The Image of the Book: Cognition and the Printed Page
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Introduction: The Making of Books

Is it possible that in another five hundred years, paper will be obsolete as the material of choice for making books, and that only digital books will be available?

Even though digital gurus such as Nicholas Negroponte, who in 2010 said that physical books had five years of life left in them, assure us this is the case,[1] perhaps this obsolescence will not fully happen because of certain qualities of the printed book that complement a reader's psychological makeup.

When I started high school in the mid-1970s in Sardinia, Italy, I convinced my mother to pay for a weekly purchase of a 32-page signature (a section of a book) that would in time form a multi-volume History of Art set. What I did not realize at the start of the process was that once the set was completed, I would

Figure 1
Signatures in traditional western bookbinding can be stitched together in series of pairs. Author's illustration.
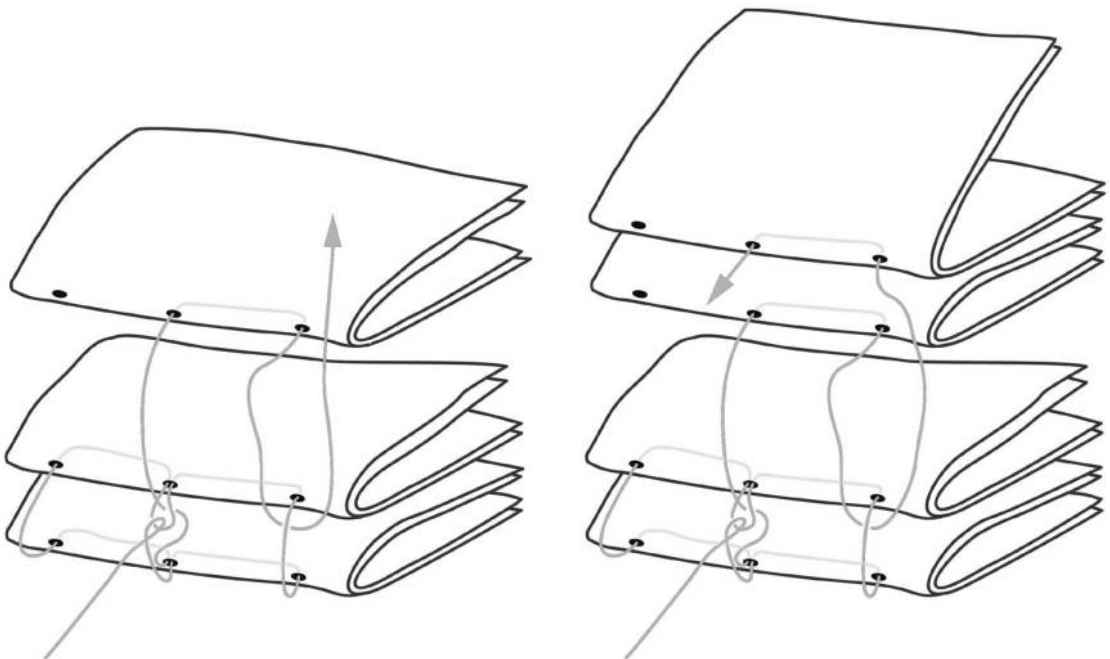
Figure 2
Above, left: three-dimensional, physical printed book (codex). Mʀ. *WILLIAM SHAKESPEARES COMEDIES, HISTORIES AND TRAGEDIES. Published according to the True Originall Copies.* (First Folio) (London: Isaac Jaggard and Edward Blount, 1623). Photo courtesy of California State Library – Sutro Branch, San Francisco, California. Above, right: two-dimensional, virtual electronic book (eBook), showing a page from "The Complete Works of William Shakespeare," Project Gutenberg, January 1, 1994, www.gutenberg.org/ebooks/100 (accessed April 17, 2015). The page shown is from *Hamlet* (3.1.55–84), as displayed on Apple's iPad 2010 edition. Public domain.

1   Howard Kurtz, "CNN: Physical books gone in 5 years?" Interview with Nicholas Negroponte, October 17, 2010, www.youtube.com/watch?v=p-BpJsqFFUY (accessed April 26, 2015).

not be able to afford the cost for professional bookbinding to turn the signatures into bound volumes. I had failed to notice that books are put together by thread and glue and that the binding technique is quite special. After putting aside the initial despair, I set out to bind the books myself and managed to finish one, albeit with a rather mixed-up stitching pattern. The pages held together, but the additional task of attaching the covers put an end to the enterprise. To this day, after having learned the basics of western bookbinding (see Figure 1), the twenty volumes are still sitting on the bookshelf of my childhood room, still unbound except for the coverless first volume.

That experience made me appreciate the handcrafted character of books, and in the process I gained an attachment to the printed book that is common to many but is somewhat difficult to rationalize. If the content is what matters and if one should not judge a book by its cover, what really justifies this attachment to the printed book?

