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Adult Literacy and Technology

Raymond S. Nickerson

Illiteracy among adults is a serious national problem in the United States and elsewhere. Attempts to alleviate the problem have worked only marginally well. Recently the Adult Literacy Initiative of the United States Department of Education convened a workshop to address the question of how technology might be used to teach reading, writing, and related skills to adults. This is the chairman's report of that workshop. It begins with an overview of the problem of illiteracy among adults. There follow discussions of what it means to be literate, of considerations pertaining to the teaching of literacy, of how technology relates to literacy, and of some possible ways in which technology might be used to facilitate the teaching of reading, writing, and related skills. Several specific recommendations are made regarding the exploitation of these possibilities.

1. OVERVIEW

Adult illiteracy is a serious national problem. Its precise magnitude is difficult to estimate, but there can be no doubt that it is large. It represents an enormous cost not only to the individuals who cannot read or write but to society as a whole. The problem is disproportionately represented among the population, and is most prevalent among disadvantaged or socially alienated groups. Attempts to remediate the problem — of which there have been many — have been only marginally successful.

In recent years, research has yielded new insights regarding reading and writing as cognitive processes. Also during the recent past, technology — and in particular information technology — has been advancing very rapidly. Together, the new research-based perspectives on literacy and the potential that information technology has for instructional uses offer hope for the development of more effective approaches to the problem.

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2. THE PROBLEM

2.1 Some Statistics

The incidence of illiteracy among adults in the United States has proven to be difficult to quantify, but estimates have gone as high as almost half the adult population (Hunter & Harman, 1979). Perhaps the most widely cited statistics derive from the Adult Performance Level (APL) study, which was conducted by the University of Texas at Austin in 1975. According to this study, 23 million American adults are sufficiently illiterate to have great difficulty functioning in our society, while an additional 40 million function, but not proficiently (Adult Performance Level Project, 1977). Assuming that the percentages have remained constant as the population has grown, the 23 million would have gone to 27 million, the 40 million to 47 million, and the total to 74 million by 1983 (Department of Education, 1983).

Both the methods and conclusions of the APL study have been challenged (Cervero, 1980; Griffith & Cervero, 1977) but the criticisms have not received as wide attention as the study report, and one finds the figure of 23 million being quoted widely without question both in professional journals and in the press. It is not necessary, however, to accept the numbers from the APL study without reservation to believe that the problem of illiteracy in the United States is a serious one.

The National Academy of Education's Committee on Reading (Carroll & Chall, 1975) used one in twenty as the percentage of U.S. adults who have not attained "minimum" literacy and one in two or three as having less than a twelfth-grade literacy level.

According to a study conducted by the National Assessment of Educational Progress, only about half of the country's 17-year-olds can write a wholly satisfactory piece of explanatory prose and only about 15 percent can defend a point of view effectively with a persuasive argument (NAEP, 1981).

A recent study of the Chicago public school system revealed that nearly half of the 39,500 students who were freshmen in 1980 failed to graduate and that only about one-third of those who did graduate could read at or above the national twelfth grade level (Tugend, 1985).

Over one quarter of the Army's enlistees are sent to remedial reading class to acquire sufficient reading competence to be able to read training manuals written for the seventh-grade reading level (Norton, 1982).

According to a fact sheet from the 1979 White House Conference on Library and Information Sciences, the literacy rate of the United States is lower than that of Western European nations and the Soviet Union.

While such figures are shocking, they fail to portray adequately either the complexity of the problem or the enormity of the challenge it represents for the nation. A particularly troublesome aspect of the problem is the fact that people lacking literacy skills are disproportionately represented among disadvantaged minorities, the unemployed, the poor, and the disaffected.

According to the APL study, an estimated 13 percent of all 17-year-olds in the U.S. are functionally illiterate, whereas for minority youth the figure may be as high as 40 percent (Adult Performance Level Project, 1977).

According to U.S. Department of Labor estimates, people who lacked basic reading and writing skills accounted for about 75 percent of the unemployed in 1982 (Toch, 1984).

Over one-third of the mothers receiving Aid to Families with Dependent Children are not literate (U.S. Department of Education, 1982).

Eighty-five percent of the juveniles who appear in court are not literate (Adult and Continuing Education Today, 1983).

An estimated 60- to 80-percent of prison inmates are functionally illiterate (Boorstin, 1984: *U.S. News & World Report,* 1982).

2.2 Whose Problem is Illiteracy?

Illiteracy is everybody's problem. It is the problem of the person who lacks literacy, because it limits one's ability to compete in the workplace, it narrows one's options for communication and information acquisition, and it impoverishes one's intellectual life in numerous ways. It is the problem of local, state, and national governments, because it represents a cost to taxpayers and necessitates the maintenance of various programs to provide for people whose job opportunities are severely limited. It is the problem of institutionalized education, because a high incidence of adult illiteracy is stark evidence of failure of the educational system as a whole. It is the problem of society in general, because it promotes the kinds of inequities that fuel social conflict, disorder, and discontent.

