Understanding Dyslexia from the Historical Perspective: Does 19th Century Neurology Apply to the 21st Century?

Prof. Albert M Galaburda
Professor of Neurology and Neuroscience
Harvard Medical School, Massachusetts, U.S.A.

It is difficult to apply knowledge obtained during the 19th century to solve the problem of dyslexia, but many investigators still attempt to do just that. The 19th century was extremely important for the growth of neuroscience. Brains were for the first time adequately fixed at post mortem, allowing proper dissection and staining. The former outlined the relative uniformity of the main gyri and sulci, as well as the course of the principal fiber bundles. The latter gave a clearer picture of the architectonic organization of neurons in the cortex and subcortical nuclei, as well as information about the structure of individual neurons. This, coupled with the study of patients affected by focal brain lesions, slowly produced some consistencies in brain-behavior relationships. Thus, the left hemisphere emerged as the language organ, and within it, several subsets of language functions became "localized" to specific cortical areas. In this context, Hinshelwood in Scotland, and others in the British Isles, Europe, and America proposed brain models for understanding developmental dyslexia.

However, the 20th century, particularly the second half of the century, saw the emergence of knowledge that has all but annihilated the so-called principles of cerebral organization and behavioral localization of function in their strongly phrenological versions. This occurred for a variety of reasons: First, the behaviors themselves were understood better, and curiously many of the behaviors that had been localized previously were found not to be real components of behavior; second, there was growing awareness of the problem of separating a behavioral picture that arose from the loss of a particular function by virtue of a brain lesion, from a picture that represented the emergence of new (abnormal) behaviors by virtue of brain plasticity (this, in fact, is at the crux of the problem of developmental learning disorders, more so even than acquired behavioral deficits in adults); and finally, the discovery through the introduction of other tools for studying brain-behavior relationships that brain lesions underestimated the amount of brain participating in a particular cognitive function, on the one hand, and overestimated the independence of separate brain lesions in the implementation of cortical behaviors.

The 21st century offers a bright future to our understanding of brain-behavior relationships and the eventual treatment and prevention of cognitive disorders in children and adults. Although the road ahead is long and difficult, whereby pathways must be elucidated after behavior relevant genes are discovered, there is now the strong possibility that we will learn meaningfully about how the brain is built and how this machinery is capable of learning. In this context, injury to the process of building the cognitive machine, the brain, or damage to its integrity after it has been built, which leads to cognitive dysfunction, developmental or acquired, will be better understood, prevented, and treated.