Building Bridges

Karl König's Phenomenology of Reading and Writing Disorders and the Current Neuroscience of Dyslexia

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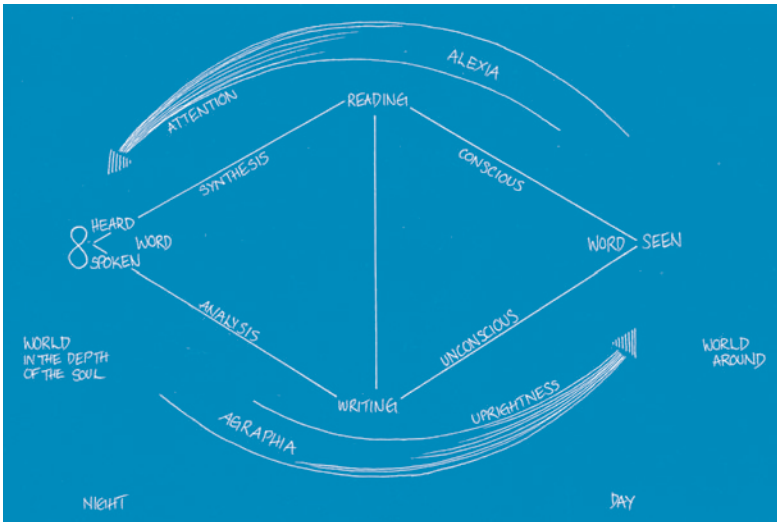
All our pedagogical and curative-educational efforts are directed at connecting one shore with the other, at connecting what is heard with what is seen. – Karl König, *Being Human*

In his lectures *On Reading and Writing*, given to Camphill teachers in 1957 and 1961 and first published in 2002, Karl König names four broad areas out of which literacy difficulties originate: uprightness, attentiveness, the realm of the heard and spoken word, and the realm of the seen word (2002, see figure below). König's typology of literacy disorders is the only comprehensive description, written by an anthroposophic doctor, available to Waldorf teachers in the English-speaking world. König acknowledges that learning difficulties can have their origin both at the level of the four bodily senses as well as in the four higher senses, specifically in the senses of speech and thought. His description sheds light on the long-standing question of how dyslexia is understood and addressed by Waldorf professionals, namely: Is screening and treatment of the four foundational senses sufficient in addressing dyslexia, or do other aspects need to be considered? Is a definition of dyslexia and of subtypes of specific reading disorders necessary and, if so, when and how are these definitions useful for an understanding of the difficulties faced by children?

The focus of this study is to look at König's paradigm through the lens of the current neuroscience of reading and reading difficulties and to show which theories stand to validate his typology. The goal is to demonstrate that, in spite of the inherent differences between these equally complex lenses, there is a clear continuum between a number of scientific hypotheses and König's typology.

The theories of dyslexia I will discuss in relation to König's typology are: the *automatization/cerebellar deficit hypothesis*, as brought forth by British researchers Roderick Nicolson and Angela Fawcett (Nicolson, 2008), in connection to body schema, or uprightness; the *dual route model of reading*, first developed by Coltheart (2005), which validates König's description of the dual nature of the word as sound and image; and the more recent *magnocellular hypothesis* described, amongst others, by French neuroscientist Stanislas Deheane in his book *Reading in the Brain* (2009). Bringing together these hypotheses into one unified set of phenomena, I will report on the synthesis proposed by Tufts University neuropsychologist Maryanne Wolf, *Proust and the Squid: The Story and Science of the Reading Brain.* It is not in the scope of this article to



The four realms of literacy difficulties (from König, On Reading and Writing*)*

discuss each of the theories in full, but simply to point out how they confirm König's paradigm.

The article is divided into two sections. Section I addresses the relationship between uprightness and attentiveness as a foundation for learning and the two memory systems (procedural and declarative). Section II focuses on the dual nature of the word and the dual route model. König's inquiry addresses both the wide spectrum of curative profiles, as well as the norm of students we meet in the standard Waldorf classroom. This article focuses on the latter.

Background

A survey I conducted in the spring of 2015 among 57 Waldorf schools in North America showed that, in spite of the incredible work done to address the rise in sensory-motor disorders so widespread among today's children, consensus has not been reached on how to detect and successfully address different types of literacy disorders in the Waldorf context (Carini, 2017).

A collaboration with outside practitioners is often necessary, and some schools have built relationships with specialists trained in Orton-Gillingham or in other methods for remediation. Schools that have established educational support positions are confronted with the question of whether Extra Lesson screenings are sufficient in detecting a dyslexic profile. Many find that there isn't always a direct correspondence between sensory-motor issues and language-based dysfunctions.

My professional experience working for three years as an educational support coordinator in a large urban Waldorf school alongside a certified educational therapist showed me that, in fact, a correspondence is not always there. Working with groups of struggling readers in the middle school allowed me to personally verify König's statements regarding different reading styles. Through my experience both as a class teacher and as a remedial teacher, I came to the conclusion that some children need help, at some point in their journey, to strengthen phonology or mental picturing, analytical or synthetic powers at the level of thinking and language processing.

All Waldorf teachers would benefit from being able to recognize learning profiles through an anthroposophical lens. Failure to develop this understanding results in Waldorf teachers' becoming insecure in their ability to meet struggling students. Guiding the parents through the sea of options available for addressing learning challenges is also difficult without a clear characterization or diagnosis.

My interest in the neuroscience of reading stems from a desire to further develop our Waldorf approaches for detecting and remediating reading difficulties in harmony with scientific findings. I hope the following description of the science of reading will help other teachers pursue a balanced approach between the extremes of the much advertised "early intervention" versus the hands-off stance that has historically led Waldorf professionals to even question the occurrence of something called *dyslexia* in the Waldorf classroom.

