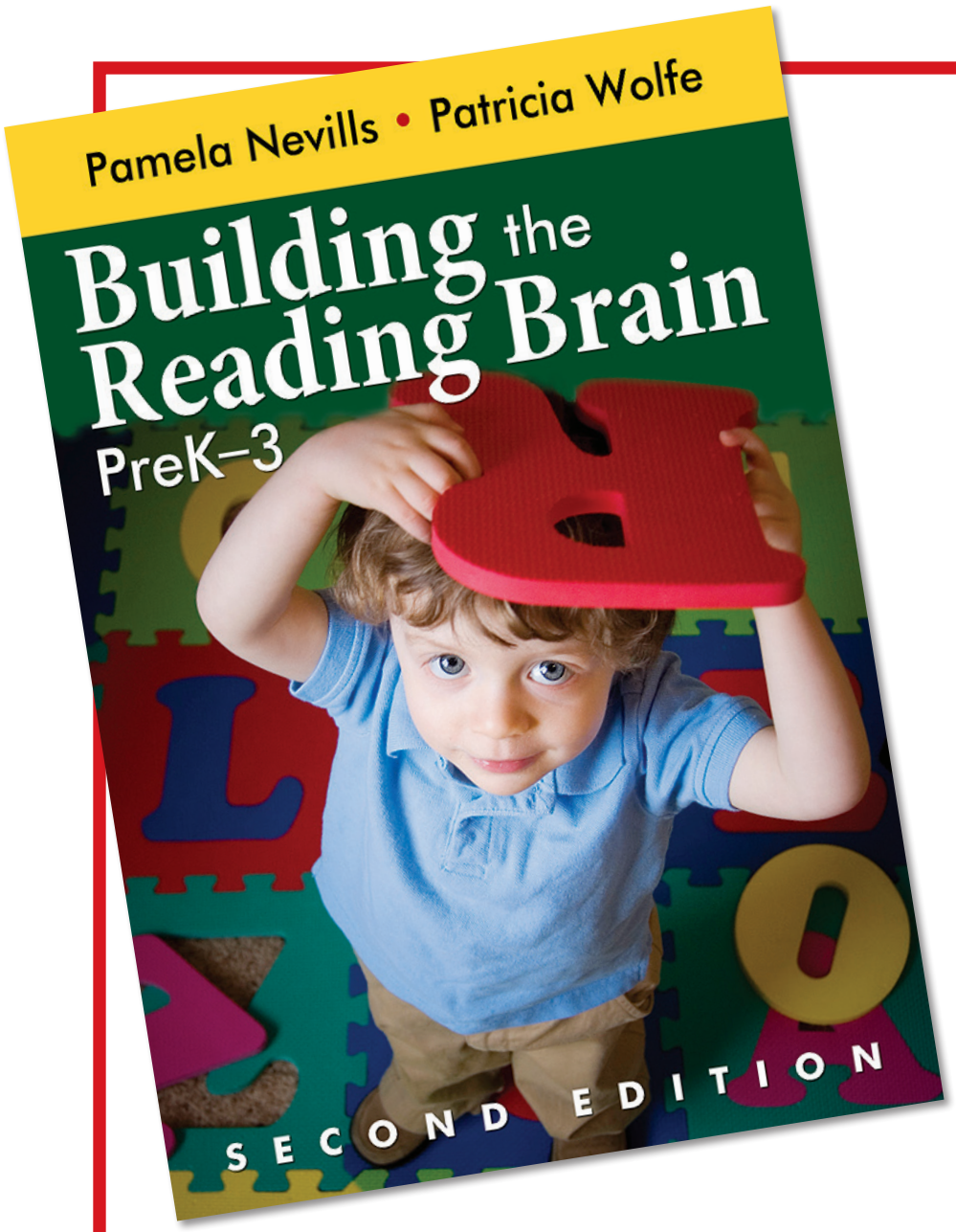

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determination to learn more about how children become proficient readers.

Lack of skill in reading also has a potent effect in other areas. Surveys of adolescents and young adults with criminal records indicate that at least half have reading difficulties. Some states actually predict their future need for prisons by fourth-grade reading failure rates (Lyon, 2001). Similarly, a high percentage of youth with a history of substance abuse have learning difficulties (National Center on Addiction and Substance Abuse at Columbia University, 2006).

An increasing proportion of children are labeled "learning disabled," with most being identified because of difficulties in learning to read. There are those who believe the special education population in our schools could be reduced significantly by giving more attention to early interventions designed to prevent reading problems (Kotulak, 1997). Although placement in special education programs for students with learning disabilities peaked in 1999 with a nationwide enrollment of 6 percent, there has been a slight downward trend recorded in 2002 of 5.9 percent and in 2003 of 5.8 percent (National Center for Educational Statistics, 2007). In spite of a possible downward trend in enrollment, there have not been significant gains in reading on national tests for fourth or eighth graders who are enrolled in special education programs (NAEP, 2007).

