? The work created in the studio does not have to become a significant object, but it is always significant if the creation of that object helps the student become more proficient at self-assessment and critical inquiry.

The course design allows it to work two pedagogical trajectories simultaneously: from abstract to concrete, and from concrete to abstract. The discussion component begins with an abstract idea of paper and moves toward a more concrete, if also more complicated, understanding of the medium and its historical and technological importance. At the same time, the studio component prompts the student to start with the concrete (making something) and move toward the abstract (talking about making the thing). Both of these trajectories move the students through the experiential learning cycle.

CONCLUSION

Herzog designed the course to move beyond the studio and examine the larger framework that paper encompasses. She feels that paper is a product of human ingenuity, patience, and determination; its production has had vast social and ecological consequences, both positive and negative. Herzog emphasizes that its development parallels that of other industries, particularly textile production, in its evolution from a cottage industry in agrarian society to a mechanized modern industry. The way paper is woven into the history and daily function of society provides grounding from which students can explore some very complicated issues.

The key to the course is the intellectual flexibility of paper itself, which makes it ideal to use as the substrate for many lessons (puns intended). Herzog says, "Paper offers the opportunity to expand one's vision of the world through examining the complexity of an apparently simple, everyday thing. It is an intimate, yet also generic, medium with global reach and implications. Its many incarnations encompass the artisanal, the fine arts, academic, clerical, commercial, and industrial realms, which provides room for narrative, social, conceptual, and formal exploration." Through the lens of paper, the professor has the opportunity to address topics relating to technology and cultural production, both new and old, such as "hand production versus mechanized manufacture, art and commerce, history, engineering and chemistry, and environmental impacts of industry." These themes offer fertile ground for academic discussion of contemporary culture and art.

This article is intended to provide a fuller understanding of the ways in which one professor and multiple campus collaborators are using paper as a starting point to address foundational intellectual ideas, approaches, and concerns. Herzog feels that working with paper allows students an extra freedom because it is not considered a precious commodity and, in their lives of fewer than two decades, is frequently recycled. Because paper is both a nonprecious, everyday commodity and a carefully crafted art medium, it can "span from artisanal to industrial to postindustrial by marrying technology and culture." Paper is a physical representation of the ideas of accretion and transformation that are cornerstones of academia. I hope this synopsis can inspire and guide others to create their own version of a course that utilizes the flexibility of paper to support their pedagogical goals.

I would like to thank the peer reviewers for their detailed and helpful feedback that led to improved clarity in the article and to Inge Bruggeman for her sustained encouragement to write up and expand upon the presentation I gave on this topic in 2014. ■

APPENDIX A. COURSE OUTLINE

An outline of the course by session.
The descriptions in quotes are taken directly from the syllabus.

Week 1: A. Introductory lecture "Curious about paper; paper as a material and an idea; slide presentation showing the range and potential of paper as primary material in contemporary art"
Week 1: B. Visit to exhibition (changes each semester)
Assignment 1: "Begin collection and document of found paper (ongoing)"

Week 2: A. Material transformation, qualities of paper in two and three dimensions
Assignment 2: Non-linear book
Week 2: B. Watch film *Between the Folds*

Week 3: A. "Being and time, chance and intention; Collage: A Radical Medium? Rupture and juxtaposition"
Assignment 3: Blog posting
Week 3: B. "Papers' origins and uses with evolutionary tales"
Visit: Yale Center for British Art, Conservation Lab

Week 4: A. "Symbolic image making. Making a watermark form"
Week 4: B. "Artist-made books"
Visit: Haas Family Arts Library Special Collections

Week 5: A. "Papermaking workshop, ingredient and product"
Guest: Winnie Radolan
Assignment 3: Responses to week 3 blog posts
Assignment 4: Create 2 watermark screens
Week 5: B. "Paper as material object through time-cultural change and material exchange"
Visit: Beinecke Rare Book and Manuscript Library

Week 6: A. "Pulp sculpture. Building and armature"
Week 6: B. "To view contemporary artworks in which paper is used to build up or create the image, rather than just acting as a substrate onto which to apply media"
Visit: Yale University Art Gallery

Week 7: A. "Pulp dip"
Week 7: B. "To view contemporary artworks in which paper is used to build up or create the image, rather than just acting as a substrate onto which to apply media"
Visit: Yale University Art Gallery

Week 8: A. "Painted sculpture; water color: its use and application"
Assignment: Annotated bibliography for final research paper
Week 8: B. "Artist/poet collaborations"
Visit: Beinecke Rare Book and Manuscript Library

Week 9: A. "Paper and pressure. Students will explore the idea of transferring an image in techniques such as embossing, relief, and frottage. Making rubbings from immediate environment. Principles of mono printing and relief printing."

Week 9: B. Flexible visit based on campus/local availability and student interest (often current exhibitions at Beinecke Rare Book and Manuscript Library)

Week 10: A. "Relief printing on selected papers"
Assignment: "Relief plate made from found material"; "research paper outline, including contacts made with specialists"
Week 10: B. Flexible visit based on campus/local availability and student interest OR studio time as needed

Week 11: A. "Transformative Acts #1: Production and Reproduction"
Assignment: blog post
Week 11: B. Flexible visit based on campus/local availability and student interest OR studio time as needed

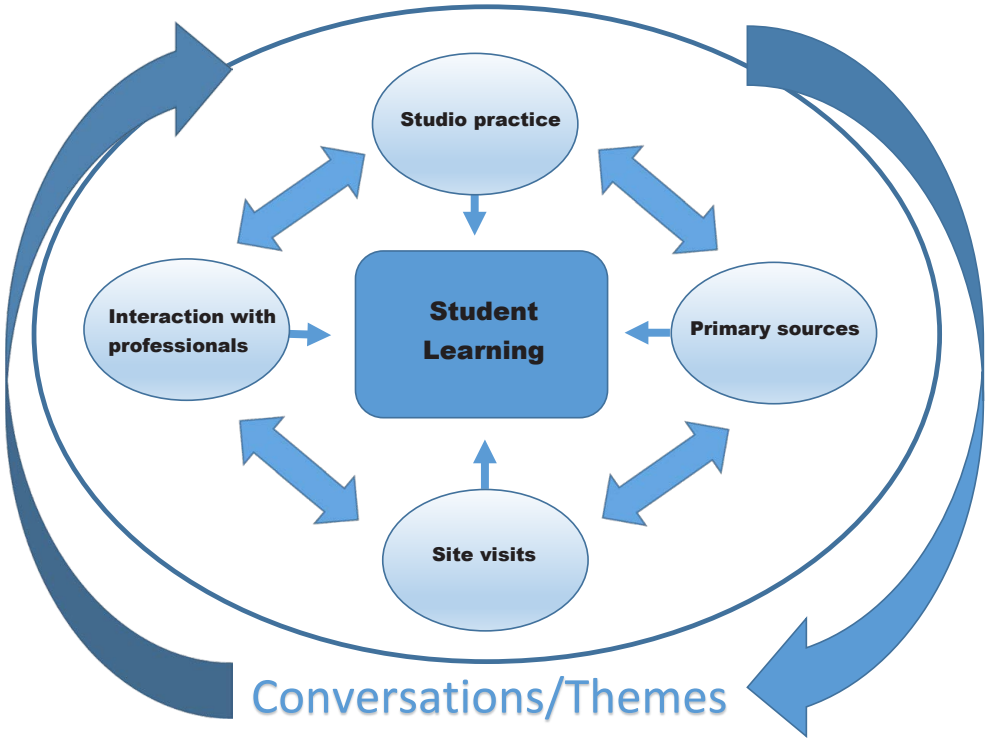
Week 12: A. "Transformative Acts #2: Generating Form: Tales of damage and repair, of growth and decay"
Week 12: B. Flexible visit based on campus/local availability and student interest OR studio time as needed

Week 13: A. "Transformative Acts" class work day
Assignment: Research paper on artwork, process, or book
Week 13: B. "Students present their handmade books"

Week 14: A. Final critiques
Assignment: Final blog post comments

APPENDIX B.
MODEL OF COURSE DESIGN

The four course components all contribute to student learning and inform each other. The conversations/themes that run through the semester tie together the course components. Assignments are not included in the model as they are a typical component of many courses.



NOTES

1. I have taught a session on artists' books for five of the seven years the course has run. During the other two years, when I had schedule conflicts, a colleague taught the library session I developed to support the course.
2. Elizabeth A. Davis, "Scaffolding Learning," in *Encyclopedia of Science Education*, ed. R. Gunstone (Dordrecht, Holland: Springer, 2015), doi: 10.1007/978-94-007-2150-0.
3. All quotes by Herzog about the course are taken from copies of the syllabus provided to the author, e-mail correspondence, or from an interview conducted in July 2014.
4. *Take an Object*, exhibition at Museum of Modern Art, August 22, 2015–February 28, 2016, accessed on December 23, 2016, https://www.moma.org/calendar/exhibitions/1549?locale=en.
5. Helen J. Chatterjee, Leonie Hannan, and Linda Thomson, "An Introduction to Object-Based Learning and Multisensory Engagement," in *Engaging the Senses: Object-Based Learning in Higher Education*, eds. Helen J. Chatterjee and Leonie Hannan (Surrey, England: Ashgate, 2015), 1.
6. Mike Cummings, "Yale School of Art Exhibit Explores the 'Pulp' Challenge to Racial Injustice," *YaleNews* (January 11, 2016), accessed December 28, 2016, http://news.yale.edu/2016/01/11/yale-school-art-exhibit-explores-pulp-challenge-racial-injustice.
7. Courtney Sato, "Out of the Desert: Resilience and Memory in Japanese American Internment," accessed on December 28, 2016, http://outofthedesert.yale.edu/.
8. David A. Kolb, *Experiential Learning: Experience as the Source of Learning and Development*, 2nd ed. (Indianapolis: Pearson FT Press, 2014). E-book accessed December 29, 2016.
9. Chatterjee, Hannan, and Thomson, 2.
10. Pam Meecham, "Talking About Things: Internationalisation of the Curriculum through Object-Based Learning," in *Engaging the Senses: Object-Based Learning in Higher Education*, eds. Helen J. Chatterjee and Leonie Hannan (Surrey, England: Ashgate, 2015), 78–79.
11. Chatterjee, Hannan, and Thomson, 4.

A TYPOLOGY FOR THE STRUCTURES OF BOOK ARTS PROGRAMS

by Katherine M. Ruffin

INTRODUCTION

The goal of this paper is to present a typology of the structures in which teaching and learning of the book arts occur. Many book arts programs exist, but there are few, if any, models for describing or classifying programs. At a fundamental level, book arts programs are based on students and teachers working together to synthesize practice and theory. This is manifested in many different ways in American book arts programs. In practice, programs have strengths and weaknesses, but very little, if any, theoretical work attempts to describe or assess this. There is also a lack of vocabulary for describing and discussing these programs. As the field of book arts education develops, a typology for classifying programs can serve as a tool to improve both theory and practice. To date, no typology of book arts programs has been developed, and, in fact, the definition of a book arts program is not fixed. As the field of the book arts matures and as common obstacles are identified, a typology that is inclusive, clear, nonhierarchical, and flexible can aid teachers and students as they develop and sustain programs.

ABOUT THE AUTHOR

Katherine M. Ruffin is the Book Studies and Book Arts Program Director at Wellesley College. She has an MFA in the Book Arts from the University of Alabama and a PhD in Library and Information Science from Simmons College. She teaches at Rare Book School at the University of Virginia and in the Printmaking Department and the Masters of Art Education Program at the Boston University College of Fine Arts. Katherine is currently the Vice President for Publications for the American Printing History Association.

Many book arts programs were founded by charismatic individuals who established unique programs in affiliation with art, English, or library science departments at colleges or universities. As higher education evolved and the founders moved on or retired, book arts programs often faltered. In fact, book arts programs can and do encounter problems when transitions occur. Developing a shared set of models that describes how programs are structured and situates them meaningfully in the context of contemporary higher education may help to communicate to key players, such as administrators and donors, the strengths and the needs of book arts programs. One of the goals of the College Book Art Association is to help professionalize the field and to assist in making book arts programs more sustainable. As such, the development of a shared vocabulary to discuss the types of programs that exist and the ways in which they function within book arts education has the potential to benefit the field as a whole.

This project began with musings regarding the fundamental nature of book arts programs and those questions led to the examination of the programs' features. I studied at a major university book arts program and have taught at a number of independent not-for-profit book arts centers. For over fifteen years, I have directed a book arts program at a liberal arts college. I also teach book arts classes in a college of fine arts at a university. This has provided me with a great deal of firsthand experience and has allowed me to compare and contrast the various models for book arts programs. There is great variety within and across American book arts programs; however, there have been very few attempts to systematically analyze programs.