When I started teaching, 20 years ago, I was told that in Waldorf we did not teach phonics. A few years later, I realized that Steiner had a lot to say about phonology. Then, I read about brain imaging studies and I understood why Steiner's method of teaching letters through pictures was nothing short of genius. His indication to connect the sound to the symbol through a pictorial image foretold the discovery that, for reading to happen, two routes have to be activated in the brain. These are equivalent to two bridges: one bridge from letter-symbols to speech-sounds, and the other from letter-symbols to mental pictures (Deheane, 2009, p. 38). The present inquiry, though merely scratching the surface of a complex science, was spurred by the enthusiasm of that first important discovery.

Two Paradigms, One Complex Phenomenon

> Some specialists are still under the impression that we have (if we are right-handed) specific areas in the left side of our brain which are connected with our ability to speak, read, write and understand the written word. We can imagine the problems faced by such specialists when they find that other areas of the brain are damaged or injured, and yet a person still suffers from one of the thousands of possible forms of aphasia!
>
> – Karl König, *On Reading and Writing*

In the 25 years that have elapsed since Karl König gave his lectures *On Reading and Writing*, enormous leaps forward have been taken in our understanding of the complexity of the human brain. Imaging technologies now enable us to watch neurons as they fire while a person reads. Yale researcher Sally Shaywitz, in her landmark book, *Overcoming Dyslexia,* rightly claims that we have finally found consensus on the main cause of reading failure and that we now have proven methods that enable dyslexic people to read (2003, p. 3). Shaywitz is right in that the so-called *phonological principle* is now universally recognized as the main gateway to reading ability (Wolf, 2007, p. 175; Deheane, 2009, p. 238). She is also accurate in stating that a number of methods have shown success in teaching seriously dyslexic children to decode. However, just three years after Shaywitz's book was published in 2003, Tufts University neuroscientist Maryanne Wolf, author of *Proust and the Squid: The Story and Science of the Reading Brain,* proposed her *cumulative dyslexia hypothesis* as a way to overcome the impossibility of arriving at one all-encompassing cause:

> Dyslexia cannot be anything as simple as a flaw in the brain's "reading center" for no such thing exists. To find the causes of dyslexia, we must look to older structures of the brain and their multiple levels or processes, structures, neurons, and genes, all of which have to come together in rapid synchrony to form the reading circuit.

Wolf reports on what Charles Perfetti and his team at the University of Pittsburgh calls the "universal reading system" (pp. 62–63). This system, which includes all the ways the brain rearranges itself for reading in different languages, shows that "areas from all four lobes of the brain are involved" in the act of reading (pp. 63–64). Admitting that "the story of the blind men and the elephant remains an apt description of much of this research," Wolf seems to resort to a phenomenological approach; she places all the current hypotheses of dyslexia on a map of the human brain. What comes out is a "decent approximation of the major parts of the universal reading system."

"We were never born to read" (p. 3) is Wolf's opening statement. The key finding from neuroscience is that reading is a very new invention in the evolution of humanity. The structures and circuits that we use for reading were "originally devoted to other more basic brain processes, such as vision and spoken language" (2007, p. 5). Reading is the product of "*brain plasticity*"—"the human brain's extraordinary ability to make new connections among its existing structures," its ability "to be shaped by experience" (p. 3). In this sense, the ability to read should be more surprising than an inability to read (Nicolson, 2008, p. 12). This finding can be interpreted by Waldorf educators as supporting Rudolf Steiner's indication that reading should be taught gradually and artistically, so as to gently integrate sensory and motor processes and all twelve of our senses (Steiner, 2004, p. 120).

Like Steiner, König does not view the human being as determined by mechanisms in the brain. He begins by looking at reading and writing as archetypal phenomena. His discussion spans across disciplines as varied as philosophy of language, mythology, and

esoteric science. However, the areas of reading and writing difficulties he identifies find a clear correspondence in Wolf's map. König describes the "landscape" of these complex processes as different "countries" between which "we must build *bridges*" in order for reading and writing to develop. These realms are uprightness, attentiveness, the realm of the heard and spoken word, and the realm of the seen word.

Areas that form the map of the reading brain include older structures, such as the cerebellum, as well as the most recently developed pre-frontal cortex. Both are largely implicated in learning, in sensory processing, attention, and memory (Nicolson, 2008, pp. 28–29). Neuropsychologist and educator Jane Healy describes the "attention loop" (1987, pp. 97–98), which runs "from the brainstem up to the top level of the prefrontal cortex" with a "feedforward and feedback system" of "interconnecting loops" throughout the limbic system, or "emotional brain." This loop charts the threefold organization of the human brain into brain stem, limbic system and neo-cortex, Paul McLean's triune brain (pp. 11–12), which parallels the three soul forces of thinking, feeling, and will. The left and right hemispheres are directly involved in receptive and expressive language, and both connect to the left lateral occipital sulcus where visual analysis of word forms has its origin (Deheane, 2009, pp. 69–76). In looking at the architecture of the brain, it appears that all areas and all directions of space are involved in reading: above and below, front and back, left and right. The way cognitive functions must be integrated in the brain seems to mirror in some mysterious way our overall integration in physical space. Building of neural pathways between different areas of the brain is also necessary. Could these pathways correspond in some way to the "bridges" which König describes in his phenomenology of literacy?

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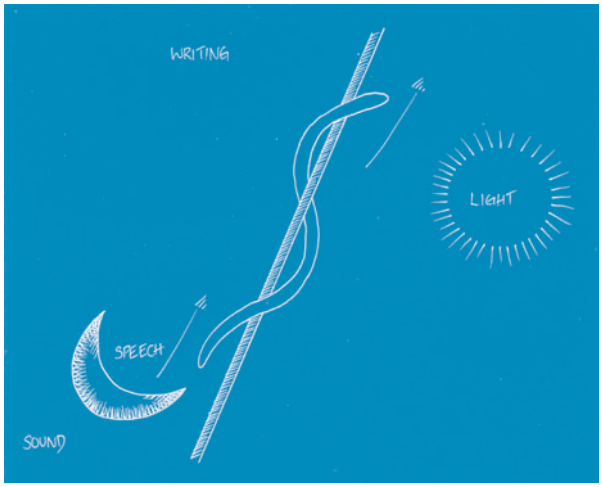
Uprightness and Attentiveness

Rudolf Steiner traces back all learning to the interplay of the two poles of the human being, the metabolic-limb system and the nerve-sense system, which meet in the rhythmic system of breathing and blood circulation. In his esoteric physiology, the first pole is the "night," the pole of "darkness," where the warm growth forces operate; the second is the "day," the pole of "light" where the cool forces of mental picturing and thinking reside (König, 2002). Waldorf teachers are familiar with the idea that learning is the transformation of growth forces into thought forces. The thought forces are first liberated when the child completes the process of physical incarnation, around the age of seven.