WHY LEARNING TO READ IS SO DIFFICULT

Our biological destiny is speaking, not reading. Speaking is a natural development; reading is an unnatural act. This means that almost every child will master speech just by spending time with people who already speak. Spoken language has become "hardwired" in the brain with structures built specifically for language. There are no naturally designated neural mechanisms for reading, however, so the brain must co-opt structures designed for other purposes. As the eye chases the words in a sentence across the page, the brain must continuously use neural systems designed by nature for entirely different survival tasks, such as looking for food or predators.

Even though reading is an acquired skill and not a natural process, most people do become fluent readers, but not without a lot of work. Learning to read is a long, gradual process that begins in infancy. Basic competency usually is not reached until middle childhood, well into the elementary school years. MaryAnn Wolf (2007), in her book, *Proust and the Squid: The Story and Science of the Reading Brain*, professes, "Unlike its component parts such as vision and speech, which *are* genetically organized, reading has no direct genetic program passing

"Unlike its component parts such as vision and speech, which *are* genetically organized, reading has no direct genetic program passing it on to future generations" (Wolf, 2007, p. 11)

it on to future generations" (p. 11). Reading researcher Sally Shaywitz (2003), professor and director of the Yale Center for Learning and Attention, states, "*Speaking is natural, and reading is not.* Herein lies the difficulty. Reading is an acquired act, and invention of man that must be learned at a conscious level. And it is the very naturalness of speaking that makes reading so hard" (pp. 49–50).

Reading in any language poses a challenge, but reading in English is particularly difficult. For example, some language systems, such as the Japanese *katakana*, are based on a system where each syllable is represented by a written symbol. When these symbols are learned, the child can read with relative ease (Snow, Burns, & Griffins, 1998). Spoken English, on the other hand, has approximately 5,000 different possible syllables. Written English uses a system of letters—an alphabet—to make up a spoken syllable. A letter alone does not refer to anything. It must be combined with other letters to represent a meaningful unit or syllable. The child must learn this complex alphabetic system in order to be able to decipher written words.

Reading in English is further complicated by its orthography—the spelling of words. Alphabetical writing systems, like English, have what is described by Louisa Cook Moats (2000) as a *deep orthography*. Spelling units correspond to sounds, which are phonemes and syllables, and also to meaning, which are the morphemes in the language. So English is a morphophonemic system where words are not phonetically predictable from writing to speech.

English orthography is influenced by the spelling patterns of the languages of origin, Anglo-Saxon, Latin, and Greek. Each of the influencing languages had sounds, syllables, and morphemes that were systematically represented as the base of the language. However, when their influence came together for English, a mixed system resulted. The alphabet is simply insufficient for English spelling. The 26 letters from the Roman alphabet must be used to represent more than 40 phonemes of the English language (Moats, 2000).

The alphabet is simply insufficient for English spelling.

In contrast, some languages, such as Spanish, have one sound for each letter. In English, one letter can represent several different sounds, depending on its placement in the word. It is understandably difficult to figure out the sound-symbol relationship when the sound of a particular letter changes in words that have the same root but different suffixes.

The sound of the *g* in the words *college, collegial,* and *colleague* is an example. Another complicating factor in English is the retention of historical spellings such as the *gh* in *ghost*, which is pronounced differently from the *gh* in *neighborhood* and the *ph* in *geography*. Other examples of spelling patterns that make the sound-symbol relationship so difficult to understand come easily to mind. Merely stating that spelling in English is unpredictable is an oversimplification of the reality of the language. Although teaching reading through a systematic phonetic program is essential,

many other attributes of teaching reading, such as patterning, frequency of use, emotional impact of words, and oddity of spelling help children to make sense out of a seemingly irregular English language.

Some Learn to Read Easily, Others Don't. Why?

Most people do not remember more than the sketchiest details of the process they undertook in learning to read. They may remember the alphabet chart strung across the front of the classroom, their basal reader, the teacher writing a story as they dictated, or matching pictures to words on a worksheet. Nevertheless, they probably have no memory of how and when they finally made sense out of the written symbols to the point where they could read fluently and comprehend what they were reading.