I began this project in 2011 in a research-methods seminar at the School of Library and Information Science at Simmons College. I presented a version of the typology in a talk, "Time, Sequence, and Technology: Book Art in the 21st Century," at the College Book Art Association conference in the San Francisco Bay Area in 2012. I received useful feedback after the presentation and subsequently shared my preliminary results with individuals who were in the process of establishing book arts programs. I have continued to develop the typology. Though the results of this study may seem obvious to those with experience in the book arts, I believe they can be helpful to those who are new to the field, who are establishing programs, or who are managing programs that are undergoing transition. I hope they will be useful to teachers, to students, to staff, and to administrators. In addition to aiding those who are engaged in book arts programs, these results may also help emerging artists and educators who are mapping out possible career paths and students who are selecting programs in which to study.

RESEARCH QUESTIONS

This research project was structured around the following questions:

What is a book arts program? What are their features? Does identifying and analyzing these features allow a typology to be developed?

How are book arts programs structured? Where are they located within institutions? What are the ranges of institutional locations and departmental affiliations? Do they offer classes for credit? Is a major or minor offered?

What disciplines (papermaking, printing, binding) do they teach? Who is teaching? Who

is learning? Do programs mount exhibitions? Do they engage in limited edition publishing? Do they sponsor lecture series?

What is the range of art and craft across various programs? Do programs include the history of the book? Do they include contemporary art practice?

LITERATURE REVIEW

After identifying the need for a typology, a literature review was conducted that included articles and presentations, both published and unpublished, on the topic of book arts programs in the United States. The literature on book arts programs is not expansive and has many gaps. Useful studies of the history of book arts programs, including the emergence of graduate programs, have been conducted, as well as surveys of letterpress printing and bookbinding training opportunities at colleges and universities and a wide variety of other venues. Four main themes were identified in the existing literature on book arts programs: historical perspectives, profiles of programs, bookbinding education, and the spectrum of art and craft in the book arts.

Philip Gaskell, David Farrell, and Sidney Berger offer historical perspectives on the study of the art and history of the book within higher education.[1] These resources link the book arts to the legacy of bibliographic presses that were frequently founded in affiliation with libraries in the middle of the twentieth century. These programs often had the express goal of teaching library science students and graduate students in English about historical methods of book production.

Articles by Sandra Kirshenbaum, Gordon Neavill, and Kathleen Walkup present a view of graduate book arts education that illustrates how bibliographic presses evolved into programs focused on producing limited edition fine press literary publications. These graduate programs emerged in the late 1970s and 1980s. Betty Bright edited a publication that describes the multifaceted undergraduate book arts program at Colorado College. These items sketch out a historical trajectory that leads to the emergence of book arts programs; however, the articles about programs are, in general, freestanding case studies.

Bookbinding education is another distinct topic identified during the literature review. Sam Ellenport contextualized the study of hand bookbinding in the early 1990s. Jeffrey Altepeter surveyed the state of contemporary bookbinding education in 2004. A panel discussion by Anna Embree, Mark Andersson, Consuela Metzger, Julie Leonard, and Steven Tatum in 2006 captured the range of contemporary bookbinding study opportunities. These resources describe the range and depth of educational opportunities specific to the discipline of bookbinding; however, they do not address the larger field of book arts education.

The final theme identified in the literature review is the spectrum of art and craft in the book arts. In 2009, Steve Miller and Shawn Simmons explored the current state of book arts education in the United States. In a thought-provoking article, Clifton Meador delved into the issue of art and craft within the book arts. Matthew Brown assessed the utility of the workshop model and progressive education as a philosophical grounding for book arts programs. In 2011, Martin Antonetti and Ruth Rogers reported at a College Book Art Association conference about the emergence of book studies within the liberal arts curricu-

lum. They reported on common obstacles faced by book arts programs and illustrated the ways in which book studies could include a greater range of teaching and research within the context of the liberal arts. These stimulating items highlight many important issues in contemporary book arts education and suggest many topics for further research.

The literature about book programs is scattered and does not contain widely applicable terms or categories for describing or classifying such programs in the United States. In fact, there is no widely agreed upon definition of what constitutes a book arts program. The potential for a typology of book arts programs to contribute to critical dialogue in the field of book arts education was reinforced by the literature review.

METHODOLOGY

Developing a typology for book arts programs is a qualitative research endeavor in which a model is constructed through the application of inductive techniques. Typologies are developed by studying phenomena and are generally accepted if they solve problems in a field. This project was conducted from a pragmatic perspective and incorporates some aspects of a phenomenological study, in which the focus is on determining what the essence of the object of study is. By asking, what are the distinguishing characteristics of this book arts program? a clearer understanding of the phenomena of book arts programs can be achieved.

A typology is a conceptually based classification strategy, typically used in the social sciences, that analyzes variables and creates useful categories for phenomena that are evolving and changing. Categories, or types, are developed that reflect the phenomena being investigated and also serve the purposes of the study or investigation being conducted. These constructed types are tested against empirical data from selected samples. As the characteristics of the phenomena are analyzed, categories that are mutually exclusive and collectively exhaustive are developed. This means that each individual sample has a place in the typology, but it only has one place. The measurement and sorting of book arts programs into categories result in the creation of a typology that reflects the variety of book arts programs while also establishing categories that allow for analysis and some generalization.

DATA COLLECTION AND ANALYSIS

To create a typology of book arts programs, a purposeful, stratified sample of forty individual book arts programs was identified. This approach was chosen because it allowed the researcher to identify subgroups and to conduct meaningful comparisons. The study was limited to American book arts programs that were chosen based on their unique properties from among the institutional members of the College Book Art Association[2] and programs listed on the "Book Arts Education" page of the Book Arts Web.[3] Book arts programs described in articles included in the preliminary literature were also included. The first round of samples included fifteen programs, and the second round of samples included an additional twenty-five programs. The processes of sampling, sorting, and analysis may have been biased due to my previous experience with book arts programs, but this method is believed to be both valid and reliable.

Types could be identified after data about the features of book arts programs were analyzed. The first issue in the analysis, however, was to define what constitutes a book

arts program. The literature review yielded one definition that was compelling and also had the potential to be applied broadly in the development of a typology. Clifton Meador defined book arts programs in the following conceptual terms: "Book arts is the study of making books as expressive artistic objects. This practice focuses on thinking about how books create meaning, how books function culturally, and how a book can be a unique experience in art."[4] This definition needed to be transformed so it could be readily applied as data collection and analysis were conducted. A more concrete version of the definition was formulated. For the purposes of this typology, a book arts program was defined as an educational entity that offers hands-on instruction in at least two of the following disciplines: letterpress, bookbinding, papermaking, and calligraphy. A book arts program must also offer at least one of the following types of outreach activities: exhibitions, publishing, or lectures. In addition, the people who are involved in a book arts program were considered. Programs teach students and create communities of both students and teachers. In addition, programs reach out into the wider communities in which they are located—campuses, cities and towns, and local, national, and international networks.

The spreadsheet was populated with the following data about programs selected for the study sample: name of program, name of institution, location, degree/certificate offered, disciplines taught (letterpress printing, bookbinding, hand papermaking, calligraphy), facilities, teaching and administrative staff, students, exhibition, lecture series, publishing, and sources for the data. The data were sorted and analyzed in order to determine the essential features of a type of book arts program and to identify patterns within categories. These features and patterns were recognized, described, and named. Then these draft types were tested against sample programs, some of which came from the original sample of fifteen programs and some of which were introduced in the second group of samples for the purpose of testing the applicability of the types.

As the features of programs were analyzed using inductive methodology, categories were created and a typology was drafted. By examining the features of individual programs, such as institutional location, type of degree or certificate offered, and which disciplines of the book arts were taught, hints about the shape of the typology's categories were revealed. Further analysis of programs included research regarding who does the teaching and learning in book arts programs. Activity that complemented teaching, such as mounting exhibitions, publishing limited editions, and sponsoring lectures and readings, was also examined. The spectrum of art and craft across programs was also considered. The pedagogical orientation of programs toward the history of the book and contemporary art practice was analyzed, as well.

As the types were developed, a logical problem presented itself. Should programs be grouped by the kind of degree they offer (BA, BFA, MFA, etc.), or should they be grouped according to their institutional identity (i.e., liberal arts college, university, art school, craft school, or independent not-for-profit)? Some programs offer multiple kinds of degrees, and thus fit into more than one of the former categories. This violates the mutually exclusive and collectively exhaustive principle and therefore is not a suitable structure for a typology. For the purposes of this study, this issue was resolved by grouping programs by type of institution. This added a new dimension to the study: an examination of the effect of institutional context on book arts programs. The grouping of programs according to their institutional identity does recognize and represent the variety across the field of the book arts or acknowledge the strengths of programs situated in various contexts. Since

typologies are flexible and evolve as the phenomena they describe evolve, this is only one possible typology. Alternative typologies could be developed, or this typology could be revised as the field of book arts education develops.

A TYPOLOGY FOR BOOK ARTS PROGRAMS

Book Arts Programs in Liberal Arts Colleges

These programs may exist in their own department or center, or may be part of the art department, the English department, or the college library. A program may also be sponsored by a combination of departments or by the college library in collaboration with a department or departments. The most highly evolved programs for undergraduates offer minors or concentrations in book arts or book studies, which include the study of the art and the history of the book. Book arts programs at liberal arts colleges incorporate aspects of both art and craft, though craft is sometimes de-emphasized due to administrative concerns regarding the place of craft in a liberal arts education. The study of the history of the book is often incorporated in the programs, and is sometimes taught formally through a dedicated class or classes. Full-time, part-time, and adjunct faculty, book artists, and librarians teach in these programs, and the students in the programs are generally matriculated full-time undergraduates. Examples of programs in this category include those at Colorado College, Smith College, and Wells College.

Book Arts Programs at Universities

This type includes the greatest diversity in terms of the structure and participants in the programs. Book arts programs at universities may exist in their own center or as part of the art department or college, the university library, the library school, or residential life. These programs may also be sponsored collaboratively by any of the above or may exist in an entirely different institutional context. The most highly evolved book arts programs at universities are very comprehensive and support high-level teaching and art and craft production across all aspects of the book—papermaking, printing, and binding informed by the history of the book. These programs are often organized around an MFA program curriculum, and may also offer study opportunities for graduate students in other programs, for undergraduates, and for members of the public. Faculty members who teach in these programs may be full time and tenure track. A number of book arts programs at universities are centered in the university library system, sometimes in association with special collections or preservation departments, and are able to collaborate flexibly with many different constituencies across the university. Examples of these types of programs include the MFA in the Book Arts Program at the University of Alabama and the University of Iowa Center for the Book.

Book Arts Programs at Art Colleges and Universities

These book arts programs are often affiliated and integrated with printmaking or graphic design departments. A minor in book arts or printmaking/book arts may be offered as part of a BFA degree. An MFA in book arts or printmaking/book arts may be offered. The emphasis in these programs is on the book as a means for artistic expression. Programs are geared toward teaching matriculated undergraduate or graduate students and instruction is conducted by full-time, part-time, and adjunct faculty. Examples include Columbia College's Center for Book and Paper Arts and the MFA in Book Arts and Printmaking at the University of the Arts.

Book Arts Programs at Craft Schools

This type of program is focused on the teaching of bookmaking skills in the craft context and tends to center on the discipline of bookbinding. Other craft schools offer bookmaking workshops regularly, but do not support book arts programs per se. The bookbinding certificate program at the North Bennet Street School is an example of this type of program. Craft schools offer classes for students enrolled in certificate programs, if they have them, and for the public. Classes are generally taught by instructors who are practicing artists and craftspeople who may be faculty or staff at other institutions. Penland School of Crafts offers workshops and classes across the "whole book" disciplines of papermaking, letterpress printing, and bookbinding.

Book Arts Programs as Independent Not-for-Profits

Many book arts programs are incorporated as independent not-for-profits. These programs are primarily designed to offer workshops to the public. Some book arts centers do offer certificate programs. Not-for-profit book arts programs may emphasize one or two disciplines of the book arts. Some integrate various facets of the book arts with one another, resulting in very rich offerings. Book arts not-for-profits are particularly active with respect to outreach activities such as exhibitions, lectures, and limited edition publishing. Within not-for-profits, the book arts are practiced across the spectrum of art and craft at very high levels. Examples include the Center for Book Arts in New York City and the San Francisco Center for the Book.

CONCLUSION

The book arts incorporate many different disciplines, and the programs in which they are taught are not uniform. In this study, a functional definition of book arts programs was established, and a sample of forty individual book arts programs was analyzed. Features of the programs were analyzed, and a typology of programs was developed. A typology of book arts programs helps to establish the vocabulary for continuing discussions about book arts programs. A typology is particularly appropriate as the field of book arts education is emerging and may be helpful in addressing some of the obstacles that book arts programs face with respect to sustainability.