The Three Spatial Dimensions of Printed Books
The pages in a printed book are three-dimensional. They have a width, a height, and a depth that is given by the thickness of the sheets of paper. The pages in a virtual book are by contrast two-dimensional: They have a height and a width but not a depth (see Figure 2). In the digital book, often the width and the height are not fixed, but can be easily changed by the reader. Moreover, any change in the width and height of the page is likely to cause other changes in line length, font size, and beginning and ending on a specific page.
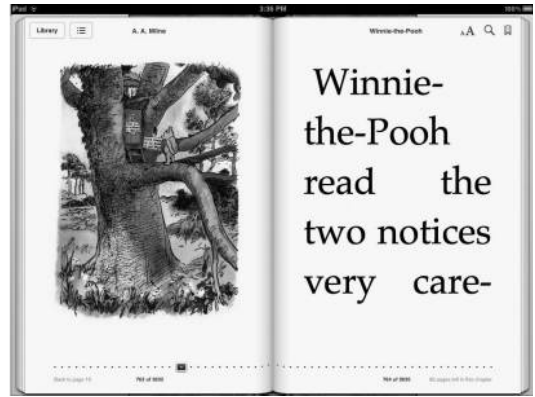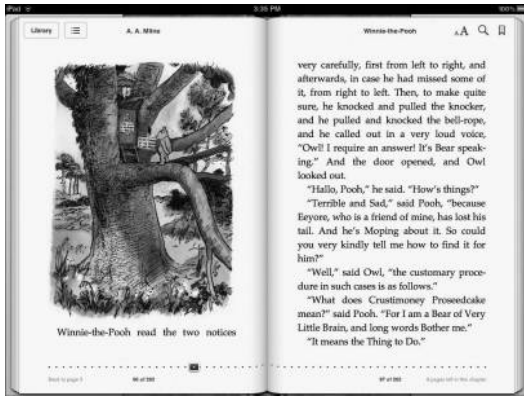
Figure 3

Above: In a digital book, the font size can easily be changed. From WINNIE-THE-POOH by A. A. Milne, illustrated by E. H. Shepard. Copyright © 1926 by E. P. Dutton, © renewed 1954 by A. A. Milne. iBook copyright © 2009 by The Trustees of the Pooh Properties. Coloring of the illustrations copyright © 1992 by Dutton Children's Books. Used by permission of Dutton Children's Books, an imprint of Penguin Young Readers Group, a division of Penguin Random House LLC. The pages shown are from Chapter IV: IN WHICH *Eeyore Loses a Tail and Pooh Finds One.*

Figure 4

Below left: 1950 printed book version of *Winnie-the-Pooh.* Below right: digital book version on Apple's iPad 2010 edition. From WINNIE-THE-POOH by A. A. Milne, illustrated by E. H. Shepard. Copyright © 1926 by E. P. Dutton, © renewed 1954 by A. A. Milne. iBook copyright © 2009 by The Trustees of the Pooh Properties. Coloring of the illustrations copyright © 1992 by Dutton Children's Books. Used by permission of Dutton Children's Books, an imprint of Penguin Young Readers Group, a division of Penguin Random House LLC. The pages shown are from Chapter VIII: IN WHICH *Christopher Robin Leads an Expotition to the North Pole.*

The flexibility of digital text has been hailed as a boon to people with low vision, who can now simply enlarge the font as needed (see Figure 3). However one such individual, the psychiatrist Oliver Sacks, laments the disappearance of large-print books that were once common in bookstores. Like many who prefer physical books, he cites the ability to immediately find a particular passage in most of his printed books.[2]
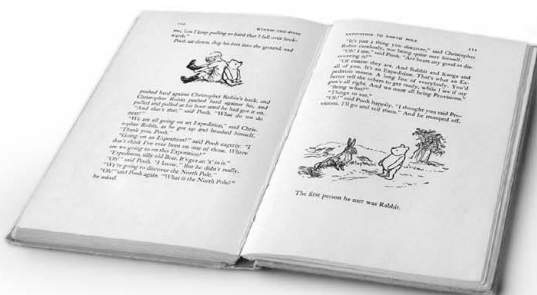
The digital response to Sack's comment would be to point out the efficient search feature of all digital readers. Why should we need to remember the location of a specific passage when we can easily search for it by typing a query into the search box?

In this article I argue that the physical embodiment of the printed book—the thick stack of pages assembled between the covers—enhances reading not simply through the tactile character of the paper, but also through its capacity to help in the actual remembering of the content of the book. By physically moving with the hands through the pages, as well as leaving physical marks on them, the reader creates a "mental image" of the book—a map of its contents similar to other mental maps, such as geographic maps, historical events, or the character of a person.

