PRAISE FOR *THE READING MIND*

"Daniel Willingham pulls back the curtain on the fascinating process of reading, explaining the discoveries of cognitive science in clear, accessible prose. For the many fans of *Why Don't Students Like School*, Willingham's new book offers more of the rigorous yet enjoyable science writing we love."

—**Annie Murphy Paul**, author of *The Brilliant Blog*

"This is a superb book. Willingham's ability to make cognitive research on reading coherent and comprehensible is exceptional. I wish that it had been available when I taught courses about research on reading to education doctoral students. This book should be standard fare in every doctoral education course on reading."

—**Isabel L. Beck**, professor emerita, School of Education, University of Pittsburgh

"What goes on in the mind as we read? How do people learn to read? What motivates some to read more than others? Does reading online differ from reading books? For those curious about these questions, and for those who care about children learning to read and growing as readers, this delightful, easy-to-read book explains this highly complex topic through fascinating studies and lively examples. With probing questions after each chapter, *The Reading Mind* will make a terrific book club read or textbook."

—**Ellen McIntyre**, dean and professor, College of Education, University of North Carolina, Charlotte

"This is the book we've been waiting for. Willingham captures the magic of reading while simultaneously demystifying how we read. He brings key experimental findings to light as he takes us on the journey from recognizing individual words to constructing meaning from text. Beautifully written, clear and accessible, yet still embracing complexities rather than shying away from them—this book is essential reading for anyone interested in how we read."

—**Kate Nation**, professor of Experimental Psychology, University of Oxford; fellow and tutor in Psychology, St. John's College

"Yet again, Daniel Willingham proves himself genius extraordinaire at translating research to practice! At once a brilliant tutorial on how the bitwise investigations of the research lab have evolved into the ever more powerful and comprehensive models that now dominate cognitive science, and a blueprint for educational excellence, this book is a must for educational practitioners, policymakers, and students. No more top-down

THE READING MIND

A Cognitive Approach to Understanding How the Mind Reads

DANIEL T. WILLINGHAM

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THE READING MIND

Introduction

The Chicken Milanese Problem

Agenda for the Introduction

To consider the question "how does the mind read?" More specifically, to understand why it is a terrible scientific question, and why we pose it anyway.

Picture this commonplace scene. I was on an airplane, reading E. L. Doctorow's *Billy Bathgate* on my Kindle. The following passage is found near the end of the book, and when I read it, I softly gasped.

Before he got through it I was hearing the distant sound of police sirens, and it was so arduous for him to speak it that he died of the effort: "Right," he said. "Three three. Left twice. Two seven. Right twice. Three three."[1]

My goal in this book is to account for what happened in the few moments it took me to read those 43 words.

The environment held nothing more remarkable than black marks on a white screen, yet somehow I was mentally transported to another world, indeed, to a world quite alien to me: New York City some 30 years before my birth, populated by gangsters. How does the mind create a mental world from black marks? And why would I care enough about Otto "Abbadabba" Berman—a real-life gangster portrayed sympathetically in this novel—to gasp when he's murdered?

The approach I'll take to answering these questions is cognitive. I'll describe what the mind is doing as we read, but I'll seldom consider what

the brain is doing. That may sound shortsighted (the mind is, after all, what the brain does), but it's a common scientific approach taken over the last fifty years. Computer science offers an analogy. You can describe the steps of a calculation—say, figuring out the date of the next lunar eclipse viewable in Toronto—without describing what's happening in the electronic guts of the computer during this calculation. In the same way, I'm going to describe the steps by which your mind reads without specifying how the brain carries out those steps.

Cognitive psychologists commonly tackle large, daunting questions by breaking them down into smaller, more manageable questions. We do that by thinking through what *had* to happen in order for some bit of mental work to get done.