This research project is meant to acknowledge the breadth and variety of programs, which range widely across the spectrum of art and craft, and incorporate various media and various degrees of traditional technique-based practices and contemporary art practice. By examining the institutional settings of book arts programs in a systematic way, the practice and theory of teaching and learning can be improved. The identification of strengths and weaknesses of various types, and the advantages and disadvantages of various institutional contexts, can lead to the growth of book arts programs. This typology is offered in the hope that it will further critical dialogue and stimulate discussion. In fact, this is just one possible typology developed from the data that were collected. Alternative typologies could be developed.

Further research could address the following questions: Why is there such a diversity of book arts programs? Does the form of the program influence how the book arts are taught and to whom they are taught? How does the history of the book influence the teaching of book arts? Further research into the evolution of bibliographic presses into book arts

programs could lead to broader and deeper understanding of the nature and diversity of book arts programs based in colleges and universities. Analysis of the funding sources and the governance structure of book arts programs may permit further refinement of the types. Investigation into the emergence of book studies at liberal arts colleges and the resulting impact on the book arts could add new dimensions to the typology. In addition, further research in the form of surveys, interviews, and campus visits could add new dimensions. The research could also be expanded to include programs located outside the United States.

NOTES

1. Full source citations can be found in the bibliography.
2. College Book Art Association, "CBAA Institutional Members."
3. Book Arts Web, "Book Arts Education."
4. Meador, "Disciplining a Craft," 9.

BIBLIOGRAPHY

Altepeter, Jeffrey. "Bookbinding Education in North America." *The Bonefolder* 1, no. 1 (Fall 2004): 4–9.

Antonetti, Martin, and Ruth Rogers. "Book Studies and the Liberal Arts: The Mellon 23 Workshop." Presentation at the College Book Art Association conference, January 14, 2011, 1–12.

Berger, Sidney E. "A History of Book Arts Programs in America." *Guild of Bookworkers Journal* 33, no. 2 (Fall 1995): 28–44.

Book Arts Web. "Book Arts Education." Accessed June 8, 2016. http://www.philobiblon.com/programs.shtml.

Bright, Betty, ed. *The Press at Colorado College: The Pressroom as Classroom*. Colorado Springs: Colorado College & the Press at Colorado College, 2004.

Brown, Matthew. "The Workshop Turn." Presentation at College Book Art Association conference, January 15, 2011, 1–11.

College Book Art Association. "CBAA Institutional Members." Accessed June 8, 2016. http://www.collegebookart.org/page-779418.

Ellenport, Sam. *The Future of Hand Bookbinding*. Boston: Harcourt Bindery, 1993.

Embree, Anna, Mark Andersson, Consuela Metzger, Julie Leonard, and Steven Tatum. "Bookcraft Education: A Panel Presentation." *Collection Management* 31, nos. 1–2 (2006): 121–26.

Farrell, David. *Collegiate Book Arts Presses: A New Census of Printing Presses in American Colleges and Universities*. San Francisco: Fine Print, 1982.

Gaskell, Philip. "The Bibliographical Press Movement." *Journal of the Printing Historical Society* 1 (1965): 1–13.

Kirshenbaum, Sandra. "Graduate Book Arts Education: Two Approaches." *Fine Print* 10, no. 2 (April 1984): 73.

Meador, Clifton. "Disciplining a Craft." *The Bonefolder* 3, no. 2 (Spring 2007): 3–10.

Miller, Steve, and Shawn K. Simmons. "Book Arts Education in Transition: A Conversation." *The Bonefolder* 6, no. 1 (Fall 2009): 41–43.

Neavill, Gordon B. "The University of Alabama Program." *Fine Print* 10, no. 2 (April 1984): 74–77.

Walkup, Kathleen, and Melody Sumner. "The Mills College Program." *Fine Print* 10, no. 2 (April 1984): 78–81.

RADICAL SCIENCE WRITING: AN INTERDISCIPLINARY BOOK ARTS APPROACH

by Danny Long, Susan Guinn-Chipman, Barbara Losoff, Leanne Walther, and Deborah Hollis

CURRENT LITERATURE IN SCIENCE EDUCATION recommends that students combine what they know with what they discover through research to create original work.[1] In response to this recommendation, we, a science-writing instructor and a team of librarians at the University of Colorado Boulder (CU Boulder), have developed a unique partnership.[2] Using materials from Special Collections and Archives (SCA) and the Government Information Library (GIL), we seek to empower students to be stewards of their own learning, since they "will retain their learning when they claim ownership of it."[3]

SCA's past instructional model consisted of a single class session in the SCA Reading Room, during which students were introduced to rare materials that complemented a course's time period or subject matter. Although this approach, sometimes referred to as a "one-shot lecture" or "show-and-tell," would generate student interest, it frequently left students with too little time to engage with the rare works. Consequently, few students would return to use these rare works in class projects. In the early 2000s, however, CU Boulder humanities faculty expressed a desire for their students to curate Reading Room exhibits using special subject collections.[4] This proved to be the first step toward making rare materials a significant feature in course curricula.

The SCA pedagogical approach now resembles a learning lab, with students returning to the Reading Room three to five times during the semester to study and analyze rare works and artists' books.[5] Yet SCA is not just a learning lab; it is also a stage, complete with rare props and interactive class sessions that fuel creative student responses. SCA has consequently adjusted its focus from student-curated exhibits to faculty collaborations that give students the means to demonstrate their knowledge and skills visually, verbally, and tactilely through books they make themselves. To be sure, SCA personnel have observed that when confronted with rare materials and artists' books, students inevitably ask questions about book history, book anatomy, and bookmaking. The physical act of turning the pages of an early printed work or an arresting artists' book sparks students' curiosity:

ABOUT THE AUTHORS

Danny Long is an instructor of writing and rhetoric at the University of Colorado Boulder (CU Boulder). In his science-writing courses he partners with his colleagues in the CU Boulder Libraries: Susan Guinn-Chipman, Barbara Losoff, Leanne Walther, and Deborah Hollis. Together they create lessons that allow students to study, use, and interact with artists' books and rare materials.

Openings | 40

"How did they do that?" It was precisely this student-sprung interest that encouraged Danny Long to approach CU Boulder life sciences librarian Barb Losoff for help in putting together dynamic classroom assignments for his science-writing course, Writing on Science and Society, an upper-division course that fulfills the core writing requirement for students majoring in, among other scientific disciplines, engineering, biology, integrated physiology, chemistry, physics, mathematics, or astronomy.

But if SCA's current educational approach is a flexible one, suitable to students from all disciplines, why the emphasis on science writing? Why not writing in business or philosophy, English or Spanish? Why not, indeed. Effective educational practices need not be confined to particular subject areas. Yet in science, especially in engineering, students are often asked to think so intently about *how* that they sometimes miss the opportunity to ask, "So what?" A design works, or it doesn't. A theory explains something, or it doesn't.[6] This emphasis on doing science is, of course, central to undergraduate science majors' education, for which reason we are not criticizing it. We are merely suggesting that getting students to examine the implications of scientific research and discovery may make them better scientists. Exploring science means delving into the nature of science, which consists of those integral, intriguing, and often overlooked principles that are science's foundation: "its realm and limits, its level of uncertainty, its biases, its social aspects, and the reasons for its reliability."[7] If students learn about the nature of science, there is a greater chance science will become humanized, accessible, appealing. If they do not, then the "notion that scientific ideas just drop from the sky or are known all along and just waiting for confirmation"[8] will persist, particularly among laypersons, who rely on scientists to be their teachers. Thus we apply an active-learning educational model to create assignments that acquaint our students with the nature of science by integrating two supposedly discrete ways of knowing: science and the arts.

SCIENCE AND THE ARTS

Scholars are challenging the prevailing academic model that has separated the arts from the sciences.[9] This new paradigm poses the question: "Could art instruction help produce more innovative scientists?"[10] Emerging pedagogy specific to writing in the STEM disciplines (science, technology, engineering, and mathematics) explores the use of visual imagery as an "instructive bridge . . . between seeing and saying."[11]

In a process that we describe as one part seduction and two parts immersion, students are drawn into an assortment of special collections and government information materials selected to promote inquiry-driven study and to ignite scholarly, scientific conversations across time.[12] The pairing of the classical and the modern, the ancient philosopher and the undergraduate, casts the students as scientists and philosophers with stories to tell, the most recent voices in a lively, centuries-old conversation.

Students' artistic interpretations of scientific thought draw upon a long tradition of exchange between the two disciplines. This interrelationship has been studied extensively by Martin Kemp, who notes that "many artists ask 'why?' as insistently as any scientist. For the artist, as for the scientist, every act of looking has the potential to become an act of analysis."[13] Further, "If we look at their processes rather than end products, science and art share so many ways of proceeding: observation, structured speculation, visualization,

exploitation of analogy and metaphor, experimental testing, and the presentation of a remade experience in particular styles. In these shared features, the visual very often has a central role."[14]

Early modern and modern scientists acknowledged the value of this union. Sixteenth-century physician and anatomist Andreas Vesalius wrote that "illustrations greatly assist the understanding, for they place more clearly before the eyes what the text, no matter how explicitly, describes."[15] Galileo relied upon his knowledge of perspective and foreshortening—"in virtù di prospettiva"—to illustrate and to describe the light and dark areas evident on the surfaces of the sun and the moon.[16] Seventeenth-century natural philosopher Robert Hooke, too, was "sharply aware of the problems with seeing, knowing, and representing."[17] In *Micrographia* (1665), Hooke writes of the flea:

> The strength and beauty of this small creature, had it no other relation at all to man, would deserve a description. . . . But, as for the beauty of it, the *Microscope* manifests it to be all over adorn'd with a curiously polish'd suit of *sable* Armour, neatly jointed, and beset with multitudes of sharp pinns, shap'd almost like Porcupine's Quills, or bright conical Steel-bodkins; the head is on either side beautify'd with a quick and round black eye.[18]

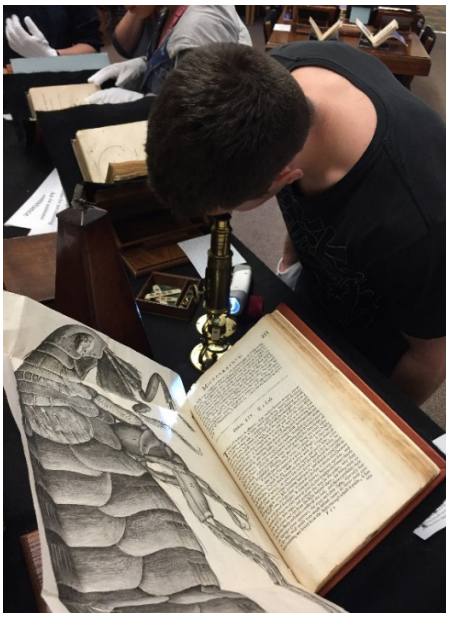


Figure 1. Student using Culpeper-type microscope.

Like seventeenth-century members of the Royal Society, their patrons, and their readers, today's students are privileged to enter into Hooke's "world of form and space"[19] (fig. 1).

Images have long played a key role in "the making of natural knowledge" and in that capacity continue to provide students with a window into the scientific and medical practices of the past.[20] One of the first printed publications of anatomical illustrations, Johannes de Ketham's *Fasciculus medicinae* (circa 1500), pictures "Wound Man," "Pregnant Woman," and "Zodiac Man," the latter reflective of fifteenth-century thought on the role of the planets in human health. Centuries on, the graphic illustrations of Edward Jenner's *An Inquiry into the Causes and Effects of the Variolae Vaccinae; a Disease Discovered in Some of the Western Counties of England, Particularly Gloucestershire, and Known by the Name of the Cow Pox* (1798) drive home the benefits of vaccination against deadly disease. *Physicians' Anatomical Aid* (1888), designed to instruct and guide physicians in daily use, offers students a similar glimpse into the strata of an unseen natural world.

More recently, US government publications offer a multidisciplinary smorgasbord of modern scientific and visual materials, many of which afford students a view into the more divisive issues that confronted twentieth-century scientists.[21] Government documents on the atomic bomb allow students to explore the original research that led to its development, the moral dilemma of its use, and, thanks to photojournalism, the human suffering in its aftermath. Once directed at a broad Cold War–era audience, the highly illustrated *Operation Doorstep* (1953) and *Facts about Fallout* (1955), published by the Federal Civil Defense Administration, and *Just in Case Atom Bombs Fall* (1951), published by the Civil Defense Office of Denver, Colorado, illuminate for students governmental and public concern over the potential for nuclear fallout during the 1950s and 1960s. Government photography from NACA (National Advisory Committee for Aeronautics) and later NASA shed light on the early years of the space program, including the experimental flight, in 1961, of the first chimpanzee in space, Ham (named after the Holloman Aerospace Medical Center).