The stack of pages between the covers demands physical exploration. Each step forward brings a physical, visible change. For example, there is a tangible change in the pages on the left that have been read, and those on the right that are left to be read. In a printed book like *Winnie-the-Pooh* (see Figure 4), the visual cue offered by these two sets of pages has no tangible, corresponding reality in the digital book version.[3]
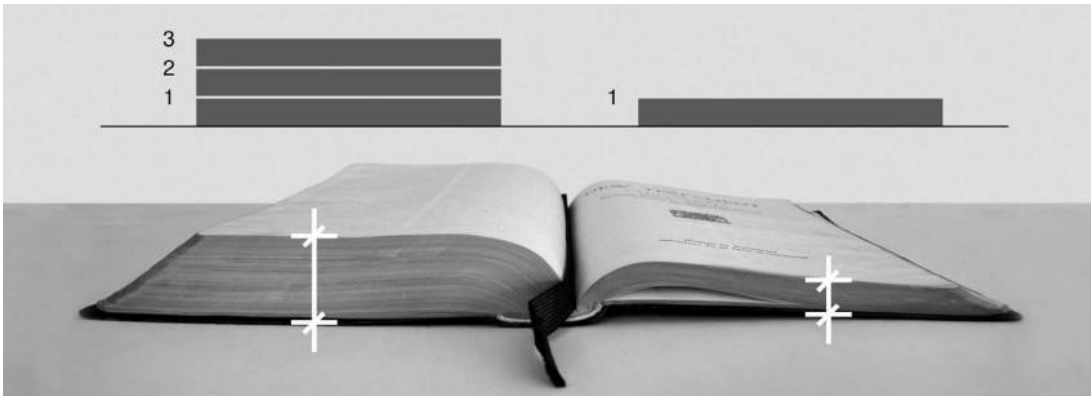
Figure 5
A *King James Bible* showing the different thicknesses of the *Old* and the *New Testament.* Author's photo illustration.

Figure 6
As magnification changes, the same 62 dots in *Winnie-the-Pooh* (2010 iPad) represent the total length of the book, irrespective of page length change. From WINNIE-THE-POOH by A. A. Milne, illustrated by E. H. Shepard. Copyright © 1926 by E. P. Dutton, © renewed 1954 by A. A. Milne. iBook copyright © 2009 by The Trustees of the Pooh Properties. Coloring of the illustrations copyright © 1992 by Dutton Children's Books. Used by permission of Dutton Children's Books, an imprint of Penguin Young Readers Group, a division of Penguin Random House LLC. The pages shown are from Chapter VIII: IN WHICH *Christopher Robin Leads an Expotition to the North Pole.*

2   Oliver Sacks, "Reading the Fine Print," *The New York Times Book Review,* December 16, 2012, 35.

3   A. A. Milne, *Winnie-the-Pooh* (New York: E. P. Dutton, 1926).

4   *The Holy Bible containing the Old and New Testaments,* AV (Glasgow: Collins, 1958).

5   A. A. Milne, *Winnie-the-Pooh* (New York: Penguin, 2009), iPad 2010 edition.

6   George A. Miller, "The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information," *Psychological Review* 63 (1956): 81–97.

A King James Bible opened at the end of the Old Testament and the beginning of the New Testament gives, when seen from the side, an immediate, concrete, natural map of the two "books" (see Figure 5). The "new" is roughly 7 millimeters thick with 327 pages—about a third of the old, which is 22 millimeters and 1,079 pages.[4]

By contrast, a similar spot at the roughly two-thirds location in a digital version of *Winnie-the-Pooh,* showing pages 182 and 183 in Apple's 2010 iPad iBook edition, is marked at the bottom of the page by a highlighted dot within a long series of dots.[5] Although the labels "182 of 262" and "183 of 262" clarify the location of the pages, I experience something unsatisfying about this notation. It still works in a general sense, but the dots representing
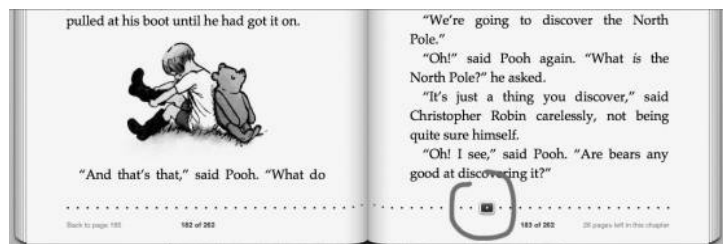
the pages subtly "want" to be counted, contravening and reversing George Miller's fundamental concept of "chunking," whereby large quantities are made manageable by collapsing them into discrete "chunks."[6] A solid line marked with a dot, rather than a dotted line, would be a much better way to visualize the current location of the reader (see Figure 6).

No doubt better interfaces will be created by user experience designers to improve the orientation system of a book. But if the history of graphical user interfaces (GUIs) is any guide, we might see just as many misguided digital improvements ahead as better innovations. The disappearing scrollbar is a current example of a misguided change, where less is not necessarily more.

Digital and screen interfaces have yet to incorporate the signals that readers interpret from the physical reality of a book. For example, a big book like *War and Peace* invites a different

Figure 7
Paper and ribbon bookmarks in printed books. Left photo courtesy of the California State Library – Sutro Branch, San Francisco, California. Center and right: author's photos.

approach from the reader than a short story does. It encourages a leisured approach and demands a different sort of commitment. This genre signal is far less real on a screen and would have to be explicitly designed into a digital version.