In *Being Human: Diagnosis in Curative Education*, König uses the terms *incarnation* and *discrimination* in relation to these two streams of forces. Incarnation is the individuality's gradual "[taking] possession of his own bodily organization step by step" (1989, p. 35). It can equally be seen as the integration of the four bodily senses to achieve what is known to physiologists as *body image* or *body schema:* "We perceive our body through learning to experience it more and more as a totality, as 'body image'" which "is nothing more than these four senses put together" (pp. 35–37). Discrimination is sensory processing, the gradual ability to "distinguish between the objects and beings of the world" (p. 36). Incarnation is a synthetic process. Discrimination is the same as analysis: "We experience the world by becoming aware of it analytically, step by step" (p. 45). König names these two poles also as *body and world*, *motor and sensory*.

In the lectures *On Reading and Writing*, König seems to simply rename the forces of incarnation and discrimination *uprightness* and *attentiveness*. The power of uprightness, through

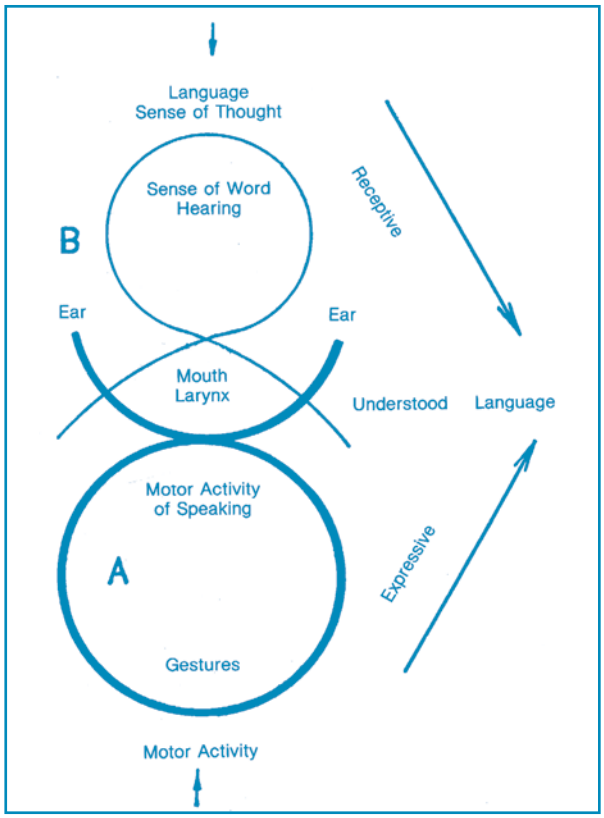


Uprightness and attentiveness (from König, On Reading and Writing*)*

spatial orientation, postural stability, and mature proprioceptive feedback enables the head pole to become still for learning. This is achieved *body schema* or the sum of the four foundational senses. The power of attentiveness König describes as "a soul power—a transcendent ability to create images." Is attentiveness the same as discrimination? Or is it perhaps the result of the process of developing sensory discrimination? Is attentiveness the ability for conscious mental representation, mental picturing, that is seen around age six-and-a-half, when the child is ready to enter school?

König says: "Attentiveness arises in the soul as it becomes permeated by the Ego" (2002, p. 126). The child enters school holding "the staff of uprightness"; around his head is the "magic circle of attention." In uprightness, the Ego works in the lower motor pole, in the unconscious realm of night darkness. In attentiveness, the Ego works in the upper pole, the conscious realm of day light.

The motor and sensory poles, the night and the day, meet in the middle system, where language also has its seat. "Motor activity [works] upward from the limbs, turning into gestures that accompany speech and enhance and support it, streaming upward into the larynx. In the larynx, with the help of the air element, "the flow of motor activity comes to a halt and is transformed so that sound is born out of movement" (1989, p. 66). What we call receptive and expressive speech, listening (with understanding) and speaking, stream from the two different poles. This is why a person can speak but not understand, or understand while being unable to speak. "These two components—the motor and sensory—work more intimately together in speech than anywhere else" (p. 61). Uprightness and attentiveness are two of the four "lands" that need to be connected if a child is to read and write. Reading and writing accompany listening and speaking in helping to connect, in the child, the pole of night to the pole of day, the unconscious pole of movement in speaking to the conscious realm of thinking in listening and understanding.



Receptive and expressive speech (from König, Being Human*)*

Uprightness and the Automatization/ Cerebellar Deficit Hypothesis

We can all picture the child who has not achieved uprightness or a mature body schema. In any Waldorf second grade classroom, at least one-third of the children show some immaturity in spatial orientation, vestibular stability, bilateral integration, or body geography. At least one-sixth also display some retention, or resurfacing, of primary reflexive patterns that should be integrated in the first three years. Based on informal reports given at Waldorf teacher conferences and in remedial workshops, it appears that rates of sensory-motor delay or Sensory Processing Disorder (SPD) have increased in the last twenty years. This seems to be the case outside of Waldorf as well (Harris, 2015), and the causes are attributed to a wide range of environmental factors.

