

Visual Cues in Word Recognition and Reading: Introduction

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Reading is a fascinating process to investigators in a wide range of fields: from experimental psychology, to education, to computer science and artificial intelligence, to linguistics, to graphic design. The ease with which most of us read tends to obscure the fact that it is a very complicated skill. However, even casual observation of illiterate adults as they attempt to acquire the skill makes it very clear that mastering reading is not at all a trivial process. Learning to read is also a time consuming (and often difficult) activity for young children. Despite widely different pedagogical strategies and techniques and often in spite of the variability that exists in the characteristics of beginning reading instruction, most children in literate societies seem to have pretty well mastered the skill by about the fourth or fifth year of schooling. Many children in our society show some retardation in reading ability. However, in many cases this merely represents a statistical and measurement artifact. That is, given the assumptions of standardized testing procedures, a certain percentage of children will be classified as reading one or two years below grade level. In many cases the poor reading will also be correlated with low intelligence scores. There will remain in each school system a certain percentage of children who have no obvious emotional or physical impairment and have normal intelligence scores, yet who have difficulty learning to read. Some of these children will eventually improve their reading performance. Some of them will not and will always have difficulty reading; such readers are often referred to as being dyslexic.

The study of reading as a process has had a very checkered and cyclic history. Within the field of experimental psychology, for example, there was considerable activity and research on the basic processes involved in reading between 1880 and 1920. The list of psychologists interested in the reading process around this time reads like a *Who's Who in Psychology*: Cattell, Pillsbury, Dodge, Dearborn, Huey, and Woodworth were among the most

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prominent psychologists of their time. Most of the work they carried out is summarized very nicely by Huey (1908) and Woodworth (1938). Unfortunately, the prevailing doctrines and theories in experimental psychology underwent drastic and radical change in the early 1900's. This was due mainly to the emergence of the behaviorist position in American psychology. Since the basic tenet of the behaviorist revolution was that only observable behavior could be studied, basic research on reading virtually ceased because the most interesting questions concerning reading are related to what's going on inside the head and the answers must be inferred rather than directly observed. Thus, it's not at all surprising that when Huey's book was republished in 1968, it was still vitally relevant. In the last ten years or so, researchers in experimental psychology have again become very interested in a number of questions concerning basic processes involved in reading and learning to read.

The rise of the behaviorist position forced many researchers who were interested in reading to move their laboratories from psychology departments to schools of education. Since education is inherently more interested in applied issues, much of the research on reading that continued after 1920 was very applied in focus. However, it was during this period that Buswell and Tinker carried out their work on the relationship between eye movements and reading. Kolars (1976) has reviewed some of the major findings of Buswell's work and in this volume Morrison and Inhoff review many of Tinker's findings with regard to the effects of various print variables on eye movements and reading. Chall (1967) has summarized much of the work within the field of education between the early part of the twentieth century and 1967 concerning the various types of reading programs and their effectiveness.

One of the things that is very obvious in considering visual factors involved in reading is that there has often not been very much communication between researchers interested in reading and typographers and graphic designers who set text to print. Crouwel (1979) makes the point that it was not until the 1920s that the idea was accepted that a text could be made more comprehensible and more functional by deliberate emphasis on form. But Crouwel also clearly points out that changes were not the result of research findings, and he generally makes a plea for more communication between research workers interested in print and text, and graphic designers responsible for the layout of the text.

Of the various disciplines mentioned here, computer science and artificial intelligence represents the newest entry into the general field of reading. Artificial intelligence has become a field to be reckoned with in regard to many human endeavors that require cognitive or perceptual processing. There has been considerable interest in computer analysis of scenes and of handwriting.

Occasionally, there have also been forays into computer recognition of words (Hanson, Riseman, and Fisher, 1976). Brady's paper in the present volume represents a current approach to more directly interface the fields of computer science and psychology with respect to reading.

In short, the study of reading is now attracting workers from a number of disciplines. In the present volume we have put together a series of papers that we believe will be of interest to psychologists, educators, computer scientists, and graphic designers. Inasmuch as the topic of the volume concerns visual factors in word recognition and reading, there is not a contribution by a linguist. Likewise, there is not a contribution by a graphic designer, but certainly the first two papers in the volume are directly relevant to members of that community. In the first paper Morrison and Inhoff have described the visual factors that are important in terms of the eye movements that occur during reading. The first half of their paper focuses on how the alignment and printing of the text influence eye movements and readability. In the second half they look at more recent work on perceptual factors influencing eye movements. Haber and Haber present an account of how certain visual cues in text, particularly word shape, may influence the reading process and more generally they discuss the interaction of printing conventions and the knowledge the readers have stored in their heads. Brady's paper represents an attempt to integrate psychology and artificial intelligence in understanding reading. Ehrlich's paper specifically addresses the issue of learning to read and how certain cues are utilized to recognize words. Coltheart then presents a detailed overview regarding reading disability and a general model of where the process of reading may break down. Finally, Well and Pollatsek provide a critique of the different papers presented in the volume and they also provide a general integration concerning how visual factors influence reading and word recognition.

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