The Printed Book and Its Spatially Fixed, Linear Character
Reading a printed book always involves the physical flipping of the pages and the physical opening and closing of the covers, and it often includes the placing of physical bookmarks between the pages (see Figure 7). With a printed book, these activities are performed by our hands and fingers all moving through the actual three-dimensional space occupied by the book, but with a digital book this movement through space is much reduced by the technical necessity of the flat, two-dimensional screen.

But in addition to its spatial, tangible materiality and obviously important sensible and tactile attributes, another, more important characteristic determines the fruitful construction of the reader's mental image of the book: It is the linear, fixed sequence of letters making up the words, the fixed sequence of words making up sentences, the fixed sequence of sentences making up paragraphs, and so on, until the complete book is assembled between the covers. In a printed book, all these sequential relationships stay the same, perhaps changing only when a new edition gets printed. Contrary to much celebrated concepts of non-linearity, simultaneity, and free-flowing text, the fixed form and linear order of the printed pages are precisely the features that give the book its power and usefulness. The fixed form of the printed page is a great aid to reading and to memory, much as the fixed location of furniture in a room is a great aid to memory for a visually impaired person.

Some might object that this fixed sequence does not change in a digital text either. However, the physical form—the shape of individual parts in the sequence—is always subject to change in the digital version. A digital book shrinks and expands its number of pages simply by changing the size of the font, and while this difference is a matter of degree more than an absolute principle, it does have an adverse effect on fixing the mental image.

The Image of the Book

The image of the book that can be gained from its physical manifestation is highly analogous to the analysis of urban experience given by Kevin Lynch in his 1960 book, *The Image of the City*.[7] He states that a more *imageable* city is one with clear and visible landmarks, with distinct neighborhoods and recognizable boundaries between districts. A clear, distinct image of the city gained through these physical characteristics helps a person become oriented, even when these landmarks extend over a large metropolitan area.

Although a physical city does not force a fixed-sequence experience, its relatively stable form affords individual paths to be used, remembered, and "imaged." The relatively stable form of a physical book similarly affords individual byways within a stable context. The digital book offers an ever-changing landscape—as if in a city the buildings would grow or shrink suddenly, or the streets would become narrower or wider as they are traversed. Thus, a paradox of the digital freedom from the static, fixed nature of the printed page is that the digital introduces uncertainty, and does not encourage the making of a mental image of the book. Lynch even draws the analogy between book and city himself when he introduces the "legibility" of the cityscape:

> By this we mean the ease with which its parts can be recognized and can be organized into a coherent pattern. Just as this printed page, if it is legible, can be visually grasped as a related pattern of recognizable symbols, so a legible city would be one whose districts or landmarks or pathways are easily identifiable and are easily grouped into an over-all pattern.[8]

Thus, while no reader would deny the meaningfulness of the typographic symbols when displayed on the screen instead of on a printed page, the physical context in which the symbols reside is undeniably different. The *kinesthetic* component is missing from the digital.

And moving to the multiple creates a larger kinesthetic context for the image of the book: A bookshelf full of books represents the personal, intellectual geography of the owner, a geography that presumably is very familiar (see Figure 8). Through

7   Kevin Lynch, *The Image of the City* (Cambridge: MIT Press, 1960).

8   Lynch, *Image of the City,* 2–3.

their use, books become more individual, and more directly connected to their users. Oliver Sacks recognizes this relationship: He wants: "...books to *belong* to me, books whose intimate pagination will become dear and familiar."[9]

The Concrete Nature of Printed Books
Every physical book, because it has dimensions and heft, has a unique identity apart from its pagination and typography. The field of historical bibliography uses minute physical differences among old copies to make ingenious inferences about provenance and meaning.[10] The identical nature of every download of a digital book is really an absence of realized form. Digital books, in their endless flexibility, are "invisible." Thus, contra to Negroponte's prediction, the book has not really died; it has just become invisible. As in a city, where the people become increasingly "invisible," as they immerse themselves in the digital world, communicating with unseen digitalized persons, ignoring the real ones a few feet away, disembodied by virtually connecting to other people through devices rather than directly, virtuality leads to increased abstraction and disassociation.

Cognitive psychology sheds light on this effect. According to Daniel Willingham, humans are not very good at abstraction. They prefer concreteness. They learn abstractions through concrete examples.[11] Of course, the concrete examples might be presented through intangible media (e.g., projections, books, verbal descriptions), but they usually make sense only by virtue of concrete past experience.

What are the implications for digital books? Can they be well-designed to address their shortcomings? Surely the answer must be yes; if by good design we mean adherence to accepted standards of legibility and organization, probably more than a handful of digital enterprises fit the bill. We previously identified kinesthesia as one of the modalities for experiencing and remembering the city, and this multisensory experience obviously plays a role in many other daily activities, including reading. But how much bigger a role does it play in *remembering* the meaning found in a physical book than it does in remembering the meaning found in a virtual book? Answering that question requires a brief excursion into the subjects of working memory and long-term memory.