The natural interdependence of art and science facilitates student adoption of the artists' book as a vehicle for their responses to these rare early modern and modern scientific works. Though artists' books have been described as a "quintessentially twentieth-century form," Johanna Drucker reminds us that it is a form rooted in the centuries-old print traditions of Aldus Manutius, late-fifteenth-century Venetian printer of Aristotle.[22] Characteristics of contemporary artists' books echo such antecedents. Clive Phillpot, former library director of New York City's Museum of Modern Art and founder and curator of the museum's extensive collection of artists' books, places the interdisciplinary, "mongrel" form "provocatively at the juncture where art, documentation, and literature all come together."[23] Anne L. Burkhart concurs, noting that "artists' books not only correspond with interdisciplinary and integrated approaches, they often embody and deftly demonstrate them. Their hybrid status as both an artwork and a book connects them to art and, depending on the book's focus, cultural practices and areas of knowledge such as history, literature, medicine, science, religion, as well as other art."[24] For Burkhart, this interdisciplinarity renders the form particularly effective in transcending the boundaries of art and in integrating multiple disciplines. Such permeability and exchange, Amanda H. Brown, Barbara Losoff, and Deborah Hollis note, produce a "cross-fertilization of intellectual and creative inquiry."[25]

For our purposes, the hybrid nature of artists' books echoes characteristics of the centuries-old tradition of scientific illustration—a tradition of works simultaneously artifact and repository of intellectual content—and suggests to students creative approaches for depicting scientific thought in images and text.[26] Displaying five periods of rare and governmental scientific illustration together with a selection of science-themed artists' books helps students appreciate how these modern creations are frequently "direct outgrowths of historical works."[27] Charles Hobson's *Fresnel's Tower* (1997), Julie Chen's *Panorama* (2008), Karen Hanmer's *Most Excellent Canopy* (2008), and Sara Press's snake-shaped *Evolve = Unroll* (2013) rest side by side with Isaac Newton's *Opticks* (1704) and Charles Darwin's *On the Origin of Species* (1859), inviting an invigorating cross-germination of scientific ideas.[28] Fueled by the history of science and imbued with artistic interpretation and personal narrative, these interdisciplinary artists' books play a key role in inspiring our students.

Figure 2. Students with life sciences librarian.

Students' artists' books, like those of well-known artists working in the field, embody a materiality that is especially instructive (fig. 2). As Burkhart has noted, the form is "uniquely sensory, material, and experiential. . . . You can touch, handle, smell, and even, in the swish of their pages and the clop of the covers, hear many artists' books."[29] This physicality informs encounters between the completed artists' book and its readers. The physical nature of the artists' book also plays a role much earlier in the process, informing encounters between artists and their own work during the process of creation.[30] The tactile creative process informs kinesthetic learning throughout, reinforcing and processing scientific thought in new ways. Cognitive aspects of process and product have been identified by Wendy J. Strauch-Nelson, who writes: "The serial and linear order of the traditional book causes both the creator and the user to reflect in a sequenced manner. The artist/author must organize and prioritize data to fit the format while the viewer is required to reflect upon the part to whole relationship."[31] For the artist, it is a problem of "spatial management" that requires the collection of data, organization, prioritization, sequencing of thoughts, and analysis.[32]

Our collaboration casts the students enrolled in Writing on Science and Society as sci-

entists and artists, each assigned with drawing upon a centuries-old tradition of exchange between the disciplines to spark inquiry and craft new narratives.

GOALS AND ASSIGNMENTS

The Colorado Commission on Higher Education lists the following objectives for upper-division writing courses, such as Writing on Science and Society:

1. Extend rhetorical knowledge.
2. Extend experience in writing processes.
3. Extend mastery of writing conventions.
4. Demonstrate comprehension of content knowledge at the advanced level through effective communication strategies.[33]

In our version of Writing on Science and Society, these objectives inform each course assignment's design. That is, they serve as curricular starting points, not as destinations. The destination, as implied above, is for our students to examine the nature of science through the stereoscopic, and rhetorically stimulating, science-art lens. The assignments are therefore meant to guide students toward this end. We will focus on two of these assignments here: the "what if?" project and the children's book. The "what if?" assignment is organized according to five time periods: pre-Galileo, pre-Enlightenment, pre-Darwin, pre–atomic bomb, and post–atomic bomb.[34] For this project, students can do one of three things. One, they can place themselves in one of these time periods and consider what life was like before a significant scientific discovery. What would it have been like, for instance, to criticize the biblical account of creation before Darwin published *On the Origin of Species*? Or how would a person have studied the cosmos before telescopes became widespread? Two, they can set themselves in the present and investigate the implications of scientific or technological research. How did refining and perfecting the technology of glass—so that, as in the case of microscopes, the tiny could be rendered large—influence modern medicine?[35] Three, they can envision an altered present by assuming that an important historical event in the sciences either did not happen or happened differently. How would modern politics be altered if the Soviets had beaten the Americans to the moon? To complete this assignment, students must work through challenging questions: Where does knowledge come from? How do science and society influence each other? How are scientific fields developed? Questions like these are the first steps toward understanding the nature of science.

The children's book project is more straightforward in concept though no less valuable to students' growth as writers and scientists. Using original stories and illustrations—evocation, not direct instruction—students create books for Stephanie Briggs's first graders at Bear Creek Elementary School in Boulder, with the purpose of teaching those first graders simple lessons in math or science.[36] This assignment (as well as others in Writing on Science and Society) gives students experience in conveying science to nonscientists. Such experience is important partly because of curricular differences. In their major courses, students discuss science with scientists—their professors and peers—and consequently receive little practice in sharing their expertise with those outside the know. This experience is also important because their ability to share science with the public may prove critical to students' careers. For example, in its grant-proposal guidelines, the National Science Foundation (NSF) requires that applicants explain the potential social outcomes

of their proposed projects, including "increased public scientific literacy and public engagement with science and technology."[37] The American Association for the Advancement of Science, which believes so strongly in the science-society connection that in 2004 it established the Center for Public Engagement with Science and Technology, echoes the NSF, stating that "scientists can discover ways to make their work more relevant to society *if they engage in two-directional dialogues with the public*."[38] The children's book project allows students to engage in this two-directional dialogue.

Both assignments naturally raise questions about genre—a concern in composition studies—and medium. By its very nature the "what if?" project demands writing that does not fit into the traditional research essay, a genre that would prove inappropriate and ineffective, for example, for a student who wanted to explore the thoughts of a teenage skeptic seeking an explanation for life's complexities before Darwin published *On the Origin of Species*. Although this student would have to do a considerable amount of research to gain an understanding of pre-Darwinian society and beliefs, the research-essay form would foil and spoil her message. A diary might serve better, yet how would the student in question create the archival effect—visual and tactile—of a nineteenth-century diary being read in the twenty-first century? What would be her medium? She could not simply drive to the nearest bookstore and buy a brand-new leather-bound journal; its newness would be its fraudulence.[39] Moreover, how should the children's books be constructed? To be authentic, the books cannot look like business proposals held together with plastic sleeves, or last-minute essays stapled in their top-left corners, or coloring books with illustrations drawn on pages containing already-printed words. The children's books need to look, feel, sound, and act like children's books. In other words, both projects require that students blend genre and medium, with each enhancing the other.

After being familiarized with artists' books, students tackle these questions, not in, but *with* their work. Below, we provide examples and analyses of this work. We begin, though, with a brief explanation of how the students learn to bind books.

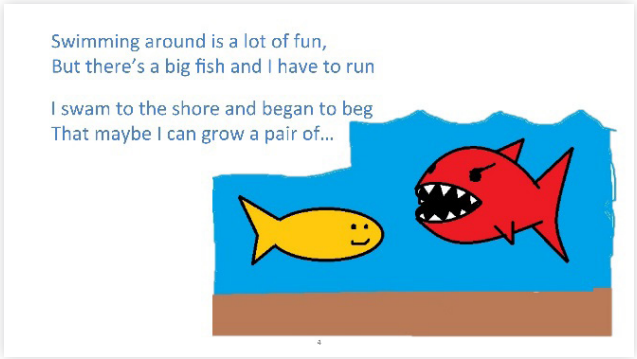
BOOKBINDING WORKSHOP

While the process of immersion into centuries of scientific materials (as described above in "Science and the Arts") is essential to the final product, so too is the building of technical skills needed for the production of artists' books. Students begin with a fifty-minute introduction to basic bookbinding skills. SCA staff and members of a local nonprofit, the Book Arts League, prepare packets with materials and printed instructions for pamphlet, accordion, Japanese stab stitch, meander, and pop-up construction techniques. They instruct a host of colleagues who, in turn, lead small groups of three or four students within each section of Writing on Science and Society. Though the Japanese stab stitch has proven to be by far the most popular technique because (we surmise) of its name, a number of students have adopted the pamphlet style or meander book as a means of replicating in a simplified form the structures of rare manuscript journals or early printed works.

CHILDREN'S BOOKS

The students' children's books benefited directly from the bookbinding workshop. *Bob the Blob* (2015), a treatise on evolution by Jesse Janzen, Ashley Zimmerer, and Zach-

ary Jones, invites young students to read along responsively from one page to the next. With its beautiful stab stitch binding and unfussy illustrations, nothing detracts from the message. *The Lost Wolf and the Sleepy Moon* (2016) by Will Golding, Christopher LeSueur, Hanadi Salamah, and Perry Soderstrom features a pamphlet-style binding and luminescent watercolor illustrations that track the phases of the moon. *Halley* (2015) by Lucy Wilkinson, Girish Narayanswamy, Christina Clementz, and Eric Brown stitches a pamphlet-style cover together with a folded interior that expands to more than four feet, vividly illustrating Halley's comet on her recurring encounters with the friendly planets of our solar system and visually depicting the expansiveness of space. *The Adventures of Reggie and Frankie* (2016), a book about the water cycle by Brock Bylovas, David DeHerrera, and Nicci Hines, borrows *Halley*'s binding style but to a different end. Its elongated accordion fold circles back upon itself, creating a three-hundred-sixty-degree panoramic image that symbolizes the water cycle (figs. 3,4,5).



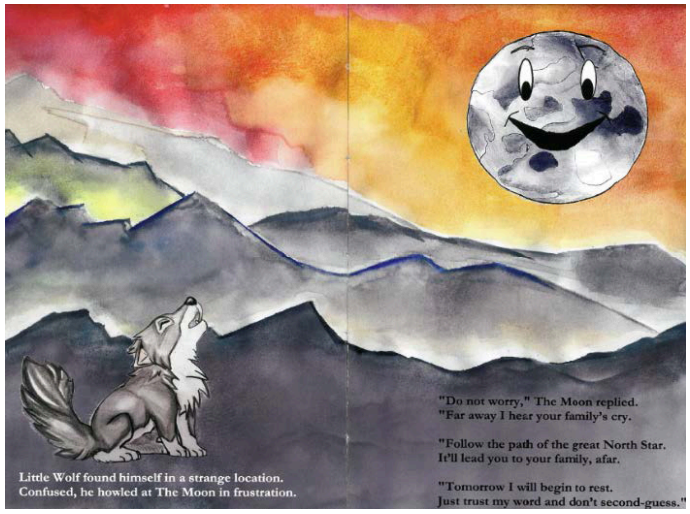


Figure 3, top. Halley*'s elongated accordion fold.*
Figure 4, left. Two consecutive pages from Bob the Blob.
Figure 5. A page from The Lost Wolf and the Sleepy Moon.

"WHAT IF?"

Students' "what if?" projects have profited from the inherent hybrid nature of artists' books. Karina Simon's *Thanks to Penicillin . . . He Will Come Home!* (2015) describes the accidental discovery of penicillin by Alexander Fleming in 1929 and its development by an Oxford team in 1941 into a drug ready for use by soldiers during World War II (fig. 6). Working closely with government information librarian Leanne Walther, Simon compared data detailing soldiers' deaths due to infection during World Wars I and II. With text rolled into empty medicine capsules rather than constructed into the form of a codex, Simon's *Thanks to Penicillin* pushes the boundaries of what we think of as a book, powerfully integrating the medium and the message: the book does not just discuss medicine; metaphorically, it *is* medicine.

Figure 6. Karina Simon's Thanks to Penicillin . . . He Will Come Home!

Joe Torres's *Journal of Thomas Johannes* (2015) narrates a fictional fourteenth-century physician's account of the arrival of the pestilence in Venice and his failed effort to discover a cure (fig. 7). Torres reminds the reader of the sociological and economic consequences of the plague and its role in the formation of the modern world. Suggestive of a centuries-old journal that, like its fourteenth-century author, survived the Black Death, this small meander book has been fried in a pan, baked in an oven, and kicked along the street—in short, aged and distressed.

Like scientific illustrators and book artists before them, the students in Writing on Science and Society have learned from the natural exchange between science and art. They likewise have profited from the hybrid nature of book arts, which allows these works to transcend disciplinary boundaries in ways that speak to students and scholars of divergent fields. These characteristics enable students to distill complex scientific thought in ways that engage young readers and to explore with creativity the thought-provoking scenarios presented by the "what if?" project.

