Notes and Quotes

**Proust and the Squid: The Story and Science of the Reading Brain (2007)**

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(free copy available for participants in Beginning Reading Workshop)

Preface: Purpose: How literate people read words and how this can be taught to children.
"to understand what we do when we read." See quote by Edmund Huey (1908/1968)
At a time when science has revealed the complex process of reading more than ever, particularly when this process is in danger of being replaced by "new forms of communication", there is a need to understand the "reading brain". Understanding the history of written language assists our knowledge of the "brain's nearly miraculous capacity to rearrange itself to learn to read, and in the process to form new thoughts." Much of this new understanding is done due to imagine technology that enables us to actually "see" how the brain reads before and after.

The act of reading, while drawing on natural capacities, is not a natural act, with both amazing and tragic consequences for children. ("we were never born to read")

Outline of the book: (written in a style for the general public) the origins of writing, the development of the reading brain with its various pathways to acquisition, and the difficult questions about virtues and dangers in the future.

Part I, How the Brain Learned to Read.
Chapter 1.
**Reading Lessons From Proust and the Squid.**

Written language is a human invention. Learning to read has rearranged the organization of our brain. This expanded the way in which we can think. The brain is plastic, capable of making new connections as a result of experience. Reading has placed new demands on our brain, which has affected how we think, feel and infer. This changing process is still taking place as we transition from a reading brain to an increasingly digital brain.

Three areas of knowledge: early history of how our species learned to read, the developmental life cycle of humans as they read, and what happens when the brain has difficulty learning to read. This has advanced our knowledge of how we teach the most essential aspects of the reading process.

Learning to read means using parts of the brain that was originally designed for other more basic processes for vision and speaking. Groups of neurons create new connections and pathways as a result of new demands placed on it. We can learn to read only because the brain has this capacity to change. How well we read and what we read over our life-time makes unique changes within each individual. We know that the structure, at the neuron level, of a person who learns to read Chinese is different than one who reads English. (sample brain images are available in the book)

Using the advanced skills of the French novelist Marcel Proust in comparison to what scientists have learned from the early neurological studies of the squid provide insights in studying what the brain needs to do to read and find ways to adapt when things go wrong.

When reading, our brains can be doing a lot of things: attention, memory, visual, auditory and linguistic processes. Visual system direct the eyes to see letter-forms, word forms, common phrases, sentence forms. When reading we must recognize subtle differences in symbols and relate them to sounds contained in words. We apply "highly automatic rules about the sounds of letters in the English writing system and use a great many linguistic processes to do so." – all part of the alphabetic principle. Our brain must "learn to connect and integrate at rapid-fire speeds what it sees and what it hears to what it knows." All this "with a rapidity that still astounds researchers."

We must draw from a vast amount of information and words that have been stored in our brains in order to make the correct matches and come to the correct meanings. We have a working memory that does the work as we read and that feeds what is ultimately learned and remembered. We then can think beyond the text.

Because we do not have a gene to instruct us to read like we do for vision and speaking, reading does not come as natural to us as vision or spoken language, which is preprogrammed. In order to perform new cultural acts, we need to use old circuitry designed for other purposes. For example, to recognize words in print we use the "species' older circuitry that is specialized for object recognition".

> "When confronted, therefore, with the task of inventing functions like literacy and numeracy, our brain had at its disposal three ingenious design principles: the capacity to make new connections among older structures; the capacity to form areas of exquisitely precise specialization for recognizing patterns in information and the ability to learn to recruit and connect information from these areas automatically. In one way or another, these three principles of brain organization are the foundation for all of reading's evolution, development, and failure." P. 12

The third principle for automaticity incorporates the previous two. This is what makes it possible to read quickly with understanding. "Becoming virtually automatic does not happen overnight and is not a characteristic of a novice reader." It takes hundreds and, for some, thousands of exposures to letters and words.

On top if all of this, our brain has the capacity to form representations to highly learned patterns of information in our specialized regions. It has been found that just imagining letters triggers activations of particular neurons in our visual cortex.

**How the Brain Learned to Read.**

In looking at early forms of writing, each new type of writing demanded something different from the brain. This may explain why it took over 2,000 before a complete alphabetic writing system was developed by the ancient Greeks. Socrates stood at the transition from an oral society and a literate society and resisted the change. This is similar to the position that we are now in between a written culture to "one that is increasingly driven by visual images and massive streams of digital information."

**How the Young Brain Learns to Read and How We Are Changed over the Life Span.**

Although it took the human species over 2,000 years to transition from graphic writing systems to an alphabetic system, it requires about 2,000 days for a child to read.

Quote from cognitive scientist and linguists, Steven Pinker, " Children are wired for sound, but print is an optional accessory that must be painstakingly bolted on."

Huge differences in oral and written language opportunities before kindergarten create large advantages for those "who begin kindergarten having heard and used thousands of words, whose meanings are already understood, classified, and stored away in their young brains."

In spite of these differences Wolf claims that, "Today, we possess sufficient knowledge about the components of reading to be able not only to diagnose almost every child in kindergarten at risk of learning difficulty, but also to teach most children to read."

**When the Brain Can't Learn to Read**

There are other more natural causes for difficulties in learning to read, revealed by difficulties with discriminating individual sounds or phonemes within words, or quickly retrieving a name of a color, are due to differences in neurological structures of the brain. However, advances in neuroimaging research provide ideas for improved interventions that can prevent reading failures with these children.

Concerns about future cultural trends

Related threats to reading achievement for all children come from "replacing books with the multidimensioned 'continuous partial attention' culture of the internet".

Wolf posses the question, "Does the rapid, almost instantaneous presentation of expansive information threaten the more time-demanding formation of in-depth knowledge?"

The choice between two modes of communication is not necessary if we just "add (the) new dimensions to our intellectual repertoire" to a well developed reading brain.

Chapter 2, How the Brain Adapted Itself to Read: The First Writing Systems
Chapter 3, The Birth of an Alphabet and Socrates' Protest

Part II, How the Brain Learns to Read Over Time
Chapter 4, The Beginning of Reading Development, or Not.
Chapter 5, The "Natural History" of Reading Development: Connecting the Parts of the Young Reading Brain.
Chapter 6, The Unfolding Story of Reading's Development

Part III, When the Brain Can't Learn to Read
Chapter 7, Dyslexia's Puzzle and the Brain's Design
Chapter 8, Genes, Gifts, and Dyslexia
Chapter 9, Conclusion: From the Reading Brain to "What Comes Next"