PSYCHOLOGY of READING

John Downing Che Kan Leong

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Preface

The need for a book on psychological aspects of reading first became clear to one of us, John Downing, when he was the instructor of a graduate course on psychology of reading at the University of California at Berkeley in 1967–1968. At that time, graduate-level texts on reading psychology were rare. Those that existed tended to have a narrow focus in the content and treatment of various topics pertaining to psychology applied to reading. In the years that followed, the need for such a work became more evident, but the writing of such a book remained a daunting task. It was not until the mid-1970s that a book of significance on the subject appeared in print. In the meantime and especially in the last five or six years, there have been significant developments in the scientific study of reading, as proven by many articles on related disciplines published in both journals and anthologies. The time seems ripe for a work which attempts an integration of the research and theory of the science of reading, and to some extent the art of its pedagogy, under one cover.

It was in the mid-1970s that John Downing initiated this important and challenging project. He mapped out the overall scheme of the work, wrote some of the draft chapters, and ensured progress of the writing. It was in 1977 that Che Kan Leong was invited to join in this undertaking, the scope of which also increased in magnitude and complexity. The two authors had first met in 1973, when Che Kan Leong contributed a chapter on reading behavior of Chinese children to John Downing's book *Comparative Reading*. Thereafter, we collaborated on several other projects with equally satisfying results. Our latest partnership culminated in the writing of this book, from which we have both learned a considerable amount.

We have not modelled this book on any existing text on the subject, the closest being Edmund Huey's *The Psychology and Pedagogy of Reading*, first published in 1908. We have taken the position that reading is the interpretation of symbols within the broad framework of literacy acquisition and development. Our emphasis is on the understanding of symbol systems, on knowledge acquisition over and above the mere teaching and learning of reading as a skill. We have followed a cognitive and psycholinguistic approach in our attempt to understand the processes of reading.

Very briefly, the 15 chapters in this book are organized into six fairly distinct but related areas. One area considers reading as a complex, interrelated skill (Chapters 2 and 3). A second relates to aspects of orthography and language (Chapters 4, 5 and 6). The third area deals with physiological and neurological aspects pertaining to reading (Chapters 7 and 8). The fourth area discusses theoretical and empirical studies of lexical access and learning to comprehend (Chapters 9 and 10). The fifth group of chapters centers round the affective and social bases of reading (Chapters 11, 12, and 13). The sixth area covers research, theory, and relevant practice in reading difficulties (Chapters 14 and 15). In treating these six vast and important areas, we have attempted to be comprehensive in drawing on current as well as significant studies of earlier years from psychology, language, and education. As is inevitable in a volume of this nature and magnitude, we are obliged to be selective at times. Any commission or inadvertent omission of specific views should be seen within the total context of the work.

For John Downing, the University of Victoria, British Columbia was the academic base for writing his various chapters. His work was greatly assisted by the many discussions that he had with his colleagues on the Faculty of Education and in the Departments of Psychology and Linguistics there. Some of his writing was done in England during visits to the Psychology Departments at the Universities of Bristol, Leicester, London, and Reading, and he owes much to the debates that took place there on the chapters that he was drafting at that period in his 1975–1976 study leave from the University of Victoria. Later in the same year of leave, John Downing continued his first drafts for this book during his visit to the Institute of Psychology, Academy of Education Sciences, Moscow, U.S.S.R. and his stay at the Flinders University of South Australia. He is grateful to colleagues in those places also for their thoughtful comments and suggestions on the ideas for this book as they developed. In the years that followed, seminars in many other places have shaped John Downing's chapters into their present published form, and he is very appreciative of the many constructive suggestions made by colleagues and students on those occasions.

For Che Kan Leong, the University of Saskatchewan in Saskatoon, Saskatchewan was the center where much of the writing was done. He is indebted to the university's administration and to the many colleagues and friends both within and outside the university for their direct and indirect assistance. The 1977–1978 sabbatical year at the two universities in Hong Kong, at the Paedologisch Instituut of the Free University of Amsterdam, and in several states in Australia, especially Queensland, provided opportunities for reflection, discussion, and gathering of materials. The subsequent years with conferences in North America and Europe also yielded concrete results. Colleagues of assistance included, among others, Felix Oteruelo and Stephen Wong, who read and critiqued portions of the chapters on physiological aspects; John McLeod, on concepts of reading difficulties; J. P. Das on cognitive processing; Merrill Hiscock and Dirk Bakker of Amsterdam, on laterality and developmental dyslexia. Helpful comments on language awareness, lexical access, and learning to comprehend came from Rumjahn Hoosain of the University of Hong Kong, Jay Samuels of the University of Minnesota, Donald Doehring of McGill University, and John Morton of the MRC Applied Psychology Unit, Cambridge, England. There are other individuals who helped to lighten the onerous task and who deserved mention, unfortunately made impossible because of space limitations.