Audrey McAllen developed her approach to remediation, based on the 1909 lectures given by Steiner on the senses, around the same time that Jean Ayres developed Sensory Integration (Ayres, 1972). McAllen's references in the scientific literature align very much with those of Ayres, which include C.S. Sherrington and O.L. Schrager & J.B. de Quiro (McAllen, 1998, pp. 35, 75), all of whom worked out of the *cerebellar deficit model*. What is this model? The cerebellum, or hind-brain, was traditionally considered only a motor area, but one with great plasticity, i.e., the cerebellum, when damaged, will recover fairly quickly. Later, it was found that the cerebellum controls the automatization of any skill, whether motor or cognitive, including balance and language dexterity (Fawcett & Nicolson, 2004). The loop of attention described by Healy shows precisely the connectivity that links the cerebellum to the center of memory, the thalamus, and from there to the prefrontal cortex, touching also the Broca area for language articulation. Its feedback loop to the cerebellum shows the reciprocal relationship between attention controls in the forebrain, memory of content (declarative memory system) and memory of skills as they become automatized (procedural memory system) (Nicolson, 2008). This means that any motor skill, from riding a bicycle to playing the recorder, to writing, to speech articulation, relies in some measure on the cerebellum in order to become automatic. The same is true for the coordination of multiple skills, such as speaking while moving, writing while sounding out words, and even reading out loud: "The cerebellum contributes to the cognitive processes integral to reading" (Nicolson, 2008, pp. 165–172).

A general correlation between balance, muscle tone, speech articulation and visual-motor coordination and a number of learning and attentional difficulties was proven to exist in 1973 by Harold Levinson (pp. 100–102). A longstanding evidence of clumsiness in dyslexic children dates back to Orton's work on laterality disturbances. However, research by Geschwind in the 1980s points to an unsolved mystery in "the fact that many of these clumsy children go on to successes in areas in which high degrees of manual dexterity are absolutely necessary" (Nicolson, 2008, p. 97). In fact, increasingly, we have been hearing about artists and athletes who identify as dyslexic.

In 1977, Frank Vellutino reported in his study on the causes of reversals in reading and writing. Vellutino asked a number of dyslexic people to copy letter symbols in several reversed directions, the way Steiner recommends doing form drawing of four quadrant symmetry in third grade. Vellutino then asked the same subjects to reproduce symbols in Hebrew letters, which was not their native alphabet. Vellutino found among his subjects a high level of accuracy in reproducing the forms, consistent across two different alphabet systems. Later, Vellutino tested the same subjects on rapidly naming the same English letters they had copied. In this test, he found a significant discrepancy between each subject's ability to visually track and copy the shapes and their ability to correctly associate names and sounds to each of the letter forms

(1977, p. 338). Vellutino's research marked a turning point in proving that the tendency to reversals, as well as transposition and omission of letters and words in both reading and writing, is "the result of deficiencies in verbal skills" (p. 338), that is, in speedily associating a sound or a name to a visual symbol.

Following these findings, the research world, divided as it is between highly specialized disciplines, has steered away from sensory-motor interpretations of literacy difficulties. The focus has turned toward higher order thinking and language (Wolf, 2007, p. 174), what Steiner would call the higher senses.

A host of factors contribute to sensory integration difficulties, from organic hindrances to birth stress, emotional trauma, environmental sensitivities, and poor lifestyle choices. This is why Waldorf educators place such importance on the development of the four bodily senses. The multiplicity of contributing factors is also what makes it so extremely difficult for researchers to establish a clear causality in the process (Nicolson, 2008, pp. 181–184). Researchers in the field acknowledge that a large number of remediation approaches tied to the cerebellar hypothesis lack clear evidence and often exploit the public's credence in the ultimate cure. The tendency on the part of teachers to over-diagnose sensory motor difficulties, especially in well-to-do school communities, has been decried by authors such as Madeleine Levine (quoted in Harris, 2015), who cites factual evidence showing that many of these difficulties disappear when children are given the space and the time to integrate naturally. In one study in which teenagers and adults with a history of dyslexia were tested, the incidence of motor coordination issues, which may range between 30% and 50% in school-age dyslexic children (Ramus, 2003a), was found to be about 25% (Ramus, 2003b).

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Automatization and Specific Procedural Learning Difficulties

An interesting development of the cerebellar hypothesis clarifies exactly which difficulties are attributable to a lack of sensory-motor integration. Nicolson and Fawcett have insisted on reframing the connection between dyslexia and sensory-motor development as a weakness in "*procedural memory*, which supports the learning and execution of motor and cognitive skills, especially those involving sequence" (p. 190). They have named their framework Specific Procedural Learning Difficulties (SPLD) to indicate sensorimotor/cognitive "habits" as "skills" that need to be made automatic. Examples of these are the quick recall of times tables facts, fluent handwriting, and the pattern recognition that enables children to decode words and to recognize morphological structures (pp. 192–193). In individuals who struggle with automaticity, *declarative memory*, the storage and use of knowledge of facts and events, may not be impacted at all. This explains why a child with strong pictorial memory, associative and reasoning capacities, and even superior verbal language skills may struggle to read or write (p. 191).

The British researchers found that early delays in motor development, which can later be resolved, may be at the root of the following dysfunctions in the procedural memory system: inefficient automatization of writing skills (dysgraphia), problems with articulation and phonation (apraxia of speech), automatization of auditory pattern recognition and sound-symbol correspondence (phonological dyslexia), automatization of visual pattern recognition affecting spelling (orthographic dyslexia), and difficulty in achieving the speed needed for reading fluency (reading automatization deficit) (pp. 204-209).

A significant difficulty found among children and adults with dyslexia is "tapping to the beat," a difficulty in coordinating foot or hand movement with the sound of a metronome at progressively higher speeds (p. 99). Usha Gotswami, of Cambridge University, speaks of *rhythmic entrainment* as the specific skill that is lacking in children with phonological dyslexia. Proving that a close relationship exists between movement and hearing, Gotswami points to tonal music and rhythmic movement as avenues for remediation (2013, p. 109). The connection between movement and hearing is at the heart of Rudolf Steiner's physiology. These findings should encourage more extensive studies on the effects of eurythmy therapy.