What had to happen between my seeing the letters on the screen and my emotional reaction to the events in an imagined world? I had to see the letters and identify them. I had to assemble the letters into words, and then the words into sentences, which I comprehended by applying grammatical rules. My emotional reaction entails not just comprehension, but memory. "He died of the effort" prompts pity only if you feel like you know Berman. So over the course of the novel I must have built and updated a sort of personality picture of this character. And of course memory is needed to organize the sequence of events into a coherent sense of the plot.

So, will this skeletal outline of what happened as I read *Billy Bathgate* serve as a starting point for a theory of reading?

How Do You Make Chicken Milanese?

Even my crude analysis shows that "what happens when we read?" is a bad scientific question, the type of question psychologists usually don't pose. Why? Think of all the millions of activities your mind can direct: you can guess the cost of a paperweight you see in an antique store, ride a child's tricycle for comic effect, make Chicken Milanese, invent a plausible excuse for missing your neighbor's son's middle school play, and so on. For each of these we might pose the question "What's happening in the mind when you do that?" But scientists don't. The reasons that scientists don't ask how you cook Chicken Milanese inform what I've included and excluded in this book, so it's worth describing these reasons in some detail.

The first reason is that task descriptions are not quite as simple as I've made out. I said "let's consider what had to happen" as I read that passage from *Billy Bathgate,* and then I said something like "you have to perceive the letters, and understand the words," and so on. The history of psychology shows that it's easy to be fooled when you try to describe a task.

Here's a simple example. When we read it feels as if we move our eyes smoothly—we sweep from the start of a line to the end, and then snap back to the far left of the page for the next line. That impression is easily disconfirmed by watching the eyes of another person as she reads. Her eyes don't move smoothly, but instead jump from one spot to the next, usually a distance of seven to nine letters.[2] That's so easily observed it's probably been known for centuries. But even that observation—jumping movements, not smooth tracking—is an incomplete description. In fact, your eyes are not always pointing at the same letter when you read.[3] About half the time each eye looks at a different letter. They may even be slightly crossed.

The implications of this fact for an understanding of reading are not obvious. I raise the issue to point out that researchers have been working at an account of reading for over a century, and they are still finding ways of improving their description of *what's actually happening* when someone reads—not how they do it, but what they are doing. That's one reason psychologists usually don't try to explain really complicated behaviors. They figure that they probably shouldn't be confident they can adequately describe what they are explaining.

Suppose we give up on the idea that we'll have a perfect description of what people actually do during a complicated task, and we decide to settle for a provisional description. That's not a bad strategy—as we learn more, our description of the task will improve. One thing we're pretty confident about is that a complex task will require many different cognitive processes. My off-the-top-of-the-head analysis of reading called for vision, memory, grammatical analysis, language comprehension, and emotion. Any one of these mental processes is known to be terribly complicated.

Consider seeing letters. One challenge is that letters can take on quite different appearances, varying in size, typeface, and typographical emphasis (bold, italic, etc.) (Figure I.1). How does my visual system treat these very different-looking objects as equivalent?

Let's Do It Anyway

I've discussed two reasons psychologists don't pose questions like "how do people cook Chicken Milanese?" or "how do people read?" First, because the task is complex we suspect we'd botch our description of what people are doing as they attempt it, so our theory of the mental events underlying the task would be wrong from the start. Second, the complexity of the task suggests it calls on many mental processes, and a theory of how the mind achieves the task may be too ambitious.

But reading differs from cooking Chicken Milanese in an important way: it matters. Reading matters in our day-to-day affairs, in our culture, in our economy, in our civic lives, in the arts, and so on. There are stakes attached to people reading well or poorly (Figure I.4). It's true that psychologists seldom try to account for really complex tasks, but they make an exception for reading, as well as a handful of other consequential tasks, like driving a car.

Still, the Chicken Milanese problems are real, so we need to deal with them as best we can. What can we do about the task description problem? What if we're trying to account for how people read but we're getting wrong what *reading* really means, just as people used to get wrong the bit about eye movements during reading? The brute truth is that there's no solution. That's the nature of science, and the best we can do is keep the possibility in mind, and try to be clear-eyed when we describe the process of reading. Thus, in this book I'll devote a lot of energy to analyzing the task of reading.