In particular, we are indebted to Lloyd C. Chilton, Executive Editor of the Macmillan Publishing Company, for his patience and encouragement in the writing and publication of this book and Hurd Hutchins for his supervision of its production. We thank Helmar Heimann for the cover design. We owe our greatest debt, however, to our respective families for their strong support in our undertaking. Their understanding and the assistance given us by our colleagues and friends have sustained us throughout these several years. Any shortcoming in the volume is necessarily our own.

There is an additional thought we would like to share with our readers. We debated many times on an appropriate title. It could have been *The Psychology of Reading.* But this seems to be a large claim, for there are many psychological theories of reading. Hence we eschewed the *the.* We might have called the work *Psychology Applied to Reading.* This probably reflects the content, though it seems clumsy. Even the present title, *Psychology of Reading,* can be all-encompassing, implying the coming together of several related disciplines. This is what we have attempted to do.

With a sense of humility towards those who have gone before us and to those whose current work also benefits us, we sincerely hope that our present volume will stimulate our readers to "read, mark, learn, and inwardly digest" the many facets of reading and will continue in their quest for more.

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Victoria, British Columbia
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Contents

CHAPTER 1

Reading—In Perspective

It was some three hundred and fifty years ago that Francis Bacon wrote: "Reading maketh a full man, conference a ready man, and writing an exact man." The force of this aphorism is not diminished in the 1980s, even though our technological advances have resulted in new media, in addition to print, to which the aphorism must apply. The emphasis on reading within the context of literacy acquisition generally operates at different levels: in the school, at home, and in society at large. Tangible examples of concern for and action to promote literacy by governments include the Right to Read Program, the Education of the Handicapped Act (Public Law 94–142) in the U.S.A. and the official British Government report on reading and language (The Bullock Report, 1975), among others.

Reading as Literacy Acquisition

It is within the broader context of literacy acquisition that we have attempted this present work on the psychology of reading. The concept of *literacy* varies and includes "ability to read and write" (Saksena, 1970, p. 11) as well as "adult literacy." In this book, we will emphasize processes of reading, although writing and spelling must also be seen as integral literacy activities. We use the term *writing* to refer to the physical activity of penmanship as well as creative writing. *Writing system* refers to orthography, while *spelling* is restricted to the recall or reproduction of words in the writing system. In speaking of *literacy*, we include the development and functioning of young children as well as older individuals. We are conscious of the lack of agreement in measuring literacy, as standards and conditions vary (see Gray, 1956; Kirsch and Guthrie, 1977–1978; Hunter and Harman, 1979). UNESCO (1965), for example, defines a literate person as one who has acquired the knowledge and skills to engage in activities for effective functioning in the community and suggests a number of years of schooling as a yardstick for measuring literacy. This grade-completion equivalency (usually fourth or fifth grade) to identify functional literacy or illiteracy suffers from lack of clear definitions and objective evidence. It is likely that this practice underestimates the rate of illiteracy among different age groups (Harman, 1970). Even if grade equivalencies are accepted, there are wide individual and national differences in actual performance levels as suggested by Samuels (1969) and shown in Downing's (1973) international study of reading behavior in fourteen countries.

There is the further problem that, as societal demands change, the level required for functional literacy also changes (Jenkinson, 1967; Resnick and Resnick, 1977). For example, the earlier estimate by Gray (1955) of completion of grade four as the minimum attainment of functional literacy would be upgraded by Curry (1967) to grade eight and by Jenkinson (1967, p. 280) to "a minimum of grade seven reading but . . . rapidly moving upwards to grade nine." In studies outside of North America, Simmons (1970) suggested that completion of sixth grade in Tunisia is necessary, while Malmquist (1965) of Sweden stated a minimum of ninth grade (rising to twelfth grade) is essential for literacy. More recently, the Report of the Committee on Reading of the National Academy of Education (Carroll and Chall, 1975) takes the position that the goal in literacy should be to ensure that every adult can read and understand the whole spectrum of reading materials he or she is likely to encounter in daily life. This

goal would mean the eventual attainment of twelfth grade literacy by all adults.

Thus the continual shifting of estimated grade level necessary for functional literacy indicates the need for the identification of knowledge and skills needed for "participation in the processes for balanced development of self as a member of collectivity" (Saksena, 1970, p. 13). Saksena suggests more specific goals related to a particular culture as knowledge and skill requirements are relative to time and place. This broader view steers us clear of the narrow prescription of literacy as activities or mere subject areas of "reading," "writing" and "spelling" in schooling. Bhola (1970, p. 33) is emphatic that "a functional literacy programme is not merely an instructional programme. . . . A functional literacy programme is . . . also at the same time a social change programme." This change must be linked with the "literate environment in the community and nation" and, where no such environment exists, it must be created (Bhola, 1970, p. 41). In their book, *Adult Illiteracy in the United States,* Hunter and Harman (1979) show that the concept of literacy is subject to historical change and relative to social goals and needs. The attainment and maintenance of a fully literate society relies heavily on adequate performance in functional reading tasks related to real-world experiences (Carroll and Chall, 1975). The continuous process of applying knowledge and specific skills to the tasks of reading, writing and spelling determines functional literacy (Kirsch and Guthrie, 1977–1978). Bormuth's (1975, p. 72) concept is appropriate: "Literacy is the ability to exhibit all of the behaviors a person needs in order to respond appropriately to all possible reading tasks." This reference to all possible reading tasks reminds us of the oft-quoted declaration from Edmund Huey (1908, p. 6): "And so to completely analyse what we do when we read would almost be the acme of a psychologist's achievements, for it would be to describe very many of the most intricate workings of the human mind." It is the aim of this book to attempt to unravel some of the intricacies of the mind in the act of reading. We will discuss the state-of-the-science of reading by drawing on findings from research and theory and with reference to sound practice in teaching and learning reading.