Attentiveness and Memory Formation

The important role played by the feeling life in developing attentiveness cannot be underestimated. The child remembers and learns from experiences that are engaging and relevant. The International Dyslexia Association (IDA) estimates that 30% of children who struggle to read and write have some difficulty with attention (Dakin, 2008). A child with attentional difficulties is either not ready for the level and type of attention that is expected of him, or he is overloaded with too many sense impressions, often including also heavy exposure to electronic media. These children live too strongly in the head pole of sensory consciousness, with overactive stress responses that impede mental imaging and memory formation. Brain-learning expert and teacher educator Eric Jensen, author of *Teaching with the Brain in Mind*, brings an abundance of research in support of the centrality of emotions in learning. Jensen explores many aspects of school ecology that are well understood by Waldorf educators and stresses the influence of rhythms in sleeping and waking in relation to cognition (2005, p. 49).

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Karl König reminds us that one goal in child development is teaching the head pole to become still for learning. "I have the impression that not enough attention is paid to the fact that the classroom is not a gymnasium," König states. The original meaning of the word school in Greek, *scholeion,* is "rest" or "leisure," *schole*. "This means that children should sit down, and, if possible, remain seated." This König claims specifically in relation to reading and writing, which are both activities that belong with the upper body (2002, p. 109). In regards to reading in particular, König states that, "while we need attentiveness in order to learn to read, it is also true that reading trains attentiveness" (2002, p. 126).

I have witnessed the power of attentiveness in several children in second grade who, according to our screenings of balance and visual tracking abilities, seemed to be far from ready to take up reading. All three boys observed were highly distractible, but alert, enthusiastic and divergent thinkers. They were all reading a month or so after the second grade screening with no prompting or pushing from their parents. Reading did help these smart children, and many others I have met since then, settle into their bodies. Such cases should encourage teachers to observe the distinction drawn by König between difficulties that originate in uprightness versus those that have to do with a lack of attentiveness; it is also a reminder to trust more in the power of the Waldorf art of education in supporting developmental integration over time.

We can sum up our discussion of uprightness and attentiveness by stating that in the earlier years, sometimes up to age nine, the "I" of the child is busy trying to make the physical body its home, while at the same time as a spirit-soul, through all its senses, it is striving to connect with the world and make sense of it. We can literally interpret "making sense" as an impulse

of the soul to unify the sense impressions into a single sense, a mental representation.* The making of this sense begins in the middle system, the feeling life, where memories are formed. According to both Jensen and Steiner, the rhythm of night and day, of physical sleeping and waking, is essential to the making of memory and learning. This is where the *writing*, the "inscribing" of the world, happens, and where reading of the world first takes place. When these processes are disrupted or incomplete and these two domains are disconnected, we cannot expect the child to achieve literacy.

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The Spoken and the Seen Word

Memory and Understanding as Archetypes for Reading and Writing

When the Waldorf class teacher asks a child to recall a story or a lesson the day after it was delivered, the child calls up images that had "gone to sleep" the previous day. Rudolf Steiner explains how these images or concepts "become alive" in the unconscious, acquiring a significance that is unique. To bring them back means to allow the child to recreate them for himself. This is why König states: "We should be quite clear that the child can read in the broader sense before he comes to school: He can read the sky, the tree, mother, sister; he can recognize and name; he can read images" (2002, p. 124).

Every kind of understanding, in Steiner's view, comes about through images: "To understand means that I meet myself" through these images. The concepts we evolve in day-waking consciousness are the shadow existence of these living images (König, 2002, p. 34). This is why in his first course for teachers, *The Foundations of Human Experience*, Steiner states that a teacher's work is to teach a child to sleep and to breathe, to move between the poles of conscious and unconscious image formation (1966, p. 22).

The word lives in the middle system as the mediator between the warm unconscious night pole and the cool pole of daylight consciousness. The word shares in the dual nature of sound and image. "In the larynx the flow of motor activity is transformed so that sound is born out of movement" (König, 1989, p. 66). In the middle system, the two poles of night and day are no longer on a vertical axis of body versus head, but rather on a relationship of center versus periphery and front versus back. Vision moves forward and backward in the frontal plane and requires a focus as the center between left and right. The organs of hearing, on the other hand, are placed at the periphery and stimulate our back space, rather than the front. Thus Steiner speaks of musical-rhythmical and sculptural-pictorial forces intersecting in the middle system (*Balance in Teaching*, 2007).

It is a person's whole body that expresses itself in speaking. In listening and understanding, in receptive language, we take in the entire individuality of the speaker, the images, the grammar, down to the level of the individual sounds. Receptive and expressive language are the meeting of the two poles. This is shown in autistic people who cannot speak because, as König explains, they are so caught up in the world that they are not able to distance themselves enough for the individuality to stream out freely through speech (p. 70).

The integration of the eye and the ear is especially strong in speaking and listening. In speaking, we transform our mental pictures into speech sound; in listening, we transpose the speech sounds we hear into mental pictures.

*I use the expression *mental representation* to intend any type of inner representation of sense impressions which uses the visual code as its primary mean. This includes the pictorial images stimulated by the Waldorf narrative approach as well as symbolic visual-spatial representations that are developed through schooling.

They form a double bridge between two lands, a bridge which is essential to literacy development. When this bridge cannot be built, we have various forms of aphasia. Without entering the domain of curative education, we must acknowledge that in the public school classroom, a vast majority of literacy issues have their origin in an impoverished language environment at home, which puts many children at a severe disadvantage (Wolf, 2007, pp. 102–104). Wolf recalls the eloquent apology of Socrates for an oral culture centered in the meaningful dialogue between teacher and student. She likens Socrates's position to that of Russian educational theorist, Lev Vygotsky, who held that "social interaction plays a pivotal role in a child's ever-deepening relationship between words and concepts" (p. 73).

Wolf argues with Socrates against the dangers of superficial understanding resulting from the diminished role of conversation between teachers and students. She sees this danger especially relevant today with the seemingly limitless information available to young people through media technology (p. 77). Wolf's argument strongly validates Steiner's overall emphasis on a culture of oral language rich in conversation, storytelling, speech, poetry, and drama.