How about the complexity problem, the fact that there are so many processes required to read? Here, we must accept that our account of reading will be incomplete. We can't fully describe how people identify letters, how they separate objects from background, and all the rest. So the question is, what will we try to explain, and what will we disregard?

We might say to ourselves "well, we don't need to explain how people separate letters from background because that's not really a reading process. It's a process for all of vision, and you happen to use it when you read. So let's set the goal of accounting for the reading stuff, and we'll leave the more general-purpose thinking processes for someone else to figure out." That won't work, because all of the mental machinery that

Figure I.4. Medicine packaging. Literate people likely do not notice how frequently they rely on the ability to read. Here I've blurred the print on medicine packaging to help you imagine being unable to read, and trying to select a medicine for your child's sore throat, perhaps by attempting to match packaging with your memory of television commercials.

supports reading is borrowed. Reading is less than 6,000 years old; that's precious little time for any reading-specific thinking processes to have evolved, and there's not much evidence that any have. The mental processes that contribute to reading evolved for another purpose, and we co-opt them for the act of reading.

A better principle will be for us to ignore the mental processes that don't vary much from person to person. Separating objects from background is a good example. Yes, it's a complicated, mysterious process, but somehow anyone with typical vision does it. Crucial to our purposes,

when people struggle to read it's not due to a failure of this process. And strong readers are no better than average readers in separating objects from background. So although this process is indispensable for reading it's not the first thing we want to explain.

Researchers do know something about the mental differences between strong and weak readers. A strong reader has a broad vocabulary, and would know the meaning of the word "arduous" in the *Billy Bathgate* passage. A strong reader would comprehend that Berman is telling Billy the combination to a safe, even though the safe goes unmentioned in the passage. Come to that, we'd guess that a strong reader would be reading in the first place, on a plane, when he could be playing a game on his phone, watching a movie, or sleeping. These factors—broad vocabulary, good comprehension skills, motivation—are quite commonsensical. Accounting for them will get more interesting when we start to engage in task analysis, as I promised we would. What are the differences in personality or attitudes between the people on an airplane who choose to read and those who don't? Is reading from a Kindle different than reading from paper? How can you make sense of a passage that depends on your knowledge of combination safes, but doesn't mention a combination safe?

The Plan of the Book

I've emphasized the complexity of reading. We will therefore take it one step at a time, starting from the ground floor, so to speak: how readers see letters, then moving on to how they see words, then sentences, and so on, with one chapter devoted to each topic. In keeping with the emphasis on close analysis of the task, each chapter frames an aspect of reading as a problem: how is *this* bit of mental work accomplished?

That emphasis on task analysis will also prompt us to begin not with reading, but with writing (Chapter 1). Considering its purpose will help us better appreciate what readers actually do when they read letters and words (Chapters 2 and 3). From there we can consider word meaning (Chapter 4), and the comprehension of sentences and paragraphs (Chapter 5). Having this understanding of the process of reading will prepare us to consider why people might be motivated to read—or not (Chapter 6). Finally, we'll consider the possibility that digital technologies should

prompt us to rethink everything we know about reading, as they have so radically changed other aspects of our lives (Chapter 7).

Before we plunge into this content, let me draw your attention to two limitations of the topics covered. First, this book is offered as a summary of one scientific approach to the study of reading—namely, the cognitive approach. That's not the only scientific perspective on reading. Another scientific literature employs the sociocultural view, which emphasizes the role of the social environment in reading; what you read, how often you read, your interpretation of what you read, and your thoughts and beliefs about reading are all influenced by the people around you and your relationship to them. The cognitive approach is not in opposition to this view; it's just different. As you'll see over the course of the book, it is more concerned with picking apart the mind of the reading individual. It's no accident that I titled the book *The Reading Mind*, and not *The Science of Reading*.