Toward a Definition of Reading

It is customary to begin a text on the psychology of reading by defining the term *reading.* This is a formidable task. There are divergent viewpoints: some emphasizing the "code cracking" approach and others the "meaning" approach. In contemporary language, reading can be approached "bottom-up" or "top-down" with the interactive mode, sometimes via data (bottom-up), sometimes via schemata (top-down), as the most likely behavior. It is difficult to define reading in an all-encompassing manner. There is not one kind of reading, but many kinds. Reading is performed for many purposes, and calls for different acquisition and processing strategies. It is therefore not surprising that there are different emphases. Take, for example, the classical linguistic viewpoint of Fries (1963) that reading consists of the transfer from auditory signs to visible signals, or Elkonin's (1973b) definition of reading as "the re-creation of the sound form of a word according to its graphic model [representation]." These definitions are usually regarded as emphasizing speech sounds. Similarly, Venezky (1967, p. 102) suggests that learning to read "requires primarily the translation from written symbols to sound, a procedure which is the basis of the reading process and is probably the only language skill unique to reading (comprehension, for example, while a necessary criterion for reading, is a function of both speech and writing)." Thus initial reading includes the ability to decode but is not confined to that subskill. As well, the reader comes to the reading task with existing language and comprehension subskills so that the process is not the same as translating from writing to meaning. On the emphasis on meaning, the view of Tinker and McCullough (1962, p. 13) that reading is "the construction of new meanings through manipulation of concepts already possessed by the reader," with the resulting meanings "organized into thought processes according to the purposes adopted by the reader," is fairly typical. Smith (1978) suggests that, with fluent readers, comprehension may precede word identification and that a reader may disambiguate meaning "without making any prior decisions about words" (p. 213). Any decoding a reader performs, according to Smith, is not to transform visual symbols into sound, but to transform the visual representation of language into meaning.

The above sampling of views on reading as decoding or as meaning derivation should not be taken to mean a strict dichotomy between the two. Even with the apparently heavy code-emphasis of Elkonin in reading the more "phonetic" Cyrillic language, his "re-creation of the sound

form" does not mean neglecting comprehension. Such re-creation refers to the complex phonemic representation and not just a simple association between print and speech. In fact, Elkonin is emphatic that the child must *understand* the features of speech encoded in the writing system. Hence, "the Great Debate" (Chall, 1967) on learning to read is not an "either–or" of code-emphasis versus meaning-emphasis, but one of a continuum or different levels of processing. Thus, notwithstanding Chall's (1979) recent reaffirmation of the benefits of code-emphasis in the absence of "any viable data to disconfirm it" (p. 33), the interactive approach may be equally facilitating to beginning readers.

It seems to us that the definition of Gibson and Levin (1975, p. 5) is as concise and yet as comprehensive as any: "Reading is extracting meaning from text." For readers to do this, they will need to: (1) decode written symbols to sound, (2) have recourse to the lexicon or mental dictionary to extract meaning for the printed word from semantic memory and (3) incorporate this meaning into their language acquisition process. The more recent view of Venezky (1976, p. 6) states that: "Reading is the translation from writing to a form of language from which the reader already is able to derive meaning." This presupposes processes involving language and the existing language abilities on which the reader must draw. To some extent it relates to language awareness which we will discuss in Chapter 6 specifically. We may of course debate the meaning of "meaning," just as philosophers, linguists, psychologists and educators have done before us to explicate "meaning." This is not our immediate concern in Chapter 1; we will leave to subsequent chapters the question of how children come to comprehend. Gibson and Levin make it clear that the word *text* in their definition quoted at the beginning of this paragraph refers not only to print but also to combinations of text and pictures, diagrams, graphs, illustrated instructions and other reading material. We wish to enlarge on the implications of this broader definition.

As a starting point, we will refer to two linguists who seem to provide some clues to this issue of reading as symbol interpretation. First, Chao (1968) draws a distinction between writing and other visual symbols. He asserts that "visual symbols do not begin to be writing until they have a close correspondence to language. . . . If a sign represents a specific part of language, it is writing; if it represents things directly, it is not" (p. 101). Chao's definition of *writing* seems to fit well the everyday usage of that term. It is a limited type of visual sign. What is even more interesting is Chao's choice of words when he goes on to give us an example: "The same road sign [⩘] will be read by an English-speaking person as *no left turn*, by a German as *links abbiegen verboten*" (p. 101). He concludes that such visual signs are not *writing*, but it is notable that he describes the English and German responses to this sign as *reading*.