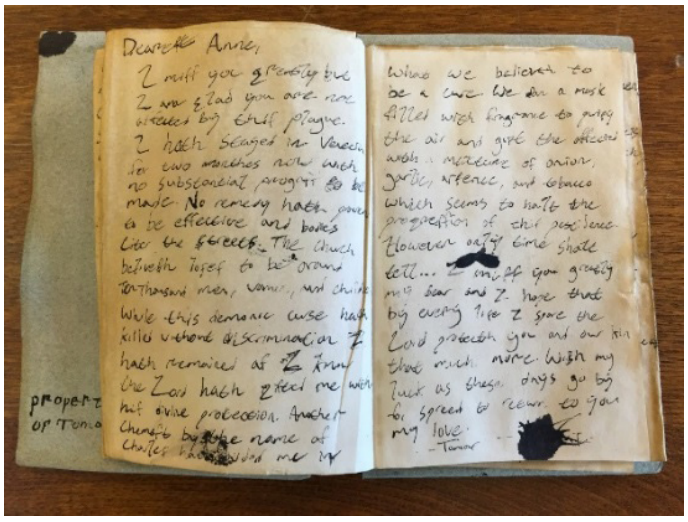


Figure 7. Joe Torres's Journal of Thomas Johannes.

STUDENT RESPONSES

Students are key participants in the educational exchange—active agents, not empty vessels. As such, they have an important role to play in our summative assessment of learning outcomes. Over the past two years of this collaborative venture, we have at the end of each semester invited students to fill out an optional survey, asking whether their work with SCA informed their understanding of course concepts; if so, how; and what they thought was important about this work. These are some of the more thoughtful responses from Spring and Fall 2015 students:[40]

> The biggest contribution that special collections made to this course for me was being able to see how our information delivery methods have changed throughout history. . . . Special collections makes this easy to see. (Dane Ballou, mechanical engineering)

> The old ways bookbinding and printing from 1400 on can be appreciated as an art form in today's society. (Chris Bean, mathematics)

> My favorite part was how [SCA] illustrated how culture-based hard science is. It expanded my perception of "fact" and made me more confident to argue my ideas. (Second-year electrical engineering major)

> It's important to remember where you come from, especially with science, since there have been a lot of mistakes and tragic consequences before, and it's good to remember when looking to the future. (Fourth-year biochemistry and molecular, cellular, and developmental biology major)

> Just like in law, science sets precedents, and there's a quote I like by Isaac Newton. It goes, "If I have seen further it is by standing on the shoulders of giants." I think that about sums it up. (Anonymous)

> I think that special collections is a cool way to look into the past. Searching for everything on Google kind of desensitizes the subject; you can't comprehend how old something is until you really see it. (Cody Gondek, aerospace engineering major)

> The most important part to me was the "awe" aspect. I thought it was just friggin' awesome to see work from Einstein, Galileo, Leonardo, as well as the more ancient items and things from the atomic age. It was inspiring, but also felt like a little walk through history. (Jeff Thomas, electrical and computer engineering major)

The vocabulary here is revealing: "information delivery methods," "art," "culture-based hard science," "precedents," "desensitizes," "awesome," "tragic consequences." This language focuses on the nature of science, providing a glimpse of what the students learned: that science has a tangible past, that the means of sharing it are forever in flux, and that it can be communicated in imaginative ways. This last point places our students firmly within current trends in science education. In *Multimodal Teaching and Learning: The Rhetorics of the Science Classroom*, for example, Gunther Kress and his colleagues argue that

> science education (and science) no longer relies on verbal language alone (particularly language-as-writing) in its efforts to describe the material interactions of people in the natural world. Implicit in this argument is the assertion that visual, actional and linguistic modes of communication have been refined through their social usage to make meaning in different ways and to produce different meaning-making potentials.[41]

Worth noting is that if the words "science education (and science)" did not appear in this passage, Kress et al. could be describing artists' books. It would seem, then, that educators are already envisioning the commingling of art and science, whether they say so explicitly or not.

A RADICAL APPROACH

Because they indicate an awareness of the mutually enriching relationship between art and science, as well as a newfound interest in the nature of science, our students' books and responses to SCA materials serve as evidence, in our estimation, of a successful learning exercise. Perhaps we are biased. Others may look at our students' work and see something else, and indeed at least one person has. Upon reading the first round of children's

books, *Bob the Blob* among them, a colleague in the CU Boulder Program for Writing and Rhetoric described them with the help of a word we did not expect: "radical."[42] While his intention was not to censure—nor, for that matter, to praise—the word caught us off guard (fig. 8). After giving it some thought, however, we realized that our colleague had hit the mark, not only for the children's books but for the "what if?" projects and, in fact, our entire pedagogical philosophy as well. In modern parlance "radical" often means new or progressive. This is likely the definition our colleague meant to invoke. Admittedly, some may hear this definition and conclude that deeming these projects radical is a bit of a stretch. Were we discussing such subjects as history, art, or education, we would agree. But because we are discussing a science-writing course, we maintain that we are using "radical" neither inaccurately nor hyperbolically but precisely, for artists' books and archival research do not figure prominently in such courses: the "what if?" and children's book projects are indeed somewhat novel.

Figure 8. Writing instructor Danny Long admiring Halley *with CU Boulder chancellor Philip DiStefano.*

Paradoxically, moreover, "radical" may mean just the opposite of new, deriving as it does from the Latin word *radix*, or "root." Besides signifying novelty, in other words, "radical" can refer to that which is foundational, fundamental, or inherent to.[43] This both/and nature of "radical" thus renders it a suitable adjective and metaphor for the kind of work we are espousing in this essay. By asking students to create artists' books, we are involving them in a time-honored (i.e., foundational) process: bookmaking; and by presenting students with historical scientific documents and government information we are putting them in conversation with the past but with the added aim of getting them to reflect upon the present. We, and consequently our students, are merging the old with the new, the fundamental with the progressive.

This approach is itself arguably progressive. Traditionally, artists' books and special collections materials have been regarded as fertilizer to the living organism otherwise known as the college course: sprinkle some here, a little more there, and watch that course flower and flourish. This treatment is positive; it celebrates special collections and artists' books, placing them at the receiving end of much faculty and student praise. Unfortunately, though, it also externalizes them (fig. 9).

Figure 9. The cyclical panorama of The Adventures of Reggie and Frankie.

We are offering an alternative instructional model for STEM courses generally and for science-writing courses particularly. Our partnership, and the student writing that has emerged therefrom, has been effective not because we have sprinkled special collections and artists' books over Writing on Science and Society but because we have made them vital to it. They are not its fertilizer; they are its roots. In our case these roots have nourished the splicing of the sciences with the arts, the archival with the contemporary, the scientist with the society in which he or she works. We call this splicing "radical science writing." It is writing that connects rather than separates, binds rather than sunders; writing that places "inter-" in front of "disciplinarity" and "active" in front of "learning." It inspires and instructs, tells stories and teaches lessons. In the words of biological anthropologist Jonathan Marks, "Humanistic knowledge is . . . at least as crucial to the scientist as scientific knowledge is for the masses."[44] Radical science writing supplies STEM majors with a method of obtaining this humanistic knowledge, knowledge that can help them to grow into thoughtful scientists capable of doing science well, sharing science with "the masses," and examining their role in society—past, present, and future. ■

NOTES

1. King, "Sage on the Stage," 30. Also see Bobek and Tversky's "Creating Visual Explanations" and Bahde, Smedberg, and Taormina's edited collection, *Using Primary Sources*.

2. This partnership would not have been possible without the help of many individuals. Our thanks to Megan Lambert, Gregory Robl, Michael W. Harris, Cheryl Koelling, Sean Babbs, Kay Moller, Mónica González, Fernanda Iwasaki Cordero, Hillary Jones, Yashmin Yacubu, Olivia Schlueter, Zander Carrie, Ilena Johnson, Alyssa Cavalier, Jordan Johnson, and Dakota Jutzi, Alex Kaaua, Nhi Lai, Winter Roibal, Allyssa Jewel, Kelsey Turner, Katy Zeigler, Taylor Chouinard, and Katelyn Cook for their energetic assistance in the bookmaking process. Book artists Megan Lambert, Gregory Robl, and Kay Moller of CU Special Collections and Archives and the Book Arts League have been especially helpful in leading sessions and facilitating the instruction process. We would like to extend still another thank you to Gregory Robl for reading a draft of this paper with the eyes of a hawk, the patience of a lion, and the understanding of an old friend. We would also like to thank Vicky and Bill Stewart for their encouragement, and Glenn Koelling of the University of Denver Libraries for her help in finding an elusive source. Finally, we would like to thank our fellow CBAA conference attendees for their helpful suggestions and good humor.

3. Foyle, ed., *Interactive Learning*, 118.

4. Graduate students curated an exhibit featuring rare works from the Enlightenment period. Students selected, researched, and wrote captions aimed at a general audience. See Schmiesing and Hollis, "Special Collections Departments," for an explanation of the pedagogical rationale and outcomes. Word spread and CU Boulder faculty and their students curated *The Printed Page and Early Modern Italy* and *ATTN: Selected Works from the Lucy R. Lippard Artists' Book Collection*, exhibits that met with rave reviews.

5. Bahde, "The History Labs," 178. In this article Bahde argues that the laboratory metaphor is not accurate: "Many of these uses of the laboratory metaphor in the literature leave out an important component of the pedagogical notion of laboratory. On the whole, they do not take into account the frequency of laboratory coursework and the cumulative learning inherent to the laboratory model. Within science or language classes using a traditional laboratory format, students visit this space frequently, often once or twice a week, to practice ongoing observation and experimentation in groups," 178. See also Mitchell, Seiden, and Taraba, *Past or Portal?*

6. Anthropologist Jonathan Marks puts it this way: "The great paradox of modern science is that scientists are not trained to think about science; they are trained to *do* it, to carry it out." See *What It Means*, 266.

7. Flammer, "The Nature of Science?"

8. Herreid, "Chicken Little," 9.

9. See Gurnon, Voss-Andreae, and Stanley, "Integrating Art and Science," 1–4; and Wallace, Vuksanovich, and Carlile, "Work in Progress." Also see Harvard professor of biomedical engineering David A. Edwards's *Artscience* and *The Lab*, both of which advocate breaking down disciplinary boundaries to propel innovation.

10. Gurnon, Voss-Andreae, and Stanley, "Integrating Art and Science," 1. Also, we do not use the words "new paradigm" lightly or accidentally, aware that the concept of the paradigm shift emerged from the backdrop of science writing—namely, Thomas S. Kuhn's *The Structure of Scientific Revolutions*. Kuhn defines paradigms as scientific achievements and practices that garner widespread acceptance among scientists. By establishing a paradigm, Kuhn argues, an area of research becomes legitimate or normal. It is fair to say, then, that the challenge leveled against a paradigm—the separation of the arts from the sciences—warrants Kuhn's terminology.

11. Faflik, "Light Writing," 52–64. Faflik notes that "as images evolve, the visual today accordingly functions as an instructive bridge: conceptually, between seeing and saying; intellectually, between the sciences and humanities; and temporally, between the classical practices of rhetoricians in the past and our current image-centered methods of making meaning," 52.

12. For interpretations of scholarly conversations within the context of information literacy, see "ACRL Visual Literacy." See also Mazella and Grob, "Collaborations," 476–87, for inquiry-

inspired uses of rare works in a special collections setting. Thanks to CU Boulder instructor Carol Byerly for characterizing our process as "seduction."

13. Kemp, *Visualizations*, 3.
14. Ibid., 4.
15. Vesalius, *Fabric*, trans. Richardson and Carman, lvi. Daniel Garrison and Malcolm Hast translate this sentence differently in their online edition of *Fabric*, published by Northwestern: "How much pictures aid the understanding of these things and place a subject before the eyes more precisely than the most explicit language, no one knows who has not had this experience in geometry and other branches of mathematics," 4r. Though it does so more subtly, this translation essentially comes to the same point: illustrations bring written text to life. In a letter of dedication from 1538, Vesalius reported some limitations to illustrations: "I believe it is not only difficult but entirely futile and impossible to hope to obtain an understanding of the parts of the body or the use of simples from pictures or formulae alone, but no one will deny that they assist greatly in strengthening the memory in such matters." See Saunders and O'Malley 1950, 233, quoted in Kemp, "Temples of the Body," 45.
16. Galilei, *Opere di Galileo Galilei*, 99, 416; Kemp, "Temples of the Body," 80. See also Galilei, *Sidereus Nuncius*.
17. Kemp, *Visualizations*, 42–43. Kemp, "Taking It on Trust," 131–32.
18. Hooke, *Micrographia*, 210.
19. Kemp, *Visualizations*, 42–43.
20. Smith, "Art, Science, and Visual Culture," 87. See also Topper, "Towards an Epistemology"; Ashworth, "Martin Gheeraerts"; and Kemp, "Taking It on Trust."
21. Federal Depository Library Program.
22. Drucker, "Concepts of Production," 2.
23. Phillpot, "Books by Artists," 33.
24. Burkhart, "Mongrel Nature," 264.
25. Brown, Losoff, and Hollis, "Science Instruction," 198. Published in 2014, this collaboration, also at the University of Colorado Boulder, introduces a confluence of illustrated science works and artists' books. Dissipation of disciplinary and institutional boundaries has also been promoted in the sciences. See Edwards, whose notion of "artscience" stresses interdisciplinarity as "catalytic for innovation." Edwards, *Artscience*, 5.
26. Despite clear benefits to a dynamic learning process, the underlying interdisciplinarity of art and science raises important questions. The primacy of text in the arena of science and, conversely, the primacy of image in the arts present the reader/viewer with distinctly different modes of expression. Brian S. Baigrie has noted the conviction that in the realm of science, "human thinking takes place in words," and that "pictures in science are psychological devices that serve as heuristic aids when reasoning breaks down." See Baigrie, *Picturing Knowledge*, xviii.
27. Taraba, "Artists' Books," 111.
28. On the important conceptual role of the sciences in the creation of artists' books, see Seigel and Chen, "A Conversation," 30–35.
29. Burkhart, "Mongrel Nature," 262.
30. Strauch-Nelson, "Book Learning," 7.
31. Ibid., 9.
32. Ibid., 14–15.
33. Colorado Commission on Higher Education (CCHE), "Content: Communication," 1–3. Because CCHE employs such language as "appropriate audiences," "variety of technologies (writing and research tools)," "adapt genre conventions," and "adapt content and style to respond to the needs of different audiences and rhetorical situations," these goals can arguably be narrowed down to one: increase rhetorical flexibility.