The second limitation of this book is that it's not about how people learn to read. I aim to describe how an experienced reader reads, not how a novice learns. That said, a great deal of reading research has been conducted with novice readers, and some it will be relevant to our purpose. I'll flag these studies when I refer to them, to help keep clear in your mind the difference between the mind of the expert reader and the mind of the learner.

Although this book is not offered as a summary of the learning-to-read research, some of the conclusions drawn may be applicable to education. However, these implications must be drawn with caution. This book is based on basic science, and basic science seeks to describe the world as it is; in this case, to describe the mind of a reader. Education is not a basic science, but an applied science. Applied sciences do not seek to describe the world as it is, but rather to change the world, to make it more like some ideal vision of what the world ought to be like. In the case of reading education the "change" is the transformation of people who cannot read into readers.

Applying findings from basic science to that effort is not straightforward.[4] For example, many of the studies I'll cite were conducted with experienced readers, and their reading may be different than that of those learning to read. In addition, many studies deal with one, isolated aspect

of reading—how we know the meaning of a word, for example, or how we read a misspelled word in the middle of a text. But when we consider reading education, we can't think about aspects of reading in isolation. Doing so entails the risk that we'll change instruction to improve one aspect of reading and unwittingly worsen another aspect. To provide an obvious example, long practice sessions studying letter-sound relationships may help improve decoding, but it may also prompt a decline in reading motivation. With these cautions in mind, I will offer some thoughts at the end of each chapter as to conclusions that scientists can offer that might be useful to practitioners.

But I'm getting ahead of myself. Before we contemplate how the science of reading can be useful to educators, let's review some of the science of reading. True to our commitment to examine carefully what a task really entails, we will begin our analysis not with the reading mind, but with the alphabet.

1

On Your Marks

Agenda for Chapter 1

To understand the purpose of reading. Before trying to understand how it works, it's useful to be clear on what the product of reading is—that is, what the act of reading accomplishes.

In the Introduction we began our analysis of some of the mental processes that are used to read. For example, we said, "well, somehow you've got to recognize the letters on the page, and then figure out what word those letters signify." That seems clear enough, but it will help if we back up a step and consider what reading is *for*. Cognitive psychologists often begin their study of a mental process by trying to understand the "why" before they tackle the "how."

Visual scientist David Marr is often credited with this idea because he emphasized its importance in such a clear way, via this example.[1] Suppose you want to know the mechanism inside a cash register, but you aren't allowed to tear it open. That's akin to being a psychologist trying to understand how the mind reads; you want to describe how something works, but you can't look inside. If we watched a cash register in operation, we might say things like "when a button is pushed, there's a beeping sound," and "sometimes a drawer opens and the operator puts in cash or takes some out, or both," and so on. Fine, but what's the purpose of the beeps and the drawer? What's the goal here?

If we watched the cash register in operation and paid attention to function (not just what we're seeing), we might make observations like *the order of purchases doesn't affect the total*, and *if you buy something and then*

Table 1.1. Watching a cash register. Observations of a cash register might lead to basic principles of arithmetic.

Observation	Arithmetic expression	Principle
The order of purchases doesn't affect the total	A + B + C = A + C + B = B + A + C, etc.	Commutativity
If you buy something, and then return it, you end up the same amount of money you started with	X – Y + Y = X	Negative numbers
If you pay for items individually or all at once, the cost is the same	(A) + (B) + (C) = (A + B + C)	Associativity

return it, you end up with the same amount of money, and *if you pay for items individually or all at once, the cost is the same*. A sharp observer might derive some basic principles of arithmetic, as shown in Table 1.1.

Knowing that the purpose of a cash register is to implement principles of arithmetic puts our earlier observations—keys to be pushed, numerals displayed—in a different perspective. We know what these components of cash register operation contribute to.

Let's try that idea with reading. What is reading for? We read in order to understand thoughts: either someone else's thoughts, or our own thoughts from the past. That characterization of the function of reading highlights that another mental act had to precede it: the mental act of writing. So perhaps we should begin by thinking about the function of writing. I think *I need milk*, I write that thought on a note to myself, and later I read what I've written and I recover the thought again: *I need milk*. Writing is an extension of memory.