The second clue for solving the problem of the conflicting types of definitions of reading is provided by Hall (1961):

> Any grapheme or sequence of graphemes used in spelling a word always symbolizes ("means") some fact of language, be it a phoneme (as in alphabetic writing) or a morpheme (as in Chinese characters). In any utterance, meaning is conveyed by morphemes and their combinations into phrases and clauses; by the term *meaning*, we here refer to the way in which these linguistic features symbolize the facts of the universe in which we live. Note especially that the SPELLING of any word has no "meaning" i.e., symbolizes nothing, directly, except the linguistic characteristics of the morpheme it represents (in an alphabetic orthography, its phonemic structure); this kind of meaning may be termed *linguistic* meaning, as opposed to *real-life* meaning. This latter is conveyed, not by written (graphemic) shapes, but by spoken morphemes and only by spoken morphemes (pp. 4–5).

Chao's definition of writing shows that reading covers a broader area than writing. We can read road signs which contain no writing. Similarly we read charts, graphs and maps. Palmists read the lines in our hands. The old farmer reads the sky to forecast the weather. The deaf read lips. Hunters read the spoor of game. A phonetician reads the symbols of the International Phonetic Alphabet and hears the sounds of an unknown language. All these forms of reading have the common characteristic of interpretation of visual signs. Sometimes reading (e.g. as in Braille) can be the interpretation of other than visual signs, but *reading is always the interpretation of signs.* If we relate Hall's distinction between "linguistic meaning" and "real-life meaning" to Chao's discussion it becomes clear that both types of definition of reading can be correct. The group of letters *rugate* constitutes a visual stimulus which can be interpreted as a sign for certain English speech

sounds, or it can be interpreted as a sign that something is wrinkled, or it can be interpreted as a sign for both.

The discussion thus far suggests that a narrow concept of reading limited to either pronouncing speech sounds or understanding "real-life meaning" will be incomplete because it excludes an important segment of what most people include in their concept of reading (see Gibson and Levin, 1975; Venezky, 1976). For research purposes, it may be important to define quite narrowly the particular aspect of reading being investigated; but, for more general purposes, a broader definition of reading seems called for. Reading should be defined to include various kinds of behavior that people engage in when they say they are reading. These various kinds of behavior all involve the interpretation of signs. Thus a brief definition of our objectives for this book might be:

Reading is the interpretation of signs.

One immediate delimitation must be made because the kind of reading that is of chief concern to teachers and parents is narrower than the general interpretation of signs. We must distinguish between two distinct categories of signs among those mentioned above. The signs read by palmists, hunters and farmers are natural phenomena that have not been deliberately created with any communicational intent. In contrast, signs such as those used in maps, Braille, and written or printed text are arbitrary *symbols* deliberately created for the purpose of communication. It is this latter type of reading that is the concern of this book, although it is valuable to remember its affiliation with the other behavior of interpreting natural phenomena as signs when we consider the evolutionary basis of the processes employed in reading text, maps, and so on. Hence, for the particular purposes of this book we shall revise our definition of reading as follows:

Reading is the interpretation of symbols.

We will elaborate on this definition.

Reading as Interpreting Symbols

The term *interpretation* refers to both a product and a process. The product or the outcome of reading arises with the successful completion of the reading act or when readers comprehend what they read. This is in itself a large statement, as there are different levels of comprehending: memorization, paraphrase or translation, inferences and application. Readers comprehend to the extent that they bring their previous knowledge to bear on the text which should be organized so as to facilitate understanding. The process aspect explains how to get to the product; or as one cognitive psychologist has put it: "Ask not what is inside your head but what your head is inside of." We emphasize the process aspect because it is flexible and adaptable, with manifold resources.

The term *symbols* is used in the semiotic sense of Charles Morris (1955) rather than as symbolic forms or the relation of language to myth, religion, art, science and other kinds of human endeavours and experiences (Gardner, Howard and Perkins, 1974). The semiotic approach focuses on the relationship between linguistic, gestural, pictorial, musical and other kinds of *symbol systems.* Chao (1968, p. 195) explains the term symbols well: "a symbol is something which can be conveniently produced and has a conventionalized, visually arbitrary, relation to what is symbolized." Fodor, Bever and Garrett (1974, p. 152) offer a similar explanation: "the defining property of a symbol is that it *is* an arbitrarily selected object which, nevertheless, succeeds in referring." Thus signs closely resemble referents or objects referred to, while symbols are a representation only. Signs have fixed characteristics, symbols are arbitrary. This arbitrariness, however, probably follows some tacit conventions. An example will illustrate this. The wet, icy roads in the Canadian prairies in winter are signs that the roads are slippery and motorists should take care. There is some fixed characteristic, some causal law why icy roads are slippery and dangerous to drive on. Hence the term *sign* or *signs* is applicable. The road sign which says, "Slow Down" or "Stop/Arrêt" on the same highway is both a sign and a symbol. Symbols can extend in space (e.g. maps, drawings) and in time (e.g. spoken discourse). These are things and events. As signs and symbols mediate between an object and an interpretant, the interpretation of symbols in the semiotic sense attempts to study the triadic relation between signs/symbols, things signified and cognition itself.

