

Chapter 1

READING LESSONS FROM PROUST AND THE SQUID

*I believe that reading, in its original essence, [is] that fruitful
miracle of a communication in the midst of solitude.*

—MARCEL PROUST

Learning involves the nurturing of nature.

—JOSEPH LEDOUX

WE WERE NEVER BORN TO READ. HUMAN BEINGS invented reading only a few thousand years ago. And with this invention, we rearranged the very organization of our brain, which in turn expanded the ways we were able to think, which altered the intellectual evolution of our species. Reading is one of the single most remarkable inventions in history; the ability to record history is one of its consequences. Our ancestors' invention could come about only because of the human brain's extraordinary ability to make new connections among its existing structures, a process made possible by the brain's ability to be shaped by experience. This plasticity at the heart of the brain's design forms the basis for much of who we are, and who we might become.

This book tells the story of the reading brain, in the context of

our unfolding intellectual evolution. That story is changing before our eyes and under the tips of our fingers. The next few decades will witness transformations in our ability to communicate, as we recruit new connections in the brain that will propel our intellectual development in new and different ways. Knowing what reading demands of our brain and knowing how it contributes to our capacity to think, to feel, to infer, and to understand other human beings is especially important today as we make the transition from a reading brain to an increasingly digital one. By coming to understand how reading evolved historically, how it is acquired by a child, and how it restructured its biological underpinnings in the brain, we can shed new light on our wondrous complexity as a literate species. This places in sharp relief what may happen next in the evolution of human intelligence, and the choices we might face in shaping that future.

This book consists of three areas of knowledge: the early history of how our species learned to read, from the time of the Sumerians to Socrates; the developmental life cycle of humans as they learn to read in ever more sophisticated ways over time; and the story and science of what happens when the brain can't learn to read. Taken together, this cumulative knowledge about reading both celebrates the vastness of our accomplishment as the species that reads, records, and goes beyond what went before, and directs our attention to what is important to preserve.

There is something less obvious that this historical and evolutionary view of the reading brain gives us. It provides a very old and very new approach to how we teach the most essential aspects of the reading process—both for those whose brains are poised to acquire it and for those whose brains have systems that may be organized differently, as in the reading disability known as dyslexia. Understanding these unique hardwired systems—which are preprogrammed generation after generation by instructions from our genes—advances our knowledge in unexpected ways that have implications we are only beginning to explore.

Interwoven through the book's three parts is a particular view of how the brain learns anything new. There are few more powerful mirrors of the human brain's astonishing ability to rearrange

itself to learn a new intellectual function than the act of reading. Underlying the brain's ability to learn reading lies its protean capacity to make new connections among structures and circuits originally devoted to other more basic brain processes that have enjoyed a longer existence in human evolution, such as vision and spoken language. We now know that groups of neurons create new connections and pathways among themselves every time we acquire a new skill. Computer scientists use the term "open architecture" to describe a system that is versatile enough to change—or rearrange—to accommodate the varying demands on it. Within the constraints of our genetic legacy, our brain presents a beautiful example of open architecture. Thanks to this design, we come into the world programmed with the capacity to change what is given to us by nature, so that we can go beyond it. We are, it would seem from the start, genetically poised for breakthroughs.

Thus the reading brain is part of highly successful two-way dynamics. Reading can be learned only because of the brain's plastic design, and when reading takes place, that individual brain is forever changed, both physiologically and intellectually. For example, at the neuronal level, a person who learns to read in Chinese uses a very particular set of neuronal connections that differ in significant ways from the pathways used in reading English. When Chinese readers first try to read in English, their brains attempt to use Chinese-based neuronal pathways. The act of learning to read Chinese characters has literally shaped the Chinese reading brain. Similarly, much of how we think and what we think about is based on insights and associations generated from what we read. As the author Joseph Epstein put it, "A biography of any literary person ought to deal at length with what he read and when, for in some sense, *we are what we read.*"



These two dimensions of the reading brain's development and evolution—the personal-intellectual and the biological—are rarely described together, but there are critical and wonderful lessons to be discovered in doing just that. In this book I use the celebrated French novelist Marcel Proust as metaphor and the largely underappreciated squid as analogy for two very different