Researchers believe that this memory function was likely the impetus for the invention of writing. Writing was invented on at least three separate occasions: about 5,300 years ago in Mesopotamia, 3,400 years ago in China, and 2,700 years ago in Mesoamerica.[2] In each case, it is probable that writing began as an accounting system. It was needed to

keep records about grain storage, property boundaries, taxation, and other legal matters. Writing is more objective than memory—if you and I disagree about how much money I owe you, it's helpful to have a written record. Writing not only extends memory, it expands it. Creating new memories takes effort. It's much easier to create new written records.

Writing also serves a second, perhaps more consequential function: writing is an extension of speech. Speech allows the transmission of thought. The ability to communicate confers an enormous advantage because it allows me to benefit from your experience rather than having to learn something myself. Much better if you were to tell me to stay out of the river because the current is dangerous than for me to learn that through direct experience. Writing represents a qualitative leap over and above speech in terms of the opportunity it creates for sharing knowledge. Speech requires that speaker and listener be in the same place at the same time. Writing does not. Speech is ephemeral but writing is (in principle) permanent. Speech occurs in just one place, but writing is portable.

Frances Bacon wrote "Knowledge is power" in 1597, presumably after entertaining this thought. When I read his words, I think what Bacon thought, separated in time and space by more than 400 years and 3,500 miles. As poet James Russell Lowell put it, "books are the bees which carry the quickening pollen from one to another mind."[3]

Let me remind you of the point of this discussion. We're trying to describe the function of writing as an entrée into our discussion of the mental process of reading. I'm suggesting that writing is meant to preserve one's own thoughts, and to transmit thoughts to others. So now we must ask, "how is writing designed, such that it enables the transmission of thoughts?"

How Writing Might Work

Suppose that we live in a culture without writing, and we encounter a need to transmit thoughts to others who are not present. What method of written communication would seem the most natural? Probably the drawing of pictures. For example, suppose I know that an especially aggressive ram frequents a particular place. I want to warn others, so I incise the image of a ram in a rock wall near where I've seen it before (Figure 1.1).

Figure 1.1. A pictograph of a ram.
Photo by David~O, Flickr, used under CC BY

The drawing I've made is called a pictograph, a picture that carries meaning. Pictographs have real functional advantages. Writing them requires no training, and they are readily interpretable; no one is illiterate when it comes to pictographs. But pictographs do have serious drawbacks. First, their very advantage—they are readily interpreted without study—also brings a disadvantage—they are open to misinterpretation (Figure 1.2). My intended warning may be taken to mean *Hey, there are lots of rams around here—good place to hunt!*

Another problem is that some thoughts I want to communicate do not lend themselves to pictographs. The ram image would have been less ambiguous if I had put a picture representing ***danger*** next to it . . . but what image would represent ***danger***? Or ***genius***? Or possessives like ***mine*** or ***his***? (When I want to signify a mental concept, that is, an idea someone is having, I'll use ***bold italics***).

The problem brings to mind the story Herodotus tells in *The Histories* concerning the fifth-century BC conflict between the Persians and Scythians.[4] The king of the Scythians sent the king of the Persians a mouse, a frog, a bird, and some arrows. What could such a message mean? The Persian King thought it was a message of capitulation: ***we surrender our land*** (mouse), ***water*** (frog), ***horses*** (which are swift like birds), and ***military***

Figure 1.2. The ambiguity of pictographs. The Korean highway sign offers fairly unambiguous pictographs: food, gas, auto repair. Some jokester has added text to the pictographs on the bathroom hand drier showing that they are ambiguous, even if the alternative interpretation is improbable.

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power (arrows). One of his advisors disagreed, saying the message meant ***unless you can fly into the air*** (like a bird), ***hide in the ground*** (like a mouse), ***or hide in the water*** (like a frog), ***you will die from our arrows.*** The image of an object might represent the object itself, but when we use it to represent anything else, it is subject to misinterpretation. Pictographs won't do. (By the way, the Persian King was wrong; the Scythians attacked.)