Chunks as Localities, Localities as Chunks
In 1956 a paper titled "The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information," by a young Harvard professor named George A. Miller, transformed the study of psychology. Miller's paper began with the memorable sentence: "My problem is that I have been persecuted by an

9   Sacks, "Reading the Fine Print."
10 Mirjam M. Foot, "The Study of Books," *Aslib Proceedings* 58, no. 1–2, (2006): 20–33.
11 Daniel T. Willingham, *Why Don't Students Like School? A Cognitive Scientist Answers Questions About How the Mind Works and What It Means for the Classroom* (San Francisco: Jossey-Bass, 2009), 87-88.

Figure 9

Baddeley's model of multicomponent working memory. Redrawn from *Memory,* by Alan D. Baddeley, Michael W. Eysenck, and Michael C. Anderson, (Hove, UK: Psychology Press, 2009): page 58, Figure 3.9. Used by permission.
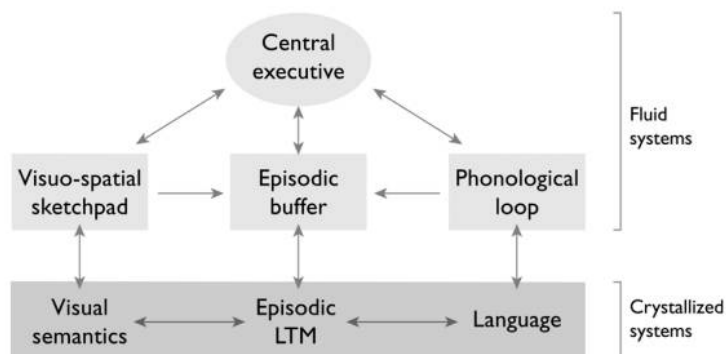
integer."[12] Miller found that we can never keep more than about seven things in immediate memory at the same time. This justifies his use of the word "chunk." If you can chunk the items—for instance, the digits in your social security number—then you can remember that number more readily. That's why social security numbers are written in chunked groups: 434-65-9623. Here we have nine digits but just three chunks, making the number much easier to handle and recall than 4-3-4-6-5-9-6-2-3. Miller's paper demonstrated the limitations of human memory, especially working memory—termed immediate memory by Miller and commonly known as short-term memory. He placed the limit at about five to seven items in determining our capacity to hold on to information during that immediate span of two to four seconds after exposure, after which performing immediate, accurate recall becomes extremely difficult.

Fast-forward about 20 years to Baddeley and Hitch,[13] or 50 years to Baddeley et al. to appreciate a more complex, though still incomplete, understanding of working memory.[14] Since 1974, when Alan Baddeley, now at the University of York in the UK, proposed his model of working memory, the model has undergone various refinements and additions, but it remains the standard reference on working memory in cognitive psychology.

Although the working memory model has evolved, three original components remain: the *phonological loop,* the *visuo-spatial sketchpad,* and a "central executive" responsible for automatic behavior and its overrides when necessary. For the executive, Baddeley later adopted the supervisory attentional system (SAS) model of Norman and Shallice.[15] The phonological loop deals mostly with verbal, oral, auditory stimuli, while the visuo-spatial sketchpad deals mostly with visually presented materials, their spatial location, and the tracking of one's movement through space. A fourth component, called the *episodic buffer,* provides an interface between different visual, verbal, and perceptual codes as well as with long-term memory (LTM). These four components together make up the working memory model (see Figure 9). In

12 Miller, "The Magical Number Seven," 81.
13 Alan D. Baddeley and Graham J. Hitch, "Working Memory," in *The Psychology of Learning and Motivation: Advances in Research and Theory* 8, ed. G. H. Bower (New York: Academic Press, 1974), 47–89.
14 Alan D. Baddeley, Michael W. Eysenck, and Michael C. Anderson, *Memory* (Hove, UK: Psychology Press, 2009), 44–58.
15 Donald A. Norman and Tim Shallice, "Attention to Action: Willed and Automatic Control of Behavior," in *Consciousness and Self-Regulation: Advances in Research and Theory,* ed. Richard J. Davidson, Gary E. Schwartz, and David Shapiro, vol. 4, no.1 (New York: Plenum Press, 1986), 1–18.

contrast to long-term memory, the working memory components are thought to provide only a temporary storage of information, within a bottleneck lasting only a few seconds.[16]

Baddeley's refinement of the working memory model into separate components has greatly expanded Miller's original understanding of this processing bottleneck. By contrast, incomplete and simplistic readings of Miller's 1956 paper have since generated many misguided and dogmatic uses of his presumed "number seven" golden rule.

In 2009, the information design guru Edward Tufte started a good-natured and highly informative thread about the implications of Miller's discovery of chunking for conveying information. The post by Tufte was labeled: "The magical number seven plus or minus two: Not relevant for design."[17] The thread quoted an earlier letter from Miller himself, confirming that his work had been subject to significant misunderstanding—especially by the billboard industry.