Reading and Writing as a Resurrection Process

König speaks of reading and writing as a resurrection process. He states, with Steiner, that the current discourse on reading and writing misses "the way in which the Word—as Logos—is functionally alive in the human being" (2002, p. 45). With writing, the word is en-graved, made to die from its living nature as speech; it is committed to the physical world. With reading, the word must be resurrected, brought back to the spiritual dimension of living images.

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Writing is speaking on paper. The organs of the larynx and mouth give way to the hand, fingers, paper, and pen as tools for inscribing the word into a physical visual form. Reading, on the other hand, is listening to the realm of "silent light" in order to bring back speech. Writing is an analytical process, moving from the whole, the image or thought behind the words, down to the single sounds. Reading is a synthetic process, reconstructing levels of meaning from the single letter, to the syllables, words, all the way to the sentence (pp. 43–47).

In *Balance in Teaching*, Steiner describes these same forces of analysis and synthesis as musical-rhythmical and sculptural-pictorial. Here he shows how the artistic curriculum given in the grade school years harmonizes these two poles and brings them into balance. Teachers recognize that children may have an affinity for one or the other of these forces, the musical or the pictorial. At the level of language, this translates into an affinity for the speech sense versus the sense of thought (both as concept and image) which is also manifested through speech. These two types of children correspond to what have become popularized as the auditory-sequential and the visual-spatial learners, as we shall see (2007, see Introduction by Douglas Gerwin, p. xiv).

Mindful of Steiner's discussion of "the reversed perception of eye and ear," König states that "all disturbances in reading and writing stem from the fact that the translation or bridge between hearing and seeing is possible only in some partial and fragmented way, or perhaps not at all" (*Being Human*, 1989, p. 71). As long as a child is unable to write under dictation, she has not crossed the bridge from 'silent light' to 'resounding darkness.' Only when the child is able to read silently has she succeeded in crossing all

the way from the pole of 'resounding darkness' to that of 'silent light.'

The Steiner method begins with writing, with an analytical process, from the whole to the parts, and in the movement pole. For reasons of space, I will not review it here. A beautiful presentation is given by Arthur Auer in three articles published in the *Research Bulletin* between 2006 and 2007, offering an essential resource for new teachers. In what follows, we will see how König recognizes the analytical/synthetic polarity in the way children take up reading.

A Tale of Two Readers

König holds that speaking and understanding never happen at quite the same time. The child who lives in the light element and rushes to synthesize meaning without carefully recreating the voice of the writer is avoiding crossing the bridge to the sound pole. The child who lives on the shore of sound may have difficulty crossing the bridge to understanding. König begins his exploration of reading issues by observing two types of readers whom he designates as the "laughing" and the "weeping" types. König associates each of these two types with a form of breathing. In the first type of reader, the "acoustic type," the eye goes slowly in short, broken movements from left to right along the line and then sweeps in a long coherent movement back from right to left again, only to move forward to the right again in short jumps. The exhale is in short breaths; the inhale in long. In the second type, "the weeping, or visual type," "the eye first moves along the line in a long sweep, then moves back to the beginning of the next line in short steps. It "skims over the script," exhaling in the long sweep, and then inhaling in steps (2002, p. 42). König observes that "the eye itself does not read, it just directs the Ego onto the text, the script or the print. The Ego uses the sense of touch in feeling, moving, fingering along the written line. It fingers along the text just as fingers move along the strings of a [musical] instrument… but out of the words an image appears and immediately understanding arises (p. 43).

König indicates that a written text is a form, just as a musical instrument is. The Ego "frees" or releases the form and "we understand." The child who struggles with sound symbol associations cannot cross the bridge from the pole of light to the pole of sound. The child who has difficulty synthesizing the meaning of words or phrases, who lacks the intuition for context clues, cannot build the bridge from sound to light.

The child who lives in the light element and rushes to synthesize meaning without carefully recreating the voice of the writer, is avoiding crossing the bridge to the sound pole. The child who lives on the shore of sound, may have difficulty crossing the bridge to understanding.

Lessons from Students

Six years ago, I began working with a small group of four sixth-graders who possessed, collectively, all the skills needed to work with the compelling young fiction my colleague had chosen for her class. Laura, nerve-sense, curious, could remember all the details in a story if she listened to it, but could not decode accurately enough to read fluently. Jacob, left handed, with a strong visual-spatial mind, could read quite well silently, but not out loud; he had very poor spelling. Marney, with a medical condition affecting the retrieval of memories, could read out loud with good expression and express the deep message in a story, but remembered very few descriptive elements; she could form beautiful sentences, and could sing beautifully. Sasha, very phlegmatic, also articulated thoughts beautifully and occasionally went off on interesting tangents, but struggled with procrastination and the ability to synthesize

essential themes. The warmth and cold poles, thick- and thin-skinned, indicated by Steiner in his Curative Education Course, were clearly visible in the constitutions of these four sixth-graders: Marney and Sasha, physically warmer in their bodies and warm in their manners, rounder in shape, more articulate in speaking, both musical; Jacob and Laura, both skinny, awake in their sense perceptions, nimble in peripheral space, able to recall images with ease, and classic in their inability to analyze words into the small units of sound.

These examples showed me the value of working consciously with the synthetic/analytical polarity.

The Realm of the Heard and Spoken Word: The Phonological Principle

Based on functional magnetic resonance images (fMRI), which register the blood activation in brain regions involved in reading, Yale researcher Sally Shaywitz was able to observe the route from the visual word-form area in the left occipito-temporal cortex to the phonological centers for speech recognition and articulation in the left temporal regions (the Broca and Wernicke areas). Shaywitz reports that this pathway is used by every child who decodes effectively. According to Wolf, 25% of struggling readers do not cross this bridge (2007, p. 189). The problem for these children lies in the sequential processing of heard speech sounds, or phonology, as well as in the ability to recognize phonemes, phonemic awareness (PA), connecting vowel and consonant patterns to their corresponding sounds. The existence of a *phonological principle* has been verified across languages the world over. In the U.S., where its incidence is highest due to the opaque nature of English spelling, it has led to the mandate for explicitly teaching phonemic awareness in order to help all children cross this bridge. This principle informs the current definition of dyslexia as

> a specific learning disability that is neurobiological in origin… characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. (IDA, 2002)

A closer look at Steiner's indications reveals that he acknowledges the phonological principle when he says that "training in careful listening lies at the basis of spelling," and that "if we cultivate accurate listening, we will also bring about accurate visual observation" (2006, p. 106). Steiner's method of teaching sound symbol associations through pictographs is brilliantly prescient of the findings that have led to the creation of the dual route model of reading.