In agreement with Gibson and Levin, we suggest that letters of the alphabet, lines in a diagram, patterns in a picture, notes of a musical score, gestures of a ballet dancer, are all parts of symbol systems with their own internal rules of organization. As symbol systems these different instances can be read, albeit in different ways. We know,

for example, perceiving print is not the same as perceiving in general, as the literature has shown. Further, the same symbol systems (e.g. language) may occur in different modes (listening, visual, print), just as the same modes (the electronic mode of television or the radio) may be a vehicle for different symbol systems. One particular aspect of different modes—listening and reading print—is of relevance to our inquiry into literacy acquisition. The question here is whether listening as part of *auding* draws on the same internal representation or requires the same basic mental operations as reading print. We will return to this later.

It is thus with some trepidation that we define reading in terms of interpreting symbols. We do so for at least two reasons. One is the more general reason of broadening the scope of reading from reading text materials to reading other symbol systems as part of the quest "toward the literate society." The other is the more specific reason of emphasizing the commonality in reading different writing systems among nations. On this second question, our earlier comparative reading project (Downing, 1973) has attempted to uncover reading behavior across linguistic boundaries with different symbol systems. On the first question of defining reading with focus on reading text materials but also including other conventionalized symbol systems such as pictures, maps and music, our intent is to underscore the importance of *knowing*. Reading should be learning through reading. Teaching reading should be teaching how to learn through reading. Knowing is not just knowing *what* but knowing *how* and knowing *with* (Broudy, 1977).

Bruner (1963) suggested that the generation of hypotheses and inspirations is at first of a nonverbal, cognitive nature, best apprehended as visual imagery. It is only later that true logical, propositional thinking develops. There are thus different processes and strategies in knowing. There are also different neurological substrates serving "verbal" and "nonverbal" activities and analytic and synthetic modes of information processing. Later, we will discuss some of the differential and reciprocal functions of the cerebral hemispheres and will emphasize processing strategies (see Chapters 7, 8 and 15). We will not, however, go so far as to identify hemispheric preferences in the exploration of literacy as some authors have done (e.g. Rico, 1978). Rico has suggested a configuration or primary graphic strategy as a means of expanding nonliteral comprehension, which is taken to be the right-hemisphere function, and which in turn is thought to transfer to verbal communication, supposedly a left-hemisphere function. There is some attraction in this kind of reasoning, but the neurologizing can be misleading. We wish to emphasize that attention can be drawn to reading spatial symbol systems without necessarily implicating the brain. This balanced view is needed as there are even commercialized teaching materials purporting to teach "right-brained kids in left-brained schools!" This neurologizing is unwarranted.

Nearly fifty years ago El Koussy (1935) stressed the importance of the *K* factor or the spatial factor. More recently, Macfarlane Smith (1964) wrote an informative book on spatial ability and its educational and social significance. He did so without any reference to hemispheric functions. These works remind us that we should remember not only the brain, but also other factors as well. Even those who argue that school systems stress *left-hemisphere skills* recognize the need for a balanced view. Nebes (1977, p. 105), for example, sees the verbal and nonverbal dichotomy this way: "Many problems can be solved either by analysis or synthesis; but if people are taught to habitually examine only one approach, their ability to choose the most effective and efficient answer is diminished." Increased understanding of the neurological substrates of language will hopefully lead to better training in how to choose between and how to use the skills of both hemispheres of the human brain. This seems to be an argument for a well-proportioned curriculum which includes reading text materials, reading pictures, reading music and other symbol systems. The reference to analysis-by-synthesis reminds us of that central theme in Neisser's (1967) book *Cognitive Psychology*. He says this of reading:

> Reading for meaning seems to be a kind of analysis-by-synthesis, a construction which builds a non-sensory structure just as "lower levels" of cognition synthesize visual figures or spoken words. Reading is externally guided thinking. Perhaps we should not be surprised that it is so poorly understood; we may not understand it until we understand thought itself (p. 136).

Recently, Wolf (1977) has drawn on relevant research to show that reading defined as reading text materials is too narrow. He examines the relations between the reading process and artistic styles and argues for the broader interpretation

of reading that Gibson and Levin and we also have attempted. Wolf emphasizes the need to go beyond the child's ability to recognize or read print and believes that we should "analyze the child's capacity for processing information of various kinds" (p. 428) as a means to advance human knowledge and understanding.