I might turn instead to *logographs*—images that need not look like what they are intended to represent. For example, I could represent the idea ***mine*** by, say, a circle with a square inscribed within. I've sacrificed the immediate legibility of pictographs—you need some training to read the writing now. But I've gained specificity and I've gained flexibility. I can represent abstract ideas like ***danger*** and ***mine*** and ***surrender***.

But this solution carries a substantial disadvantage. I have introduced the requirement that the writer (and the reader) have some training. They have to memorize the abstract symbols. Educated adults know at least 50,000 words, and memorizing 50,000 symbols is no small job. We could find ways to reduce the burden, for example, by creating logographs so that words with similar meanings could be matched to similar-looking symbols, but we're still looking at a heavy burden of learning.

Furthermore, we are overlooking an enormous amount of vital grammatical machinery that conveys meaning. When we think about

Notice that I've depicted the sound of words and the meaning of words as separate, but linked. How do we know they are separate? Maybe they are different aspects of a single entity in the mind, like a dictionary entry, which gives you the definition of the word and the pronunciation.

A lot of technical experiments indicate that sound and meaning are separate in the mind, but everyday examples will probably be enough to make this idea clear. We know meaning and sound are separate because you can know one without the other. For example, suppose you use the word **quotidian**. The word might sound familiar to me—I know I've heard it before—even if I don't know the meaning. The familiarity suggests I have some sound-based representation of the word; it's not like you said **pleeky**, about which I might think ***that certainly could be a word, but it's not one I've ever heard***. The opposite situation is also possible; there's a concept with which you're familiar, but you have no word associated with it. For example, everyone knows that ***people have a crease above their lips and below their nose***, but few people have a memory entry for the sound of the word naming this anatomic feature, the **philtrum**.

We also know that sound and meaning are located in separate parts of the brain. Brain damage can compromise one without much affecting the other. Damage to part of the brain toward the front and on the left side can result in terrible difficulty in finding words; the patient knows what she wants to say but cannot remember the words to express it.[7] It's the same feeling you have when you feel a word is on the tip of your tongue; you're trying to think of the name of the ***Pennsylvania Dutch breakfast food made with ground pork and cornmeal***, and you *know* it's in your memory somewhere, you just can't quite find it.

But of course, most of the time, you *can* find it. If that word is in your memory, my providing the definition is very likely to make the sound of the word (**scrapple**) come to mind. And conversely, if someone says a word you know—**market**, for example—you automatically think of the word's meaning. So these mental representations—the sound and the meaning of a word—are separate, but linked; and the link is typically strong and works reliably.

Reading, then, will build on this existing relationship between sound and meaning. It will entail adding some translation process from letters to