34. One reason we formed these admittedly Western-male categories is their recognizability. The names Galileo, Enlightenment, and Darwin create clear chunks of time in students' minds without the aid of vague, impersonal dates. "Enlightenment" is more concrete than "eighteenth century," at least in the context of scientific history. Another reason is students' awareness of the significance behind these names. For instance, undergraduates may not be fluent in the intricacies of Galileo's work, but they do know that after Galileo the world was never the same. The names themselves help students to grasp the "what if?" assignment's driving purpose. However, a student interested in the pre-Galilean world is not obligated to research Galileo himself, nor is a student fascinated by pre-Darwinian society forced to focus solely on Darwin or his famous theory. And neither of these students is restricted to studying male scientists or Western scientific history. Our students are aware of the wide-open range of possible topics, and this awareness has led them to ask some intriguing questions that reveal just how complicated the science-society relationship can be, questions like "What if Albert Einstein had been a woman?"

35. Steven Johnson performs a version of such "what if?" research in *How We Got to Now*. Johnson considers glass, cold, sound, cleanliness, time, and light through the lens of what he calls the hummingbird effect, named after the coevolution of nectar in flowers and the unique traits of the hummingbird's wing. We find Johnson's work important, not to mention gratifying, because it brings both legitimacy and interest to the "what if?" assignment's guiding methodology.

36. Though in theory it should not matter which school, teacher, and first-grade students we partner with, we mention them by name here because Bear Creek Elementary is a STEM-oriented school. Many of the kids' parents are scientists themselves, which means a book on, say, evolution—whether or not the word "evolution" appears on any of its pages—is less likely to fall on hostile ears. Having a sympathetic audience has been crucial to getting this project off the ground floor. Once it picks up momentum, we may try expanding to different schools. Also, in "Kids Weave Tales," Clint Talbott nicely summarizes just how important the children's book project has been to the first graders' developing skills in reading, writing, and researching, inspiring them to write science books of their own.

37. National Science Foundation, *Proposal and Award Policies*, 19.

38. American Association for the Advancement of Science, "Why Public Engagement Matters," emphasis added. Another, more recent, more local reason for asking Writing on Science and Society students to write science for public audiences has to do with CU Boulder campus initiatives. In his October 2014 State of the Campus address, Chancellor Philip DiStefano invited students, faculty, and staff to create "a collaborative campus environment in which earth and space sciences, engineering, business, law, social sciences, and humanities come together" to "explore and shape how space-based innovations and technologies impact business, law, and society." In response to this Grand Challenge, as it has come to be known, a steering committee was put together consisting of twenty campus administrators, among them Waleed Abdalati, professor of geography and director of the Cooperative Institute for Research in Environmental Sciences, and Steven Leigh, dean of the College of Arts and Sciences and professor of anthropology. See DiStefano, "Chancellor's Corner" and "State of the Campus Address."

39. Authenticity is critical not only to the "what if?" and children's book assignments but to the Writing on Science and Society curriculum as a whole, as it stems directly from the rhetorical appeal of *ethos*, commonly translated as "credibility." Budding scientists owe it to themselves to think about credibility—where it comes from, how to establish it, how to use it persuasively and ethically, etc.

40. Some of these statements were copyedited for readability.

41. Kress et al., *Multimodal Teaching and Learning*, 20–21.

42. How could we have expected it? Children's books are a lot of things—cute, fun, adventurous, adorable, creative, artistic, succinct, beautiful, gutsy, uncanny, scary, bright, cheerful, bittersweet, educational, dreamy, realistic, abstract, metaphorical, concrete, colorful, diverse, poetic, powerful, punchy, pithy. But radical? *Radical*?

43. *OED*, 2nd ed., adjective and noun, "radical."

44. Marks, *What It Means*, 288.

BIBLIOGRAPHY

"ACRL Visual Literacy Competency Standards for Higher Education." Association of College and Research Libraries at http://www.ala.org/acrl/standards/visualliteracy.

Ambrose, Susan A., Michael W. Bridges, Michele DiPietro, Marsha C. Lovett, and Marie K. Norman. *How Learning Works: Seven Research-Based Principles for Smart Teaching*. San Francisco: Jossey-Bass, 2010.

American Association for the Advancement of Science. "What We Do." *Center for Public Engagement with Science & Technology*. Last modified March 2, 2016. http://www.aaas.org/pes/public-engagement.

Ashworth, William B. "Marcus Gheeraerts and the Aesopic Connection in Seventeenth-Century Illustration." *Art Journal* 44, no. 2 (Summer 1984): 132–38. doi: http://dx.doi.org/10.1080/00043249.1984.10792534.

Bahde, Anne. "The History Labs: Integrating Primary Source Literacy Skills into a History Survey Course." *Journal of Archival Organization* 11, nos. 3–4 (2013): 175–204. doi: 10.1080/15332748.2013.951254.

Bahde, Anne, Heather Smedberg, and Mattie Taormina, eds. *Using Primary Sources: Hands-On Instructional Exercises*. Santa Barbara, CA; Denver, CO; Oxford, UK: Libraries Unlimited, 2014.

Baigrie, Brian S. Introduction to *Picturing Knowledge: Historical and Philosophical Problems Concerning the Use of Art in Science*, edited by Brian S. Baigrie, xvii–xxiv. Toronto, Buffalo, London: University of Toronto Press, 1996.

Bazerman, Charles, and David Russell, eds. *Writing Selves, Writing Societies: Research from Activity Perspectives*. Fort Collins, CO: The WAC Clearinghouse and Mind, Culture, and Activity, 2003. http://wac.colostate.edu/books/selves_societies/intro.cfm.

Bobek, Eliza, and Barbara Tversky. "Creating Visual Explanations Improves Learning." In *Proceedings of the 36th Annual Conference of the Cognitive Science Society*. Austin, TX: Cognitive Science Society, 2014.

Brown, Amanda H., Barbara Losoff, and Deborah R. Hollis. "Science Instruction through the Visual Arts in Special Collections." *portal: Libraries and the Academy* 14, no. 2 (2014): 197–216. http://dx.doi.org/10.1353/pla.2014.0002.

Burkhart, Anne L. "'Mongrel Nature': A Consideration of Artists' Books and Their Implication for Art Education." *Studies in Art Education* 47, no. 3 (Spring 2006): 248–68. http://0-search.proquest.com.libraries.colorado.edu/docview/199761046?accountid=14503.

Chen, Julie. *Panorama.* [Berkeley, CA]: Flying Fish Press, 2008.

Chickering, Arthur, and Zelda F. Gamson. "Seven Principles for Good Practice in Undergraduate Education." *AAHE Bulletin* (March 1987): 3–7.

College Book Arts Association. "Book Art Theory." Accessed April 16, 2016. https://www.collegebookart.org/bookarttheory.

Connor, A. M., S. Karmokar, and C. Whittington. "From STEM to STEAM: Strategies for Enhancing Engineering and Technology Education." *International Journal of Engineering Pedagogy* 5, no. 2 (2015): 37–47. doi: http://dx.doi.org/10.3991/ijep.v5i2.4458.

Dahlstrom, Michael F. "Using Narratives and Storytelling to Communicate Science with Nonexpert Audiences." *PNAS* 111, no. 4 (September 16, 2014): 13614–20. doi: 10.1073/pnas.1320645111.

Darwin, Charles. *On the Origin of Species by Means of Natural Selection: or, the Preservation of Favoured Races in the Struggle for Life*. London: J. Murray, 1859.

DiStefano, Philip. "Chancellor's Corner: Undertaking a Grand Challenge." *News Center: University of Colorado Boulder*. November 11, 2014. http://www.colorado.edu/news/features/chancellors-corner-undertaking-grand-challenge.

_____. "2014 CU Boulder State of the Campus Address." YouTube. October 15, 2014. https://www.youtube.com/watch?v=1FNhN8AZKq8.

Drucker, Johanna. "Concepts of Production." *Afterimage* 42, no. 1 (July/August 2014): 2–5. http://0-search.proquest.com.libraries.colorado.edu/docview/1543763056?accountid=14503.

Duncum, Paul. "Visual Culture Isn't Just Visual: Multiliteracy, Multimodality, and Meaning." *Studies in Art Education* 45, no. 3 (2004): 252–64. http://0-www.jstor.org.libraries.colorado.edu/stable/1320972.

Edwards, David A. *Artscience: Creativity in the Post-Google Generation*. Cambridge, MA: Harvard University Press, 2008.

_____. *The Lab: Creativity and Culture*. Cambridge, MA: Harvard University Press, 2010.

Facts about Fallout. [Washington]: [US GPO], [1955].

Faflik, David. "Light Writing: Verbal, Visual, and Virtual Images in the STEM Classroom." *Currents in Teaching and Learning* 5, no. 2 (Fall–Spring 2012–13): 52–64. http://www.worcester.edu/currents/archives/volume_5_numbers_1_and_2/currentsv5n1-2faflikp52.pdf.

Federal Civil Defense Administration. *Operation Doorstep: AEC Atomic Proving Ground, Yucca Flat, Nevada, March 17, 1953*. [Washington]: [1953].

Federal Depository Library Program. http://www.fdlp.gov/about-the-fdlp/federal-depository-libraries. Accessed March 23, 2016.

Flammer, Larry. "What Is the Nature of Science?" February 21, 2016. http://www.indiana.edu/~ensiweb/nos.html.

Foyle, Harvey C., ed. *Interactive Learning in the Higher Education Classroom: Cooperative, Collaborative, and Active Learning Strategies*. Washington, DC: National Education Association, 1995.

"Framework for Information Literacy for Higher Education." Association of College and Research Libraries at http://www.ala.org/acrl/standards/ilframework.

Galilei, Galileo. *Opere di Galileo Galilei*. Bologna: per gli hh del Dozza, 1655–56.

_____. *Opere di Galileo Galilei Divise in Quattro Tomi, in Questa Nuova Edizione Accresciute di Molte Cose Inedite*, vol. 2. Padua, Italy: Stamperia del Seminario, 1744.

_____. *Sidereus Nuncius. A Reproduction of the Copy in the British Library*. Alburgh, Norfolk, UK: Archival Facsimiles Limited, 1987.

Gurnon, Daniel, Julian Voss-Andreae, and Jacob Stanley. "Integrating Art and Science in Undergraduate Education." *PLOS Biology* 11, no. 2 (February 2013): 1–4. doi: http://dx.doi.org/10.1371%2Fjournal.pbio.1001491.

Hanmer, Karen. *Most Excellent Canopy*. [Glenview, Ill.]: K. Hanmer, 2008.

Herreid, Clyde Freeman. "Chicken Little, Paul Revere, and Winston Churchill Look at Science Literacy." From *Start with a Story: The Case Study Method of Teaching College Science*, 3–14. [Arlington, VA]: NSTA Press, 2007.

Hobson, Charles. *Fresnel's Tower: Why Lighthouses Are Like Stars*. [San Francisco, CA]: Pacific Editions, 1997.

Hooke, Robert. *Micrographia, or, Some Physiological Descriptions of Minute Bodies Made by Magnifying Glasses with Observations and Inquiries Thereupon.* London: J. Martyn and J. Allestry, 1665. Wing / H2620.

Huttner, Sidney F. "Waving Not Drowning: Rare Books in a Digital Age." *RBML: Rare Books & Manuscripts Librarianship* 13, no. 2 (1999): 97-108. http://0-search.ebscohost.com.libraries.colorado.edu/login.aspx?direct=true&db=ofm&AN=502809157&site=ehost-live&scope=site.