Reading and "Auding"

Part of human understanding can be through "looking at script in order to language" and part through listening. The relationship between reading and auding (listening to speech in order to comprehend) is not a direct, one-to-one correspondence. The ability to understand a stretch of discourse is multidimensional in nature. Whether understanding is through spoken or printed language, the individual has to deal with different aspects of language: vocabulary, grammatical features of syntax and semantics (see Chapters 5, 6, 9 and 10 in this volume; and Carroll, 1972). In listening comprehension, prosodic elements of language are also involved. In reading print, the succession of rapid fixations will merge together to build up a meaningful message, at least in skilled reading.

Kleiman and Schallert (1978) have written of "some things the reader needs to know that the listener doesn't." They explain that spoken and written discourse differs in: (1) prosodic information such as intonation, stress and constituent boundaries inherent in speaking but not marked in texts, (2) varying situations in which both or either modes are used, (3) different functions for spoken and written communication, (4) different characteristics of the two modes and (5) the permanence of writing as compared with the transient, temporal nature of speech. Some or many of these devices are exploited to advantage by writers. For example, poems and plays are meant to be read orally, listened to, and played out or enacted. Only in this way will the gentle, gossamerlike quality of Portia's plea for mercy which "droppeth as the gentle rain from heaven" in Shakespeare's *The Merchant of Venice* be properly appreciated. So also can one savour the sensuous quality of the passage in *Antony and Cleopatra* describing Cleopatra gliding down the Nile in a barge. We are *told* that "age does not wither her, nor custom stale, her infinite variety." Again, the cut-and-thrust dialogue in *The Taming of the Shrew* must be spoken to be enjoyed in the way that the audience in the Bard's days must have done. Shakespeare explains the power of "poetic meaning" thus:

> The poet's eye, in a fine frenzy rolling,
> Doth glance from heaven to earth, from earth to heaven,
> And, as imagination bodies forth
> The forms of things unknown, the poet's pen
> Turns them to shapes, and gives to airy nothing
> A local habitation and a name.
>
> *Midsummer Night's Dream*, ACT V, SCENE 1

Much of Shakespeare's poetry will pale in its beauty without the power of his dramatic diction. The same argument applies to other forms of dramatic and poetic work. The content of poetry is intimately bound up with its form—the verse, the melody, the rhythm. These prosodic and poetic elements are an integral part of reading works of poetry. It is also likely that poetry, as a form of art, follows a set of rules characteristic of presentational symbolism as compared with the discursive symbolism of language in prose, through which historical, philosophical and scientific materials are expressed (Langer, 1960). Langer (1953) speaks of poetry and literature generally as an "illusory experience" and this artlike and childlike quality in language perception and usage is one that teachers should sensitize children to through storytelling, games and play activities. It is "doing things with words" and the use of language and how it affects its user (pragmatics) that we should encourage (Bruner, 1975, 1978).

This prosodic mode of meaning is well discussed by Firth (1958). He points out that poets do not have the monopoly on this form of meaning. "Whenever a man speaks, he speaks in some sense as poet. Poets have often emphasised that a great deal of the beauty and meaning of the language is in the sound of it" (p. 193). This beauty is achieved through the use of alliterations, assonance, onomatopoeic words and other prosodic devices. Firth drew attention to the effect of putting together words not usually associated with each other as at a high level of meaning. This he calls collocative meaning, which is a creative expression of the writer. We can call to mind Dr. Samuel Johnson's comment on the metaphysical poets that they "yoked heterogeneous ideas by violence together." John Donne, for example, compared the constancy of lovers to a pair of compasses, in which one point of the compasses is at the center while the other always revolves round it within a constant locus. The heteroge-

neous idea is an act of creation in which the poet sees the familiar element in the strange, and the strange element in the familiar. Thus, the speaker/writer and listener/reader need to enter into the spirit of the context of the discourse.

The shared linguistic context is less evident in reading written text. Readers must rely on the framework (content and style) set by the author. In interpreting words, sentences and paragraphs, they must bring their previous knowledge to bear on new knowledge and to the task of integrating both. Some examples may be cited. In reading Thomas Gray's "Elegy Written in a Country Churchyard" for the first time, students may well appreciate the line "the curfew tolls the knell of parting day. . . ." They may just as well read the line as "the curlew tolls the knell of parting day" if they know only the words. Thus the shared linguistic context is both *referential* and *metalingual.* It is referential in that the context tells us something. It is metalingual in that we need to enter into the code, the register the poet is using. Other examples of knowing the code are reflected in bringing to focal awareness what we think we know. Thus Carroll (1972, 1977) has emphasized that reading and reading comprehension be considered in the light of general language comprehension and the student's general cognitive maturity. The three levels of reading skills, language competence and cognitive ability are all related and represent the "developmental parameters" of reading comprehension (see Chapters 6 and 10). The empirical aspects of the reading-auding relationship will be developed in Chapter 10 when comprehension is discussed.

A Wider Range of Reading Tasks

When we use the broader definition of reading as interpreting symbols, we should be alert to other modes of representing meaning. We will attempt only a sketch of some of these other modes of communication that may fall within literacy acquisition. Of relevance to this section is our discussion of the analysis of the child's task of learning how to read and its relation to the development of the English writing system in general (Chapters 4 and 5 in this volume).