Tufte was right to be skeptical about mechanical rules supposedly derived from Miller's work, such as the rule of 6-6-6 from The American College of Radiology, which counsels its members in making presentations: "Use no more than six words per bullet, six bullets per image, and six word slides in a row." Participants in the discussion pointed to successful graphics that seemed to contravene Miller's apparent limitations.

But Tufte's critique is overstated. The magical constraint does apply in principle to all cognition. Miller's path-breaking work developed into one of the most informative and rewarding research programs in cognitive psychology. Its general application to the mind and its universality make it relevant, when properly applied, to all teaching and all attempts to convey information.

The key issue often missed in critical discussions concerns the issue of closure ("clause" in grammar). If the items in working memory do not gain closure and form into a meaningful unit within a span of a handful of seconds or less, then the discrete items begin falling out of memory, and new impressions intervene. The experience will then become uncertain and meaningless. But this severe limitation of working memory pertains only to the parts of an experience, not to the whole. *Anna Karenina* begins:

> Happy families are all alike; every unhappy family is
> unhappy in its own way. Everything was in confusion
> in the Oblonskys' house. The wife had discovered
> that the husband was carrying on an intrigue with a
> French girl....[18]

Note the nice, direct sentences with fast closure. Moreover, the plot line is simple, direct, and effective. So here we have a vast novel that is actually obeying Miller's strictures—which partly explains the novel's success. However, while the number of discrete items

16 Alan D. Baddeley, *Working Memory, Thought, and Action* (Oxford: Oxford University Press, 2007), 1.

17 Edward Tufte, "The Magical Number Seven, Plus or Minus Two: Not Relevant for Design," November 16, 2009, www.edwardtufte.com/bboard/q-and-a-fetch-msg?msg_id=0000U6 (accessed November 11, 2013).

18 Leo Tolstoy, *Anna Karenina,* trans. Constance Garnett (New York: Random House, 1993).

that can be held in working memory is limited, the number of discrete items in a book, whether sentences, paragraphs, or whole pages, is essentially limitless, as is the number of elements within each item, so long as readers form a unified generic context, and achieve rapid meaningful closure at every stage of their reading.

When the verbal, aural dimension of reading the text is accompanied by the physical body's interaction with the printed book, we can make more reliable and memorable chunks that we can later unpack as needed. The ability to create a mental map of a book, of both its abstract, semantic content and its three-dimensional landscape, is greatly enhanced when reading is accompanied by the spatial, tactile experience afforded by the printed page.

The spatial dimension of memory, pointed out by Baddeley in his visuo-spatial sketchpad component, might explain why, since classical times, physical space has been invoked as an aid to memory. Such was the central concept of *ars memoriae*, or art of memory, whereby imagining things inside the rooms of a house was seen as an effective way to remember these things. The pages inside a printed book would be analogous to the rooms inside a house, their contents more easily remembered by remembering in which pages they are stored.[19]

Reading a Book with All the Senses

Since digital media can provide broader and faster access to other relevant texts, nothing can replace this new ability to carry huge amounts of data on one's tablet—which is well to keep always at hand. But traveling through hypertext is just as distracting as putting down a book to consult a data source.

Some concessions to virtuality must be made: Flight simulators and video games show that in learning and entertainment, reality and virtual reality can reasonably be interchangeable. Further, if the task is very specific, such as quickly consulting a manual of procedures, gaining quick access to searchable digital media has obvious advantages. Consider, for example, the new digital flight manuals stored on iPads, which are replacing printed flight manuals in the airline industry.

But what changes if the content is a story or an essay, rather than a procedure, and the reading context is a classroom or a living room, rather than an airplane cockpit? In these contexts, a printed book can stimulate the spatial and kinesthetic areas of working memory through the tactile interaction needed to move through the pages. In this process, chunking helps in remembering through the use of both the verbal and the spatial components of working memory.

Experiments by Baddeley and others have shown not only that the visual and the verbal constitute separable systems in the working memory process, but also that the visual, spatial component can be divided into storage of spatial location and storage of