Jenner, Edward. *An Inquiry into the Causes and Effects of the Variolae Vaccinae*. London: Sampson Low, 1798. Facsimile reprint, [1923.]

Johnson, Steven. *How We Got to Now: Six Innovations That Made the Modern World*. New York: Riverhead Books, 2014.

Just in Case Atom Bombs Fall: Prepared by the Civil Defense Office of Denver, Colorado [Denver, Colo.]: [The Office], [1951].

Kemp, Martin. "Taking It on Trust: Form and Meaning in Naturalistic Representation." *Archives of Natural History* 17, no. 2 (1990): 127–88.

_____. "Temples of the Body and Temples of the Cosmos: Vision and Visualization in the Vesalian and Copernican Revolutions." In *Picturing Knowledge: Historical and Philosophical Problems Concerning the Use of Arts in Science*, edited by Brian S. Baigrie, 40–85. Toronto, Buffalo, London: University of Toronto Press, 1996.

_____. *Visualizations: The Nature Book of Art and Science*. Berkeley; Los Angeles: University of California Press, 2000.

[Ketham, Johannes de]. [*Fasciculus medicinae*]. [Venice]: [Johannes and Gregorius de Gregoriis, de Forlivio, 1493–1513].

King, Alison. "From Sage on the Stage to Guide on the Side." *College Teaching* 41, no. 1 (1993): 30–35. doi: 10.1080/87567555.1993.9926781.

Kress, Gunther, Carey Jewitt, Jon Ogborn, and Charalampos Tsatsarelis. *Multimodal Teaching and Learning: The Rhetorics of the Science Classroom*. London; New York: Bloomsbury Academics, 2014.

Kuhn, Thomas S. *The Structure of Scientific Revolutions: 50th Anniversary Edition.* Chicago: University of Chicago Press, 2012.

Land, Michelle H. "Full Steam Ahead: The Benefits of Integrating the Arts into STEM." *Procedia Computer Science* 20 (2013): 547–52. doi: http://dx.doi.org/10.1016/j.procs.2013.09.317.

Lauer, Claire. "Contending with Terms: 'Multimodal' and 'Multimedia' in the Academic and Public Spheres." *Computers and Composition* 26 (2009): 225–39. doi: http://dx.doi.org.colorado.idm.oclc.org/10.1016/j.compcom.2009.09.001.

Lutkewitte, Claire. "An Introduction to Multimodal Composition Theory and Practice." In *Multimodal Composition: A Critical Sourcebook*, edited by Claire Lutkewitte, 1–8. Boston and New York: Bedford's / St. Martin's, 2014.

Marks, Jonathan. *What It Means to Be 98% Chimpanzee: Apes, People, and Their Genes*. Berkeley, Los Angeles, London: University of California Press, 2003.

Mazella, David, and Julie Grob. "Collaborations between Faculty and Special Collections Librarians in Inquiry-Driven Classes." *portal: Libraries and the Academy* 11, no. 1 (2011): 467–87. http://0-search.proquest.com.libraries.colorado.edu/docview/854040988?accountid=14503.

Mitchell, Eleanor, Peggy Seiden, and Suzy Taraba, eds. *Past or Portal? Enhancing Undergraduate Learning through Special Collections and Archives*. Chicago, IL: Association of College and Research Libraries, 2012.

Murray, Donald M. "Teach Writing as a Process Not Product." In *Cross-Talk in Comp Theory: A Reader*, 3rd ed., edited by Victor Villanueva and Kristin L. Arola, 3–6. Urbana, IL: NCTE, 1997.

National Council for the Teachers of English. "Position Statement on Multimodal Literacies." In *Multimodal Composition: A Critical Sourcebook*, edited by Claire Lutkewitte, 17–21. Boston and New York: Bedford's / St. Martin's, 2014.

National Science Foundation. *Proposal and Award Policies and Procedures Guide* (January 2017). http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.

Newton, Isaac. *Opticks: or, a Treatise of Light, Reflections, Refractions, Inflexions, and Colours of Light*. London: Sam Smith and Ben Walford, Printers to the Royal Society, 1704.

O'Hara, Robert J. "Representations of the Natural System in the Nineteenth Century." In *Picturing Knowledge: Historical and Philosophical Problems Concerning the Use of Arts in Science*, edited by Brian S. Baigrie, 164–83. Toronto, Buffalo, London: University of Toronto Press, 1996.

Oxford English Dictionary Online. Oxford: Oxford University Press, 2016. http://dictionary.oed.com.

Phillpot, Clive. "Books by Artists and Books as Art." In *Artist/Author: Contemporary Artists' Books*, edited by C. Lauf & C. Phillpot, 31–66. New York: Distributed Art Publishers, 1998.

Physicians' Anatomical Aid. Chicago: Western Pub. House, 1888.

Press, Sara. *Evolve = Unroll*. Sebastopol, CA: Deeply Game Productions, 2013.

Schmiesing, Ann, and Deborah Hollis. "The Role of Special Collections Departments in Humanities Undergraduate and Graduate Teaching: A Case Study." *portal: Libraries and the Academy* 2, no. 3 (2002): 465–80.

Seigel, Caroline. "A Conversation with Book Artist Julie Chen at Her Studio, Berkeley, California, January 11, 2000." *Journal of the Art Libraries Society of North America* 21, no. 1 (April 2002), 30–35. doi: http://dx.doi.org/10.1086/adx.21.1.27949177.

Smith, Pamela H. "Art, Science, and Visual Culture, in the Early Modern World." *Isis: A Journal of the History of Science Society* 97, no. 1 (March 2006): 83–100. doi: http://dx.doi.org/10.1086/501102.

Strauch-Nelson, Wendy J. "Book Learning: The Cognitive Potential of Bookmaking." *Teaching Artist Journal* 9, no. 1 (13 Jan 2011), 5–15. doi: http://dx.doi.org/10.1080/15411796.2011.531633.

Talbott, Clint. "Kids Weave Tales of Snakes and Eagles and Bears." *Colorado Arts & Sciences Magazine* (April 27, 2016). http://www.colorado.edu/asmagazine/2016/04/20/kids-weave-tales-snakes-and-eagles-and-bears.

_____. "Soviet Lunar Colonies, and Other Challenging Tales." *Colorado Arts & Sciences Magazine* (April 30, 2015). http://www.colorado.edu/asmagazine/2015/04/30/soviet-lunar-colonies-and-other-challenging-tales.

Taraba, Suzy. "Now What Should We Do with Them? Artists' Books in the Curriculum." *RBM: Journal of Rare Books, Manuscripts, and Cultural Heritage* 4, no. 2 (September 21, 2013): 109–20. http://rbm.acrl.org/content/4/2/109.full.pdf.

Topper, David. "Towards an Epistemology of Scientific Illustration." In *Picturing Knowledge: Historical and Philosophical Problems Concerning the Use of Arts in Science*, edited by Brian S. Baigrie, 215–49. Toronto, Buffalo, London: University of Toronto Press, 1996.

Underwood, David. "Nothing Teaches Like Teaching." *The Designer's Corner* (blog). June 26, 2015. http://www.colorado.edu/thedesignerscorner/2015/06/26/nothing-teaches-teaching.

Vesalius, Andreas. *Andreae Vesalii . . . De humani corporis fabrica libri:* Bruxelles: Culture et Civilisation, 1964. Reprint. Originally published: Basileae: Ex Oficina I. Oporini, 1543.

_____. *On the Fabric of the Human Body.* Translated by William Frank Richardson and John Burd Carman. San Francisco: Norman, 1998.

Vesalius, Andreas, Daniel Garrison, and Malcolm Hast. *On the Fabric of the Human Body: An Annotated Translation of the 1543 and 1555 Editions of Andreas Vesalius' De Humani Corporis Fabrica*. Northwestern University, 2003. http://vesalius.northwestern.edu.

Wallace, Darrell, Brian Vuksanovich, and Kathie Carlile. "Work in Progress—Building Up STEAM—Exploring a Comprehensive Strategic Partnership between STEM and the Arts." ASEE North Central Sectional Conference (March 26–27, 2010). http://people.cst.cmich.edu/yelam1k/asee/proceedings/2010/papers/162.pdf.

Yancey, Kathleen Blake. "Made Not Only in Words." In *Multimodal Composition: A Critical Sourcebook*, edited by Claire Lutkewitte, 62–88. Boston and New York: Bedford's / St. Martin's, 2014.

ON PAPER: THE EVERYTHING OF ITS TWO-THOUSAND-YEAR HISTORY

Nicholas A. Basbanes
Alfred A. Knopf, 2013

THE PAPER TRAIL: AN UNEXPECTED HISTORY OF A REVOLUTIONARY INVENTION

Alexander Monro
Alfred A. Knopf, 2014

PAPER: PAGING THROUGH HISTORY

Mark Kurlansky
W. W. Norton & Company, 2016

Reviewed by Amy Richard
Owner and proprietor of Amy Richard Studio

GIVEN THE GENERAL SCARCITY OF BOOKS written *about* paper, a flurry of recently published monographs is cause for celebration among bibliophiles and paperphiles alike. Nicholas Basbanes led the way in 2013 with *On Paper: The Everything of Its Two-Thousand-Year History*, followed in 2014 by Alexander Monro's *The Paper Trail: An Unexpected History of a Revolutionary Invention*, and most recently Mark Kurlansky's *Paper: Paging Through History*, published in 2016.

Why the sudden interest in publishing monumental books about paper? Were these intended as memorials? Or could it be that paper is somehow gaining new significance in the face of an all-consuming digital presence? With these questions in mind, a review of all three books seemed appropriate. At the very least, I hoped to determine which of them to acquire for my own library.

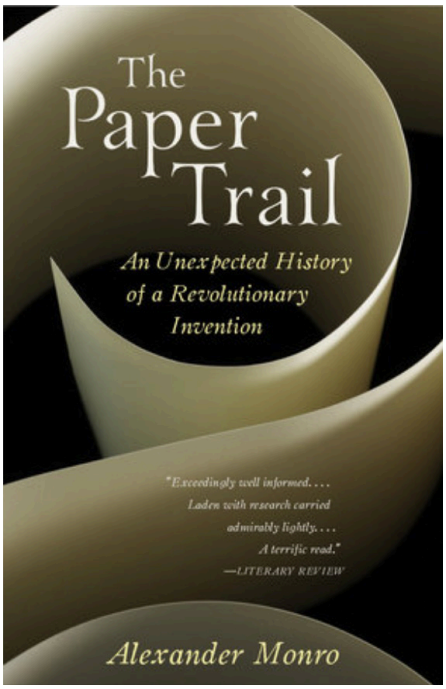
Since Basbanes was first out of the gate, it made sense to start with his 430-page treatise. An investigative journalist and self-professed bibliophile, his hands-on research makes for an engaging read. True to his goal of exploring the *idea* of paper more than its chronological history, he covers a wide range of topics above and beyond the usual paper-history narrative, including its role in the development of art, architecture, currency, war, munitions, and international relations, to name a few.

After setting the stage in the book's first six chapters with an overview of early writing and paper's "relentless circumnavigation of the globe," Basbanes spends the rest of his time weaving a tapestry of history's decisive paper-related moments, some of them quite surprising and little known. A consummate storyteller, he delights in sharing these tales, as well as personal interviews with a host of contemporary scholars and innovators in the field, which will no doubt serve as an important archive for future generations.

Determined to cover the "everything" of paper, Basbanes includes dozens of innovations that irrefutably changed our lives, for good or bad. Who knew that cigarette wrappers, feminine hygiene products, toilet paper, gas mask liners, and munitions cartridges would have such a huge impact? While these less-than-glamorous subjects may seem like diversions, they offer a deeper understanding of just how thoroughly paper has permeated our lives, culture, and history—the very "human factor" the author aspires to.

In his final chapter, "Elegy in Fragments," Basbanes brings this point home with haunting accounts of the paper "rain" that fell from the Twin Towers during the 9/11 terrorist attack. Among them were handwritten notes from victims trapped in the buildings. Discovered later at Ground Zero, these gritty fragments of ephemera serve as a profound example of our close and long-standing connection with paper.

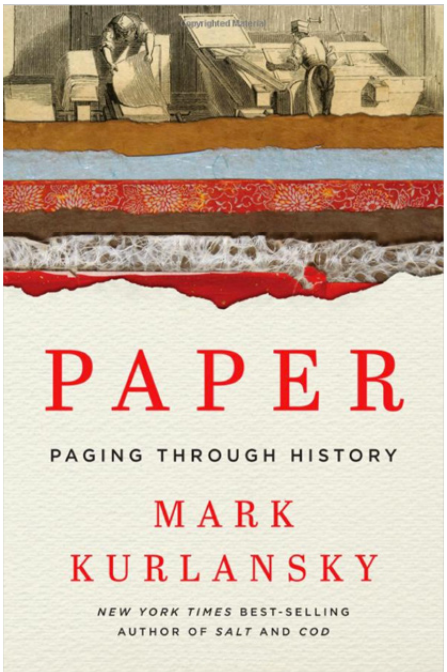
The Paper Trail by Alexander Monro likewise deviates, in its 368 pages, from the usual Western narrative by providing in-depth examination of Asia's paper, writing, and printing history, reserving Europe and Gutenberg for the last hundred pages. This makes sense given Monro's background as researcher and reporter for Reuters Shanghai. His nuanced knowledge of China has clearly been influenced by personal travels there. In 2002, for example, he retraced on horseback the route Genghis Khan took through Mongolia.