What eventually happens to all fluent readers is that the process of decoding becomes automatic. They decode without conscious thought. This ability to carry out an act unconsciously occurs not only in reading but in many other habits and skills such as driving a car, tying shoelaces, playing the piano, or swinging a golf club. When someone first learns a skill, every aspect is consciously attended to. But over time, and with a great deal of practice, the brain "remembers" how to carry out all the procedures involved in the skill, allowing it to attend consciously to something else. This type of automatic processing is called *unconscious* or *implicit memory*. It comes into play in reading by allowing the reader to concentrate on the meaning of what is being read without having to think about deciphering every word. The downside to this unconscious memory is that knowledge about how this unconscious task is accomplished becomes very difficult to access. As a result, there has been no clear picture of the processes and procedures involved in learning to read. This lack of clarity about acquiring proficient reading habits partially explains the amount of intense debate over which teaching methods work best.

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To become a fluent reader, certain prereading skills need to be mastered, but emergent readers do not all learn these skills in the same way and at the same rate. A small percentage of children appear to learn to read on their own with no formal instruction before they enter kindergarten. Others learn to read fairly quickly once exposed to instruction.

However, too many children struggle throughout their school careers, continuing to read haltingly, and consequently lacking ability to fully comprehend what they are reading. Why this disparity? The answer to this question is complex. However, to begin to understand reading difficulties,

two major factors, one biological and the other environmental or instructional, need to be explored.

Some Problems Have a Biological Basis

Neuroscience and educational research, when blended together, begin to give some rationale for struggling readers who have a biological or neurological difference from regularly progressing readers. We get a better understanding of neuroscience as it is defined as a science focusing on the nervous system. Neuroanatomy is the branch of neuroscience focused on the *structures* of the system, while the *functions* of the system are the focus of neurophysiology. Working together and uniquely separate, these two systems of study focus on the human central nervous system (the brain and spinal cord) and the peripheral nervous system (the cranial and spinal nerves to carry information from the brain and spinal cord). Neuroscientists use brain-imaging techniques, such as the **functional magnetic resonance imaging**, or fMRI, to examine brain activity when a task is processed and **computed tomography**, or CT, to provide detailed images of the anatomy and physiology of the nervous system. Obtaining a tentative picture of the brain components involved in reading gives a dynamic view of structures that have the potential to affect a child's ability to read.

Neuroanatomy is the branch of neuroscience focused on the *structures* of the system, while the *functions* of the system are the focus of neurophysiology.

Dyslexia, a term coined by some researchers for specific reading disabilities, for example, appears to have a biological basis. While a complete composite of the specific structures involved in this disorder are often difficult to pinpoint, Bernard and Sally Shaywitz and their colleagues (2002) are beginning to make progress in identifying parts of the brain that play a role in this disorder. Specific research on dyslexia as a physiological disorder will be addressed later in this book.

Occasionally, adverse pregnancy or labor events can result in severe learning and/or reading problems for children (Berninger & Richards, 2002). Auditory and/or memory processing difficulties—found in an estimated 20 percent of all children—are additional causes of reading problems (Honig, 2001) and are most likely genetic factors resulting in some reading disabilities (Pennington, 1989; Scarborough, 1989). Hearing or visual impairment, verbal memory problems, and attention deficit hyperactivity disorder (ADHD) are other biological conditions that lead to risk factors for successful reading.

Looking at genetic and biological factors, we might assume that a child's intelligence quotient (IQ) would determine future reading success. This, however, does not appear to be the case. The results of a number of

empirical studies on the correlation between IQ and reading achievement have shown that IQ is not a strong predictor of reading achievement, unless we are looking at children with severe cognitive deficiencies who usually develop very low, if any, proficiency in reading (Stanovich, Cunningham, & Cramer, 1984). Typically, IQ is more frequently used for entrance into a university than it is to predict school success. Regular educators and special educators alike identify children who test or respond at average or above intelligence ranges and also have difficulties with reading.

Care needs to be taken when attributing reading problems purely to biological factors. Discovering a child has a brain system that is not responding to instruction says little about the possibility for remediation. Young children's brains are remarkably plastic or open to change. The brain with its extraordinary ability to take in information and orchestrate complex behavioral responses is termed the "ultimate organ for adaptation" by the National Research Council, Institute of Medicine (2002). So researchers and educators alike realize the human brain's potential for remediation, and we are aware of biological factors that can be at the root of reading difficulties. However, the impressionable human brain can also be altered by the environment, in this case by the reader's experiences. The second set of factors influencing whether a child becomes a fluent reader leads to a discussion of environmental factors.

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Other Problems Stem From Environmental Factors

Unfortunately, many children are capable of learning to read but do not make adequate progress because of their life's circumstances. Three major categories of circumstances influence whether children with no apparent biological deficits will reach their reading potential.