Some of the graphic systems of communication are outlined by Clark and Woodcock (1976). The Blissymbolics, for example, are suggested as useful for severely handicapped children learning to read. The originator Charles Bliss (1965) proposed his semantography as a system of representing meaning graphically. Vanderheiden and Harris-Vanderheiden (1976) educed some evidence for the use of this system with severely handicapped individuals. Sign language with its system of a sequence of signs in English grammatical order provides a further venue for research into the relationship between structure and function of one form of language and the extent to which this form relates to or differs from spoken language. A variant form, American Sign Language (ASL or Ameslan) has been the subject of intensive studies (e.g. Bellugi and Klima, 1975; Stokoe, 1972). Bellugi and Klima did not find support for the popular notion that signs are processed more in terms of meaning; they found that signs are highly encoded units. Of the more than two thousand signs in the first dictionary of Ameslan (Stokoe, Casterline, and Croneberg, 1965), many are arbitrary rather than iconic or, if once iconic, have lost much of their iconicity. Tweney and Heiman (1977) found from their experiments that grammatical structure plays the same functional role in sign language as in spoken language and that it is possible that the same general cognitive capabilities underlie representations in visual or auditory modes (see also Klima and Bellugi, 1979).

In turning to the reading of pictures, we may ask if picture literacy is analogous to reading comprehension. There is a vast body of research on the perception of pictures (see N. Goodman, 1968; Hagen, 1974 for different views). Sigel (1978) defines a picture as any two-dimensional representation, which can vary in: (1) the details presented (e.g. portrait or sketch), (2) the levels of representation; and (3) the spatial perspectives (e.g. flat or three-dimensional) presented. He suggests that comparable cognitive processes are involved at the deep level in both picture comprehension and literacy, although different rule systems are involved. In children, the awareness that a picture is not a replica of a referent but a representation, and that pictorial representations are similar to but different from objects represented, is a cognitive achievement that evolves gradually. "This achievement necessitates mental coordination on the part of a child of two apparently unrelated events" (Sigel, 1978, p. 103). This achievement is a function of development and reflects cultural and subcultural influences. This achievement is brought about by acquiring knowledge through various developmental epochs in visual, motor or haptic modes. These different modes may alter the form, but not the underlying meaning.

Wolf (1977) actually compares the perception

of aesthetic work to a kind of skilled reading. As fluent readers use different cues—grapho-phonological, syntactic and semantic—to interpret the printed page, so aesthetic perceivers use different *notational* systems like rhythm, harmonic sequences, tone contrasts, perspectives and other structural devices. Some symbol systems are more notational than others and are syntactically more discrete and better articulated (e.g. writing systems). Drawing on eye-tracking studies during picture reading, Kolers (1973c) explains some of the different rules in interpreting pictures. In general, pictures are semantically interpretable but are syntactically amorphous. Sentences abide by certain grammatical rules and the relational aspects of words are important. Pictures are not just read holistically or immediately as a Gestalt, but also read over time, much as written words are read. Kolers (1973c, p. 38) suggests that an important difference between reading pictures and reading words is based not on the supposedly simultaneous processing of the one and the supposedly serial processing of the other, but on "the presence and absence of rules governing construction of the item and complementary rules governing interpretation." He goes on to say: "Pictures are freely open to many interpretations because they are rich in semantic information, but deficient in syntactic regularities; any part can be seen as 'modifying' any other. Sentences are more constrained by the rules of syntax, and notations are even more constrained" (pp. 38–39). Kolers also makes the important point that, in relating the reading of written words, children should be taught something about the idea of representation itself and the role of symbols in that process. What Kolers has stated as an experimental psychologist, psycholinguists and other psychologists including the present authors have emphasized variously as language awareness, cognitive clarity and reading as reasoning (see Chapter 6). Researchers and practitioners need to help children to *discover* what reading is, what it is for, and the joy it can bring to them.

What about the reading of maps, graphs and other forms of visual symbols that children encounter in schools? This is part of the much larger philosophical issue of symbolic or abstract space and spatial experience that theorists like Cassirer (1944), Werner and Kaplan (1963), Piaget and Inhelder (1956); Piaget, Inhelder, and Szeminska (1960) have grappled with. Cassirer (1944) has sought to understand the fundamental form of human culture and has discussed the abstract knowledge of space and spatial relations at different levels: organic space, perceptual space and symbolic space. Werner and Kaplan (1963) discussed development in terms of differentiation and subordination of parts to the whole. They made an important point (from the developmental-educational perspective) that the child should be helped to move from reacting-to to knowing-about. Knowing-about progresses from the sensorimotor through the perceptual to the contemplative levels of development or from concrete to abstract knowledge of the world. Piaget and Inhelder (1956); Piaget, Inhelder, and Szeminska (1960) deal with perceptual-scale space. Their main concern is the development of the child's knowledge of space as a geometric entity culminating in a Euclidean image of the world.