The Heard Word and the Seen Word: The Dual Route Model

The *dual code model* of reading was originally developed by Max Coltheart from studying the effects of brain lesions on reading. At the brain level, this model recognizes both of König's bridges, from the eye to the ear and from the ear to the eye, as actual pathways, which light up in images in the reading brain. French neuroscientist and author of *Reading in the Brain*, Stanislas Deheane, distinguishes two routes for reading, starting from the "brain's letterbox" in the occipito-temporal region: the *phonological*, or *indirect route* (left hemisphere) leading to the language centers, and a *direct lexical route*, leading to centers in the superior temporal regions of the brain, called our "mental dictionary" (Deheane, 2009, pp. 61–68). This upper dorsal pathway is called "direct" because it connects directly the word-form to meaning. Research shows that this pathway is successfully used by expert readers, who can recognize words by sight. However, it is not an efficient route for beginning readers, who fail to develop the

phonics skills necessary to successfully decode new words. A percentage of children who display phonological dyslexia are the strong visual spatial thinkers, König's weeping types, who don't naturally develop the bridge to sounding.

The visual word form area (Deheane's "brain's letterbox") is the starting point for translating symbol to sound. This is a small portion of a center that also enables the recognition of shapes, objects, faces, and even colors. The fine recognition of letters is made possible in this center by a complex adaptation Deheane calls *neuronal recycling* (p. 74). The phenomenon of synesthesia (seeing forms in color), not infrequent in children under the age of eight, proves that the brain needs to undergo a reorganization in order to establish a secure bridge from image to sound (p. 215). This finding is definite proof that Steiner's idea of teaching each letter sound through a pictorial image greatly facilitates the building of both pathways.

The lexical route is essential for developing fluency. When this connection is less active, we see the second most common type of reading difficulty, designated as *surface dyslexia*. This difficulty may be affecting 20% of struggling children who don't succeed in becoming fluent comprehending readers. These are analytical readers, König's "laughing" types, often girls, whose difficulty easily goes undetected. The term *surface* may have to do with the fact that these children can be very diligent in applying decoding rules, stumbling mostly on irregular words. They may, with practice, become fluent readers. Their weakness is a lack of synthetic forces, manifesting as slowness in decoding words that don't follow the rules, and a lack of intuition in using context clues when reading passages, which goes with weak inner picturing, lack of fluency, and spotty comprehension. König places in this category shortsighted children and those with a squint.

The dual code model of reading has become popularized as right or left hemispheric dominance, developing the notion that people can be securely classified as right- or left-brained. In reality, the interaction between the two hemispheres is much more complex, as shown by Iain McGilchrist in his extensive review of neuroscientific findings in his book, *The Master and His Emissary* (2009). McGilchrist characterizes the difference between the two hemispheres as different approaches to the world: one, the left, more conceptual, strongly dependent on verbal language; the other, the right, more perceptual, associative, favoring visual and spatial representations. Based on this description, we can think of the left/right brain polarity as tendencies which are bound to come into a unique and different balance in each individual.

It is widely recognized that the connecting bridge between the two hemispheres, the corpus callosum, is not fully developed until school age, which is when we detect a transition to left brain processes of sequential analysis. From this, we could deduce that children with phonological dyslexia, who struggle to make a bridge to left brain processes, may be somewhat younger developmentally, appearing to resist accessing the conceptual realm. Conversely, children who show a lack of intuition for contextual clues and slowness in recognizing unusual orthographic patterns appear to struggle to make a bridge, at the brain level, between the language centers in the left hemisphere and the mental dictionary center in the right hemisphere.

Hidden Gifts and Special Learners: The Magnocellular Theory of Dyslexia

A movement toward better understanding the "neurodiversity" of reading has been growing exponentially. This movement affirms that the less efficient non-phonological route does not mark a dysfunction, but rather a different wiring of the brain, one that we are coming to associate with people who have a highly creative mind and the gift of making sweeping connections across distant regions of the brain and mind.

Not all people with a reading or spelling difficulty have special creative gifts. However,

according to Brock Eide and Fernette Eide, authors of *The Dyslexic Advantage*, 20% of the population show gifts in realms of thinking they define as "material, narrative, dynamic and interconnected." These are all characteristic of an approach to the world that is more perceptual and less conceptual, more creative and less sequential, more experiential and pictorial (Eide & Eide 2012). Dyslexia, a significant difficulty in learning to read, is one feature of this profile.

The magnocellular theory supports these observations. This model distinguishes between magnocells (large cells) and parvocells (small cells) in the cerebral cortex. The magnocells form pathways across the brain for fast recognition of visual and auditory stimuli. The parvocells support detailed analysis of the same (Nicolson, 2008, pp. 32–33). We could say that there are in the neocortex different pathways for fast synthetic thinking, as might be needed in order to quickly detect a predator coming toward us from a distance, as opposed to analytical pathways, as might be needed to develop a future plan for protection from predators.

Unique studies of the anatomy of dyslexic brains conducted by Geschwind and Galaburda in the late 1970s showed that the brains of bright people with dyslexia lack the kind of asymmetry between left and right hemisphere that is assumed in a normal brain, where the left side is bigger around the language regions. These brains were more symmetrical (Wolf, 2007, pp. 202–204). They also showed microscopic abnormalities (ectopias) in language areas of the cerebral cortex. Ectopias are patterns of scarring that follow neuronal migrations during fetal development. The result of these ectopias is a completely different brain architecture, a different neurological profile, which is especially disorganized in the left temporal region, and yet capable of establishing far-reaching connections between disparate parts of the brain (Deheane, 2009, pp. 243–250). This may be the origin of the gifts of synthetic pictorial thinking that accompany the deficits characteristic of phonological dyslexia. Evidence shows also a genetic component to this profile (p. 254). This theory accounts for difficulties in fine grain analysis of auditory and visual stimuli, which correspond to the two types of dyslexia we discussed, phonological and surface dyslexia.