Instructional Factors

As a result of a massive effort, research-based guidelines and content standards for reading and language arts now identify specific information, concepts, and skills for children to master at each grade level. Reading First, now an initiative mature with age, is the portion of the federal government's No Child Left Behind Act that identifies five components for effective reading: phonemic awareness, phonics, reading fluency, vocabulary development, and reading comprehension. Alan Farstrup (2006), executive director of the International Reading Association, states, "Already, many students are benefiting from the additional professional development and resources made available to teachers through programs like Reading First. Recruitment of strong teacher candidates, excellent teacher preparation,

and ongoing access to new research in support of best instructional practices are central elements in preparing students." In a previous strong statement for the success of the nation's students, he applauds the alignment publishers have with reports, research, and recommendations. Additionally, he asserts that "teachers have heeded the call for reading reform and are teaching these components with vigor and sequence! Previous convictions about publishers not being informed of research or teachers following a potpourri of educational practices are no longer valid. Instruction is the most important variable in achieving reading success" (Farstrup, 2000).

"Instruction is the most important variable in achieving reading success" (Farstrup, 2000).

So if it is not a lack of research-based, solid instruction, what is the cause for reading failure related to instructional factors? Studies have documented that the first-grade reader who makes poor reading progress continues to be a poor reader (Francis, Shaywitz, Stuebing, Shaywitz, & Fletcher, 1996; Torgesen & Burgess, 1998). Now, with appropriate instruction occurring in most public school classrooms, how can children continue to fail to become proficient readers? The response, quite simply, is that a lack of adequate instruction continues to be an environmental circumstance when children do not attend school consistently, change schools often, or are absent due to frequent illness.

Socioeconomic, Ethnic, and Second-Language Factors

Children of all social, ethnic, and economic groups experience reading problems. However, failure to read well, documented by national reading tests, is more common among nonwhite children, children who qualify for federal lunch programs, and nonnative speakers of English (NAEP, 2007). The reasons are complex. For example, Spanish-speaking students, who make up the largest group of limited-English-proficient (LEP) students in the United States, are particularly at risk. One obvious reason is the language difference itself, as evidenced by teachers who observe that when these students are taught to read in Spanish, many achieve excellent reading capabilities. However, this is not the only explanation. Children in good bilingual programs may still fall behind their English-speaking peers (Slavin & Madden, 1994). A thought worthy of study may be the confusion resulting from the English language as it is spoken at school and the language models children hear from the home environment when parents also attempt to learn English as a second language.

Low socioeconomic status (SES) also appears to play a role in reading achievement, although there is no consensus as to why. One possible explanation is that children with low SES tend to go to schools where there are fewer higher-achieving students and fewer educational opportunities. Another is that, unlike parents in middle-income homes, many low-SES parents provide fewer opportunities for informal literacy learning, a

language-intense home environment, defined as visits to the library, joint book reading, play with print, independent reading, and frequent conversations with direct involvement with youth (Baker, Serpell, & Sonnenschein, 1995; Hart & Risley, 2003).

Early Language Development

As we shall see in Chapter 3, there is a close relationship between reading and language. In some children, inability to achieve reading proficiency seems to be attributable to a lack of exposure to language patterns and literacy-based interactions and materials during their early years (National Institute of Child Health and Human Development, 2000). Recent public concern focuses on television watching and impact on a young child's opportunity to experience language with real people. The American Academy of Pediatrics (AAP) recommends young children, under the age of two, have no television screen time and limits viewing of older preschool children to one to two hours a day of programs selected for their quality (Nemours Foundation, 2007). Current findings furthermore suggest that electronic sources can be excellent sources of education and entertainment for kids but caution that too much can have unhealthy side effects. Could it be that if children are not interacting with other people they are not experimenting with words and ideas?

Recent public concern focuses on television watching and impact on a young child's opportunity to experience language with real people.

As with the development of all human abilities, genetic and biological factors cannot be dismissed or minimized in considering the ability to become a competent reader. However, whether a child becomes that reader is also dependent on the environment in which the child is raised. As author Ronald Kotulak (1997) so beautifully puts it, the genes are the building blocks of human development, but the environment is the on-the-job foreman.

THE BASICS OF READING

If teachers are asked to list all the skills a child needs to read, they might do so with some difficulty. As mentioned earlier, for nearly all adults, the act of reading has become an unconscious activity, its processes stored in a type of memory called *implicit* or *unconscious* memory. In the beginning, every step was a conscious process that had to be learned. Eventually, with a great deal of practice, reading gradually becomes a seamless, automatic activity carried out by the child's brain without conscious awareness.

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As with any task that has reached the point of being cognitively automatic, the act of reading is difficult to explain (and