Against this background of philosophical investigation of abstract, representational space, Hart and Moore (1973), a geographer and a psychologist, and Downs and Stea (1973, 1977), a psychologist and a town planner respectively, have made conceptual and empirical contributions to *knowing* our everyday spatial environment. Hart and Moore show how children develop their frame of reference of spatial environment (e.g., homes, schools, shops and so on). The researchers emphasize five domains of development: (1) *levels* of organization of spatial cognition (sensorimotor, preoperational, concrete, and formal operations); (2) *types* of spatial relations (topological, projective and Euclidean); (3) *modes* of representation (enactive, iconic and symbolic), (4) *systems* of reference (egocentric, fixed and coordinated) and (5) *types* of topographical representations (route and survey). Thus, knowing one's spatial environment and solving spatial problems involve some basic problems of cognition itself. Starting from their own actions and explorations, children move through the egocentric system to a coordinated system akin to a spatial map and organize their spatial world in an integrated representation. Downs and Stea (1977, p. 6) conceive of this development in terms of cognitive mapping, which is "an abstraction covering those cognitive or mental abilities that enable us to collect, organize, store, recall, and manipulate information about the spatial environment." Cognitive mapping is both a product and a process and it is also a cross section representing the world at one instant in time. Cognitive mapping enables us to organize and manipulate our knowledge of the world and to get from here to there. This question of spatial problem solving was recently investi-

gated by Hardwick, McIntyre and Pick (1976) in first-graders, fifth-graders and college students. The qualitative differences in mental manipulation of cognitive mapping is interpreted as a two-stage operation. There is a stage of transformation applied to ordinal spatial relationships and a stage applied to specific relationships between self and spatial layout. Both stages of the manipulation sequence are required for successful cognitive mapping. Also, such accurate mental manipulation is found to increase with age.

Skill and Knowledge

In the preceding sections we have discussed reading via the listening mode, reading maps and presentation forms such as poetry and pictures. The question may be raised about the relevance to reading in the conventional sense. Our central concern in these sections is less with the practice of the alternative modes of reading. We are more interested in other forms of print media representing knowledge. Knowledge here is interpreted as an activity, a process of knowing. There are many forms of media which are variant modes of symbolic representations that we have not discussed. The wide-ranging work *Media and Symbols: The Forms of Expression, Communication, and Education* (Olson, 1974) bears testimony to the diverse ways in which different media, both print and nonprint, may be utilized in literacy acquisition. The contributors to that volume have critically examined the potentials of prose, pictorial, electronic and other media and also direct experience in improving children's learning and in relation to different intellectual purposes. Take, for example, popular television programs dealing specifically with teaching children the patterns and values of "the literate society"—"Sesame Street" and "The Electric Company." These programs are an example of the "desanctification of print" and attempt to promote literacy through the electronic medium. "The Electric Company" is more specialized than "Sesame Street" and deals specifically with reading or the systematic relationship between print and speech. But, by their very forms and contents, these alternative modes of literacy acquisition are generally thought to deal only with one level (generally a low level) of literacy. The higher integrative levels are achieved through reading print (prose) itself.

If reading is accepted as reading for meaning, and if the highest level of comprehension involves logical propositional thinking and general reasoning, then reading also goes beyond simply interpreting the printed page. In their *Psychology of the Child,* Piaget and Inhelder (1969, p. 90) reiterate that "language does not constitute the source of logic but is, on the contrary, structured by it. The roots of logic are to be sought in the general coordination of actions (including verbal behavior), beginning with the sensorimotor level, whose schemes are of fundamental importance. The schematism continues thereafter to develop and to structure thought, even verbal thought, in terms of the progress of actions, until the formation of the logico-mathematical operations." They emphasize the unity of diverse manifestations of "semiotic functions" of imitation, symbolic play, drawing, mental images, and language in the developing child. Although Piaget and associates have not discussed reading in their developmental theory, other developmental psychologists of the Genevan persuasion have emphasized that reading, language, and symbolic representations have a common source rooted in cognitive structures (e.g. Furth, 1978; Murray, 1978). The School for Thinking of Furth and Wachs (1974) for children aged between five and seven years treats reading within an overall thinking atmosphere. The recent position of Piaget (1976) seems to indicate that perception is not the basis of understanding and that children move from a perceptually dominated world to one of conceptual understanding through a process of construction. Insofar as we can relate this to reading, our emphasis on the interactive model of reading (Chapters 6, 9 and 10) seems to come close to this active, integrative process. Our elaboration in Chapters 2 and 3 on reading as *a* skill and on principles of skill acquisition has consistently emphasized *understanding* the *integration* of a complex set of processes—cognitive, attitudinal and manipulative. The attainment of this complex skill is facilitated by positive affective factors (Chapter 11), supportive home background (Chapter 12) and stimulating school environment (Chapter 13).

Reference to skill acquisition brings us to the slightly different views of learning through experience and learning through media of Olson and Bruner (1974). They explained knowledge and skill in this way:

> The set of features that are more or less invariant across different activities may be considered as the structural or invariant features of objects and events that constitute our *knowledge* about those objects and events. Similarly,