Experienced Waldorf teachers who have taught one or more of these bright individuals with dyslexia recognize that the Waldorf curriculum honors their gifts of flexible creative thinking. At the same time, they realize that teaching these resistant learners to decode may require a specific approach which is beyond the scope of the class teacher.

The phenomenon described as *disorientation* by author Ron Davis in his book *The Gift of Dyslexia*, can be seen as the effect of magnocellular activity. In Davis's description, the reversals, omissions, and transpositions of letters experienced by some students with serious phonological dyslexia are distortions of perception which the dyslexic brain enacts "at an unconscious level in order to perceive [the letter symbols] multi-dimensionally" (1994, p. 17). The inability to access meaning by sequentially processing letter correspondence to speech sounds pushes the child with dyslexia to disorient in order to find a synthetic path to meaning.

Experienced Waldorf teachers who have taught one or more of these bright individuals with dyslexia recognize that the Waldorf curriculum honors their gifts of flexible, creative thinking. At the same time, they realize that teaching these resistant learners to decode may require a specific approach which is beyond the scope of the class teacher (Carini, p. 63).

The Landscape of Reading and Writing Disorders

Each child with a learning difficulty has unique traits that the teacher or therapist must learn to interpret. König's typology of writing and reading disorders can help us recognize the bridges that must be built so that the child can move across the four lands that make up the landscape of literacy.

In the table on the following page, I have connected each of König's types to recognized syndromes derived from current models of dyslexia (2002, p. 127). For each area, I also include König's suggested avenue for remediation. König clearly did not mean to be exhaustive with his indications; rather, he pointed the way, so teachers could go on to develop, out of their own intuition, the strategies most suitable to the needs of each individual child. In the section on uprightness, I included the puzzling question brought by Frank Vellutino's research on the origin of reversals. Further studies on remediation should address parallels between König's suggestions and methods developed from mainstream research.

I advocate that we develop further our strategies for remediation, and that we empower class teachers to keep dyslexic children in the Waldorf classroom where they belong.

Conclusion

The *Dyslexia Survey* showed that, in spite of a growing investment in educational support, a thorough understanding of reading difficulties has been lacking in many Waldorf schools (Carini, p. 64). Two opposing tendencies surfaced through the data: a discounting of the reality and implications of dyslexia and, conversely, an excessive reliance on mainstream programs for remediation. What also surfaced was a strong wish to better articulate a specifically Waldorf approach to these difficulties, to fine-tune screenings and observational assessments, and to think further about what effective strategies for remediation stem directly out of anthroposophy.

In this inquiry, I have attempted to validate Karl König's comprehensive typology of literacy difficulties through the most current research in the neuroscience of reading and dyslexia. Proper detection of these different types should happen primarily through deep observation and child study. It is hoped that more anthroposophic doctors will also take interest in describing these profiles and their possible connection to constitutional polarities. It is important that we keep updating our knowledge of the scientific paradigm and that we evaluate carefully when and how this knowledge is helpful in the Waldorf context.

I hope to have demonstrated that the two paradigms are not only compatible, but also that the overall Steiner method serves well the struggling child. I hope this description will strengthen the claim for a slower timeline for struggling students in the standard classroom, and for pointed support of the foundational senses across the grade school years, which is already strong in most of our schools. Last but not least, I advocate that we develop further our strategies for remediation, and that we empower class teachers to keep dyslexic children in the Waldorf classroom where they belong.

Area of difficulty	WRITING	READING	SYNDROMES
Uprightness	Laterality disturbances having to do with (1) the horizontal plane (above-below), or (2) the sagittal plane (left-right) **Rod & balance exercises; above-below and left-right mirror form drawing*	Laterality disturbances having to do with the sagittal plane (left-right) *Left-right mirror form drawing* [An open question: Laterality disturbances causing reversals, omissions and transpositions may have their origin in the pole of attentiveness]	For writing: difficulty with spatial orientation and balance causes poor letter formation, crowding and spacing issues (**Dysgraphia**) For reading: Difficulty with **analytical sequential processing** may originate at the magnocellular level, causing the phenomenon of "disorientation" (Davis)
Attentiveness	[See below. Attentiveness affects writing indirectly through overall memory weakness and weak sequential processing of memory pictures.]	There are difficulties with attention whereby fluency is weak. *Exercise fine-motor skills, eye-hand coordination and walking & speaking*	For reading: Difficulty with **automatization** (Specific Procedural Learning Difficulty, SPLD)
Realm of the Heard and Spoken Word	The analytical forces are weak. The child cannot translate into words what he wants to communicate on paper. This points to a difficulty with the sequential processing of memory pictures. *Exercise mental imaging involving sequences ('How many steps will it take to cross the yard?')*	The bridge from seeing to sounding is not built due to a lack of analytical powers. The letters never become familiar enough to translate symbol to sound. *Sing the text* [or read texts with strong prosody including poetry]	For writing: **Oral & Written Language Disorder** (OWL LD), difficulty with listening comprehension For reading: **Phonological Dyslexia**, difficulty with phonetic patterns, especially with new words and with non-words
Realm of the Seen Word	Difficulties in establishing memory of letter symbols as well as symbol sound connections *Singing the text to be read*	The child cannot synthesize the word out of its several component letters and gather their meaning. *Enliven fantasy, preview in pictures before reading*	For writing: **Oral & Written Language Disorde**r (OWL LD), difficulty with memory and mental imaging For reading: **Surface Dyslexia**, difficulty with irregular words, with context clues and, in general, with synthesizing meaning

*Konig's scant indications for remediation shown in italic

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