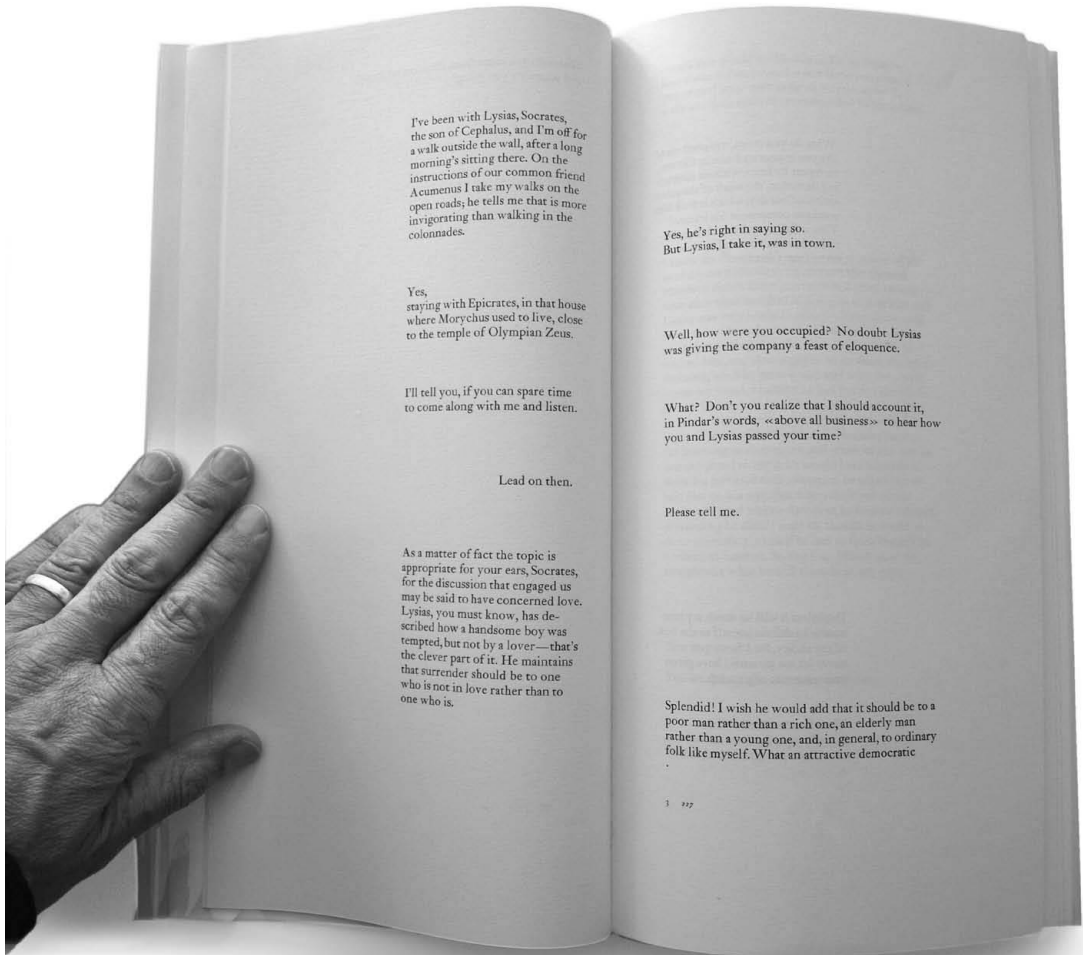19   Frances A. Yates, *The Art of Memory* (Chicago: The University of Chicago Press, 1966).

Figure 10
The Greenwood Press's *Phaedrus.* The section shown (Phaedrus 227a-d) is from the beginning of the dialogue. Author's photo, reproduced courtesy of The Greenwood Press.

20 Baddeley, *Working Memory, Thought, and Action,* 77–78.
21 Beverly Weiser and Patricia Mathes, "Using Encoding Instruction to Improve the Reading and Spelling Performances of Elementary Students at Risk for Literacy Difficulties: A Best-Evidence Synthesis," *Review of Educational Research* 81 (2011): 170–200.
22 Jack W. Stauffacher, *The Search for the Typographic Form of Plato's Phaedrus* (San Francisco: The Greenwood Press, 1978), 12.
23 Jack W. Stauffacher, *Phaedrus: A Dialog by Plato,* trans. Reginald Hackforth (San Francisco: The Greenwood Press, 1977).

movement through space—kinesthesia.[20] For this reason, teachers use so-called manipulatives to increase memory retention and awareness of the graphic representation of phonemes and their sound equivalent. In 2011 Weiser and Mathes showed that students at risk for literacy difficulties who received encoding instructions using letter tiles and plastic letters outperformed control groups whose members did not receive such instruction.[21]

The Phaedrus
In August 1974 the typographer and printer Jack Stauffacher wrote to his former student, Charles Bigelow, that *"Phaedrus* is no longer in my hands. The content is slowly shaping everything...." The passage, recorded in *The Search for the Typographic Form of Plato's Phaedrus,*[22] marks the turning point in a quest lasting from 1972 to 1977, when the Greenwood Press announced the publication of a limited edition of *Phaedrus: A Dialogue by Plato.*[23] Handset and printed by Jim Faris on a 15-inch Vandercook proofing press, the book provides a unique reading experience and a rare communion between author, characters in the story, book designer, and reader.