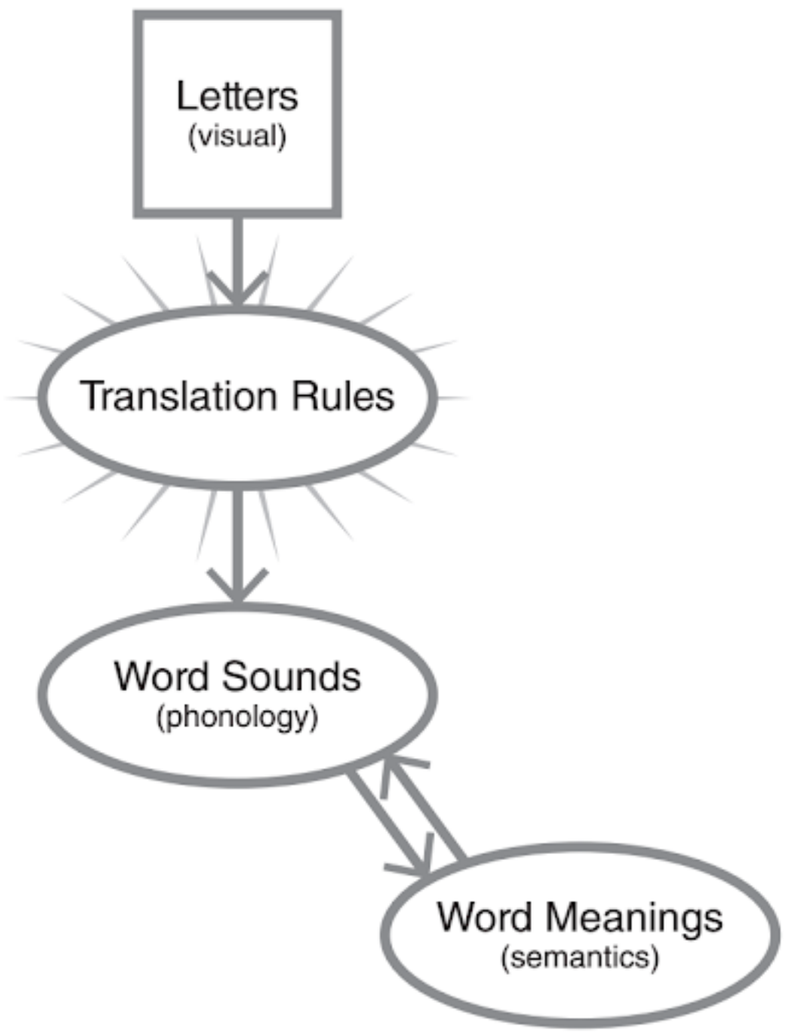

Figure 1.5. Letters, translation rules, sound, and meaning.
© Daniel Willingham

the sound representations, which already have a robust association with meaning (Figure 1.5).

It's all very nice to say, "we'll code sound instead of meaning," but it's not obvious how to do so. An architect of writing might first think of coding syllables because they are pretty easy for adults to distinguish. People can hear that **daddy** has two sounds: **da** and **dee**. So we create a symbol for **da**, another symbol for **dee**, one for **ka**, another for **ko**, and so on. There are some languages—Cherokee, for example, and Japanese kana—that use that strategy. But in English (and indeed, in most languages), there would still be a memorization problem. Spoken Japanese uses a relatively small number of syllables—fewer than 50. English has over 1,000! That's many fewer than the 50,000 symbols we were speculating that a logographic system might require, but it's still a lot of memorization.

Instead of syllables, English uses an alphabetic system. That means each symbol corresponds to a speech sound, also called a *phoneme*. There are about 44 phonemes in English (Figure 1.6).

Now the memorization problem seems manageable—just 44 sounds and 26 letters! That's nothing!

I hope it is now clear to you why we took this side trip through an analysis of writing. Our initial question was "how does the mind read

VOWELS	
IPA	**Examples**
ʌ	pup, luck
a:	arm, father
æ	bat, black
ə	away, cinema
e	set, bed
3:	burn, learn
ɪ	ship, sitting
i:	three, heat
ɒ	pot, rock
ɔ:	mall, four
ʊ	book, could
u:	true, food
aɪ	hive, eye
aʊ	cow, out
əʊ	so, home
eə	there, air
eɪ	play, eight
ɪə	fear, here
ɔɪ	toy, join
ʊə	cure, tourist

CONSONANTS	
IPA	**Examples**
b	ball, lab
d	door, lady
f	fix, if
g	gas, flag
h	hot, hello
j	yet, yellow
k	cap, back
l	light, little
m	my, lemon
n	no, ten
ŋ	bring, finger
p	pat, map
r	ring, try
s	say, miss
ʃ	shut, crash
t	tee, getting
tʃ	chime, church
θ	thing, both
ð	that, mother
v	voice, five
w	wig, window
z	zoo, lazy
3	measure, vision
dʒ	jet, large

Figure 1.6. The phonemes used in American English. IPA stands for International Phonetic Alphabet.

words?" Our analysis of writing gives us a much better idea of what "reading words" will actually involve. First, we must be able to visually distinguish one letter from another, to differentiate "b" from "p," for example. Second, because writing codes sound, we must be able to hear the difference between **bump** and **pump**. Actually, it's not enough to be able to hear that they are different words. We must be able to describe that difference, to say that one word begins with the sound corresponding to the letter "b" and the other begins with the sound corresponding to the letter "p." Third, we must know the mapping between the visual and auditory components, that is, how they match up. Reading brings challenges in all three processes, and we'll consider them in the next chapter.