Monro's substantive overview of paleography and early calligraphy in central and south Asia is greatly appreciated, as are chapters 8–12, in which he covers papermaking in the Arab world and the monumental influence it had on Islam and the Koran. He expresses justifiable amazement at how a book-based religion evolved from a long-standing oral culture and ultimately spread over half of Asia.

Similar care is given to an enlightening section about Martin Luther and the seismic shift that resulted from his vernacular German text printed and disseminated on paper. I have studied the Reformation in several history courses, but Monro's narrative brought this moment to life.

Last but not least, Mark Kurlansky's 389-page *Paper: Paging Through History* makes an interesting contrast to the other books. Dispensing with any attempts at warm, fuzzy introductions, the author greets the reader with an apparently ongoing debate about the idea of the "technological fallacy." He insists, "technological inventions have always arisen from necessity," then spends the first few pages of his prologue trying to convince us that "technologies do not change society but instead society develops technology to address the changes that are taking place within it."



Taken aback by this sweeping generalization, I chose to withhold judgment. For one thing, it's a chicken-and-egg argument and beyond the scope of this essay, though it provides much food for thought. Thankfully, chapter 1, "Being Human," is less strident, beginning with a question instead of a manifesto. Asking what humans do that other animals do not, Kurlansky answers with the observation that only humans *record*. He then launches into a captivating historical overview of this uniquely human compulsion—a nice segue to the history of paper.

While covering much of the same territory on early writing systems and languages, the book offers plenty of new material to absorb. The history of Arab-world paper is less robust than Monro's, but its presence is an indication that it is finally gaining the respect it deserves. He also deserves credit for including the history of paper in Mexico's Aztec and Mayan cultures, which, like Arab-world paper, deserves much more attention and scholarship. All three authors discuss paper in Mexico briefly, but Kurlansky dedicates the most space, which will hopefully inspire more scholarship on the topic.

Printing-history enthusiasts will appreciate the detailed accounts of the evolution of European printing in chapters 6 and 7, including a section on musical notation and a lengthy discussion of Albrecht Dürer. Several later chapters proved favorites that I will revisit again soon, as they provide an expanded look at paper's influence on art, including a number of contemporary Asian paper artists, something touched on only briefly by the other two authors (although Basbanes does an equally nice job with Leonardo da Vinci and a number of contemporary origami artists).

Some minor points of contention in Kurlansky's narrative bear mentioning, however. Several times, I stumbled across assertions that seemed like a stretch, and some were just plain wrong. References to the use of urine for retting fiber (in early European papermaking) may have been confused with techniques used in the wool industry.[1] The author lists silk as a source of cellulose (it's a protein), and describes Fabriano as a city on the west coast of Italy (it's on the east); such inaccuracies are surprising from a *New York Times* best-selling author and distract from an otherwise compelling book.

The good news is that all three authors seem to agree that paper isn't going away anytime soon and is indeed gaining new significance while retaining its original "human factor." As Monro eloquently explains, "Paper may face a very real threat to its use for text in the digital age, but it also has peculiar strengths as a cultural product, strengths which cannot all be replicated. Chief among these is its physical reception by readers as an independent item: a handheld extended piece of writing that can be physically owned."

It's also clear that all three books need to be added to my library; each contains a unique perspective on paper's enormous history, filling in gaps others may have missed, and with much more to offer than I have been able to convey in this short review. ■

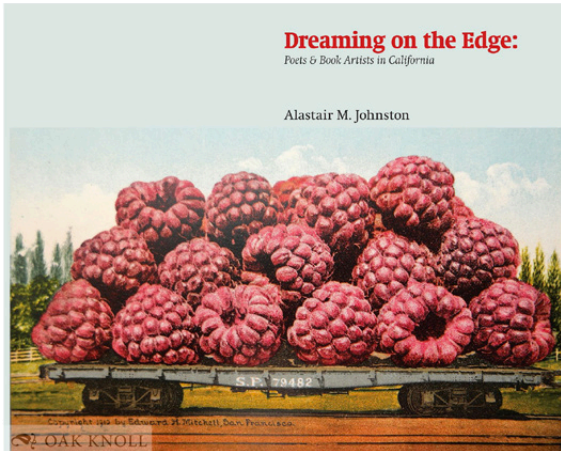
NOTE

1. According to University of Iowa scholar and paper specialist Tim Barrett, who has done considerable research on the subject of European paper production from the thirteenth through the nineteenth century, "The idea that various agents may have been used to encourage the retting step, such as sour milk, urine, stale beer, or whatever is very intriguing but I haven't yet encountered any historical references to their use. Lime is the only agent I know of that was sometimes used during the retting step." More on this can be found in Barrett's fascinating research project "Paper Through Time" at http://paper.lib.uiowa.edu/.

DREAMING ON THE EDGE: POETS AND BOOK ARTISTS IN CALIFORNIA

Alastair M. Johnston
Oak Knoll Press, 2016

Reviewed by Danelle Moon
Head, Special Research Collections, Skofield Printers Collection,
and Artist Books Curator, University of California Santa Barbara



DREAMING ON THE EDGE takes the reader on a circuitous 150-year "biblio-tour of California," with a focus on how artists, printers, and poets shaped the development of the book across time. The journey begins with the boomtown era of San Francisco during the gold rush and after, followed by a view of twentieth-century art, poetry, and printmaking from San Francisco to Los Angeles. It ends with a brief history of the second wave of book artists and the academic programs supporting book arts. The book is beautifully illustrated. The front cover presents a chromolithograph postcard by Edward H. Mitchell (1912), and the endpapers are from the John Henry Nash type-ornament collection in the Bancroft Library. It is laid out, loosely chronologically and thematically, in thirty chapters, with photographs throughout documenting early printmaking and the book as art from the 1960s to the present.

In the preface, Alastair Johnston argues that "self-publishing is a key component of creative growth in California" and that this unbound creativity has been influenced by multiple social movements, politics, and a rebellious spirit against social conformity. The synergy between printers, artists, and writers over 150 years provides a context for understanding the unique diversity of California's history, culture, and politics. Indeed, to examine the role of "the form of the book as a vehicle for self-expression" is to study Californian identity—or the geography and culture of shaped poetry through book art.

Johnston traces the diverse history of book arts, presenting an eclectic cast of radical characters: conscientious objectors, anarchists, pacifists, feminists, hippies, beatniks, and Buddhists. Among writers and printers, the usual suspects from the twentieth century are well represented: Rexroth, Duncan, Everson, Jeffers, Ginsberg, Burroughs, Spicer, Patchen, Ritchie, Nash, Hoyem, the Grabhorn brothers, Black Sparrow, White Rabbit, Ruscha, and others. While the narrative focuses dominantly on men, Johnston weaves in the roles played by women, including Idah Strobridge, Florence Lundborg, Joanne Kyger, and Frances Clark Butler. The creation of academic and nonprofit programs provided a training ground for female and male printers and artists that influenced the second wave of book artists from 1960 to the present. Academic programs and organizations at University of California Santa Cruz, University of California Santa Barbara, Mills College, California College of Arts and Crafts, Claremont College, and the Pacific Center for the Book Arts are examined among others.

The first four chapters focus on the early history of San Francisco, providing the literary context that shaped demand for newspapers, periodicals, photo books, chapbooks, postcards, and ephemera. The oldest of the periodicals of this period, the *News-letter*, featured

the stories of Bret Harte and was followed by the *Wasp*, the *Argonaut*, and the *Lark*, among others. Johnston provides a rich narrative, with local character and color in his prose, providing a fascinating look at this period. While San Francisco dominates as the hub for fine printing, Southern California, once considered a wasteland in this regard, is rescued by the likes of Ward Ritchie and Lawrence Clark Powell and enhanced by SoCal transplants, among them wood engraver Paul Landacre. One can easily see the interplay between East and West Coast talent in creating a very unique culture of printing in California.

One of the book's strengths is its focus on the birth of the postmodern era and underground publishing, starting with Henry Miller, Anaïs Nin, Bern Porter, Kenneth Patchen, and Kenneth Rexroth. Patchen's *Journal of Albion Moonlight* represented the intersection of poetry with an articulated typography as a linear bound book. As Johnston so elegantly describes, Patchen's "presenting text in complex ways" prepared the way for a new printing aesthetic that included variety of scale, white space, and dramatic illustration (64).

Johnston enhances the narrative with some insightful firsthand accounts by printers and artists. For example, he describes the experience of those working with William Everson and recounts a story told to him by Graham Mackintosh: "Mackintosh recalled helping him print at St. Albert's, unaware that Everson was a 'shouter'—given to spontaneous ejaculatory praise. Mackintosh was carrying a galley of hand-set type when Everson claimed 'OhmyGod!!' shattering the silence, causing Mackintosh to pie the type all over the floor" (109).

The postwar years produced a cultural mecca in California that inspired creativity in poetry and printing. Johnston presents well the emergence of the beatnik generation and the conflicts between the old guard that included Jack Spicer and Robert Duncan. He also traces the emergence of the White Rabbit Press and the Black Sparrow Press, highlighting John Martin's unique marketing strategies, which included targeting libraries, forcing an all-or-nothing purchase requirement, with no review or return policies.

While the bulk of this history is heavily male, snapshots of women printers and poets do emerge. Chapter 22 explores the life of Joanne Kyger and her contributions as a poet and writer, and her journals present her insider view of the anti-beatnik sentiment of the Spicer-Duncan circle. Chapter 27 is focused on women and begins with a description of the Women's Co-operative Printing Union established in Oakland in 1868 and run by printer Marietta Stow, and moves on to the production of *Carrier Dove*, a feminist publication edited by Julia Fish Schlesinger. The anti–Vietnam War movement and the second-wave feminist movement inspired a new collective movement in printing. Kathleen Walkup, a self-taught printer, opened her first letterpress shop Five Trees Press, and in 1976 with Cheryl Miller opened Peartree Printers, the first letterpress shop run by women in San Francisco since the 19th century. Five Trees Press represented a women's collective that included Kathleen Walkup, Cheryl Chaney Miller, Jaime Robles, Eileen Callahan, and Cameron Bunker. The second-wave feminist movement would inspire a new collective movement in printing.

The last three chapters address the second wave of book art production, which is illustrative of the role of women as printmakers, bookbinders, designers, and artists. The birth of academic and nonprofit centers is also prominently described, including the formation of

the Codex Foundation and the CODEX Book Fair and Symposium by Peter Koch. Johnston opines that "CODEX fails to engage a larger audience" where "they too often focus on one aspect of the book [text, illustration, structural concept]," thus guaranteeing rarity. Although CODEX has created an artist environment that is grounded on traditional and postmodern interpretations of the meaning of the book, it seems equally true that the fine press movement is similar in creating intentionally rare, finely crafted limited edition works. Despite Johnston's critique of CODEX, he has a strong appreciation of the book arts ability to transform our thinking about the "intrinsic nature of the book" (202). In these final chapters Johnston teases out his favorite artists while revealing the diverse landscape of the book as art. He provides a critique of the meaning of the book and playfully embraces the deconstruction of book arts as mastered by many seasoned book artists, such as Julie Chen and Mark Head. Head defines his approach using multimedia stating "it's a rift between illustrated mind and map of consciousness . . . poetic inspiration" (202). Hedi Kyle's "creatively engineered structures" and those by Julie Chen represent both bound and unbound books and are indicators of the new genre and the creativity and diversity of the book arts in the twenty-first century.

Dreaming on the Edge is a welcome addition to the history of the book, printmaking, and book art in California. Johnston's extremely dense narrative is presented circularly, bringing a nuanced approach to the fine press movements across time and making connections to the early master printers and writers. The last two chapters slimly address the birth of the contemporary artist's book movement, while offering an interesting perspective on the "intrinsic nature of the book" and the role of novelty, surprise, and visual representation in postmodern book production. I was happy to see many of the great masters recognized, including Harry and Sandra Reese, Carolee Campbell, Johanna Drucker, Julie Chen, Gaylord Schanilec, Peter and Donna Thomas, Felicia Rice, Kitty Maryatt, Peter Rutledge Koch, and many others.

As much as I enjoyed Johnston's prose and research, as a historian I was disappointed by the lack of footnotes and found the index difficult to use. Still, this book should be considered as a text for college courses in book arts, history, and interdisciplinary studies. I am certain that printers, writers, and artists will also enjoy this delightful narrative. ■