Figure 11
The speakers-and-reader relationship in Stauffacher's *Phaedrus,* with a schematic diagram of a section from the beginning of the dialogue (Phaedrus 227a-d). Author's photo illustration. Photo courtesy of The Greenwood Press.
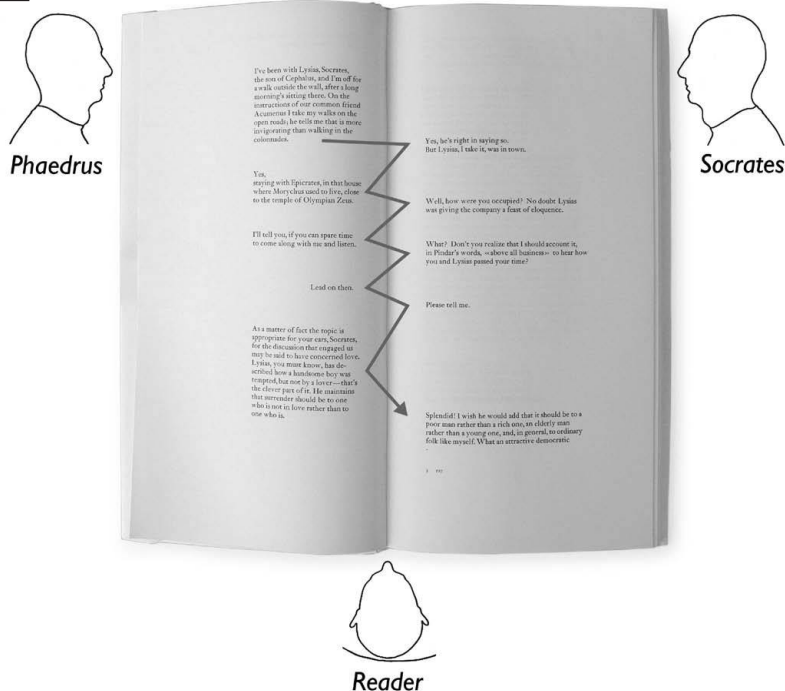
With a radical layout that challenges traditional typography and book design, Stauffacher's *Phaedrus* is perhaps a limiting case of the intersection and interaction between all those figures—a case in which normal reading might seem to be temporarily put on hold. The layout confines each speaker in the dialogue to his own inviolable left or right page, where the voices of Phaedrus and Socrates are crystallized in text blocks forbidden to meet each other across the spine (see Figure 10).

As in the setting of the dialog, the two voices walk alongside each other, but their speaking bodies remain distinct, and only the reader is allowed to cross the invisible fence that separates them. But whereas a fence suggests isolation—Socrates notes that written words keep repeating to the reader the same thing over and over[24]—here the separation takes editorial advantage of saccades, or the quick movement of the eyes during "exploration and fixation."[25]

Our eyes are constantly moving, and in reading they jump forward in small saccades along each line of text,[26] jumping backward occasionally and at every line change—a necessary regression. But in Stauffacher's *Phaedrus,* these longer saccades punctuate the back-and-forth of the two voices, reinforcing meaning through spatial movement and spatial location. In the *Phaedrus,* a large saccade might cover a distance twice as long as in a normal text, but in every case, the eye is sent back to the fixed left or right location of each speaker, which is never violated. As the reader looks on, Phaedrus and Socrates take turns at speaking, the line of talking between them bending and zigzagging down the page and crisscrossing the reader's field of vision (see Figure 11). Thus, the reader

24 Reginald Hackforth, *Plato's Phaedrus – Translated with an Introduction and Commentary by R. Hackforth* (Cambridge: Cambridge University Press, 1952), 275d.

25 Susana Martinez-Conde, "Vision Is All About Change," *The New York Times,* May 17, 2013, www.nytimes.com/ 2013/05/19/opinion/sunday/vision-is-all-about-change.html (accessed March 21, 2014).

26 Jost Hochuli, *Detail in Typography* (London: Hyphen Press, 2008), 8–9.

Figure 12

In Stauffacher's final typographic format, when Phaedrus listens to Socrates, Phaedrus's long pauses fill the left pages as effectively as Socrates's long speeches fill the right pages. The sections shown above are, on the left, Phaedrus 274c–275b, and on the right, Phaedrus 255e–256e.

imbues the left page with Phaedrus's character and the right page with Socrates's, efficiently forgetting that at every turn the two are but the two sides of the same coin.

The left page *is* Phaedrus, even when he speaks very little or is completely silent, with only white space left to face the right page, Socrates. Each double page fixes the dialog into a series of geographic plates—an Atlas where the spine runs North to South, where Socrates is to the East while Phaedrus is to the West (see Figure 12).

"Camerado, this is no book,/Who touches this touches a man,/..."[27] The layout of *Phaedrus* invites the reader to be a part of the conversation—an extreme but telling example of the reasons the printed book has shown surprising resilience in the digital era. The physical, fixed sequence allows for easier memorization, recall, and re-visiting—all important characteristics for fixing meaning in long-term memory and remembering it. Students might prefer physical textbooks to digital ones, even in this late era,[28] for just this reason: In tacit acknowledgement of this paper's argument, they recognize that every advantage for enhancing comprehension and memory is precious!

Acknowledgement

27 Walt Whitman, *Leaves of Grass,* Modern Library Edition (New York: Random House, 1993), 620.

28 Tvissha Goel, "Back to the Basics: Studies Show Students Prefer Physical Textbooks," *USA Today,* September 19, 2013. www.college.usatoday.com/2013/09/19/back-to-the-basics-studies-show-students-prefer-physical-textbooks/ (accessed April 26, 2015).

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