Summary and Implications

Summary

- We consider the purpose of cognitive activities (like reading) because it's easier to think about the smaller-scale pieces of this activity if you know the larger goal to which they contribute.
- The purpose of reading is the communication of thought across time and space.
- Communicating thought directly into symbols would be impractical because it would require a lot of memorization, but a bigger obstacle is that we'd have to figure out how to represent grammar.
- Instead of writing down thoughts, we write down oral language. Writing codes sound.

Implications

- The fact that writing codes spoken language should lead us to expect that reading ability in adults will be closely related to their ability to understand spoken language. It is.[8] There is a strong relationship between oral comprehension and reading comprehension among people who can decode fluently. If you can't follow a complicated written argument, for example, you wouldn't be able to follow the argument if someone read it to you.
- The fact that writing codes spoken language should also lead us to expect that explicit teaching of that code will be an important part of learning to read. It is.[9] The amount of explicit instruction children need in the code varies, depending on other aspects of their oral language, but for some children this explicit instruction is vital.
- The fact that our writing system does not use many logographs indicates it would be a bad plan to treat words as though they are logographs—in other words, to teach children to focus on what words look like, rather than the sound they code. (The exception would be irregularly pronounced words that are very common, e.g., "be," and "have.")

Discussion Questions

1. Sometimes a tool can be developed for one purpose but then used for another purpose. Are there purposes other than "transmit thoughts" to which writing is put?
2. I said that one of the disadvantages of a logographic writing system is that reading and writing would require the memorization of a lot of symbols. Suppose we did use a logographic writing system. What would this change mean for schooling, and more broadly for society? Would different people be literate?
3. Consider the popularity of one type of logograph, the emoji. Their ubiquity, along with the fact that *all* writing systems use at least some logographs, suggests that there may be something that logographs communicate well that an alphabetic system does not capture well. What might that be?
4. Language is meant to transmit thoughts and it usually seems to serve that purpose well. Email messages, however, seem especially prone to misinterpretation. What tends to go wrong with email messages and why might that be?
5. I claimed that writing captures thoughts through oral language—you write what you say. But some types of communication seem to be closer to "what we say" than others. The writing in text messages, for example, is closer to the way I would speak to the person who will read it than, say, a letter I would write out. Should this matter to our characterization of what writing is?

References

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Sound It Out

Agenda for Chapter 2

We've concluded that our alphabet codes spoken language. Being able to read means being able to decode writing to recover speech. The particulars of that task depend on the language represented (English) and the alphabet used to code it (the Roman alphabet). This chapter describes the particulars of the code used by English readers.

In Chapter 1 we concluded that writing is meant to preserve and communicate thoughts, but does so indirectly. It's a workaround, a cheat, because it doesn't communicate thought, it communicates the sound of spoken language. That means reading what someone has written requires three things. You need to be able to differentiate one symbol (i.e., letter) from another. You must be able to differentiate one sound from another, to hear the difference between **b** and **p**. And you must know what sound a letter or group of letters is associated with. Those challenges exist for experienced readers, but they are easiest to appreciate when they are fresh. So in this chapter I will use many examples of studies that have examined children learning to read.

Challenge 1: The Letters

If you were inventing an alphabet from scratch, how would you design the letters? I've just prompted you to think that it might be wise to create letters that would be easy to distinguish, so readers would not confuse them. Then again, it might be helpful to create letters that are easy to draw, for the sake of writers. That's logical enough, but alphabets respect neither principle.