Illiteracy is a fundamental and profound problem to the nation, because only to the degree that its citizens are sufficiently well informed

to participate meaningfully in the political process, which means being able to understand political issues and to evaluate arguments that are made with respect to them, can a democratic society expect to survive and prosper.

The ability to assimilate new information and acquire new knowledge and skills is a critical one in any society, but especially in one that is undergoing rapid change as a consequence of technological innovation. The person who cannot read or write is deprived of a major avenue of learning and is at risk in such a society. A society that tolerates a high incidence of illiteracy among its populace is itself at risk in today's complex world.

2.3 Literacy and Employment

The point was made that illiteracy limits one's ability to compete in the workplace, and so it does. We want to be sure that this assertion is not misinterpreted. It is a small step from the identification of illiteracy as a cause of unemployability to the conclusion that a high rate of illiteracy represents a negative impact on the Gross National Product by effectively keeping some people out of the labor force. It is important to keep two issues separate here. We do not assume that universal literacy would necessarily lead to full employment. If job opportunities are limited by demand for literate labor rather than by supply, increasing the supply will have little effect on the unemployment rate. For the individual, however, literacy can indeed make the difference between being able to compete effectively for available jobs and being completely out of the running.

Levine (1982) has challenged the legitimacy of increased employment opportunities as the major motivation for attempting to acquire skills of literacy. He points out that the low levels of literacy that have often sufficed to qualify as functional are not likely to enhance greatly one's employability. What may be a more effective motivator, he suggests, is personal pride:

> a lack of competence in reading and writing, exemplified by the inability to comprehend printed materials in common use, by misspellings and grammatical errors, earns negative social esteem or a stigma. In most industrial societies, this stigma is pervasive and damaging, and many adults desperately seek to master literacy not merely in the hope of employment, or solely for its obvious practical utility, but partly in order to gain or preserve esteem among family and peers (p. 259).

While we acknowledge the significance of personal pride as a major factor in motivating the acquisition of literacy — as well as many

other types of skills — we believe strongly that the practical desire to increase one's job opportunities is also a common and legitimate reason for wanting to learn how to read and write. But that there is a risk of encouraging false hopes by promoting the idea that small increases in literacy will invariably lead to major enhancement of vocational or economic status is a point well taken. For most people who are functionally illiterate, the kinds of improvements necessary to increase job opportunities significantly will probably involve a rather considerable effort over an extended period of time. Unrealistic expectations resulting from failure to acknowledge this fact may go some way toward accounting for the very high drop-out rate that often plagues literacy training programs (Carroll & Chall, 1975).

Failure to assess realistically not only the time and effort required to increase literacy significantly but also the level of literacy essential to acceptable performance in many jobs may be at the root of difficulties with federally funded job training programs. Such programs (MDTA, CETA, and now JTPA) have been plagued by high attrition rates during training and unimpressive rates of continued employment by those trainees placed on jobs after completion. In addition to a job training component, most of these programs have a much smaller basic education component, in recognition of the lack of basic skills among the target group out of which trainees are usually recruited. Most of the occupations for which training programs have been developed require at least a seventh-grade reading level and a working knowledge of fractions, decimals, and often some algebra and geometry.

This combination of factors creates a catch-22 situation. Requirements for success in the program and on the job exceed the abilities of many of the trainees. The basic-skills component of programs typically is not of sufficient duration to prepare these students adequately for the job-training component. Even if adequate basic-skills components were included, it would be difficult to maintain student interest and motivation for the hundred hours or so of classroom time typically needed to raise a student one grade level in reading using traditional methods. If federally financed job-training programs are to be successful, more time-effective methods for teaching the basic skills of literacy must be used.

2.4 Need for New Approaches

The problem of illiteracy has proven to be a particularly recalcitrant one. Lack of significant progress on it is not the result of lack of attention. The "reading problem" has been a major concern of the Federal

Government at least since James E. Allen Jr. focused attention on it by initiating the Right to Read program while he was U.S. Commissioner of Education in the early 1970's (Allen, 1970). The problem has been widely discussed by the media for years. Numerous literacy training programs have been established at national, state, and local levels. Weber (1975, p. 147) points out that

> in the 1960's, at least ten major federal agencies were authorized by nearly 30 laws to teach reading to adults (Greenleigh Associates, 1968), while more than 600 nongovernmental agencies were engaged in adult basic education (Cortright and Brice, 1970).

A national guide to literacy facilities and services published by the Contact Literacy Center (Kadavy, Moore, & Hunzeker, 1983) lists 39 national literacy programs and several thousand state-level resources.

In spite of these facts, formal adult literacy programs are reaching only about 2 to 4 percent of the population in most serious need of them, according to Hunter and Harman (1979). The search for effective approaches to the problem continues. In September 1983 President Reagan announced an Adult Literacy Initiative, which was to contain the following eight elements: a national awareness campaign, a national adult literacy project, establishment of state and local adult literacy councils, funding of college work-study adult literacy programs, provision of college credit for literacy tutoring, networking of Department of Education units involved in literacy training, establishment of a program to involve federal employees as literacy tutors, and establishment of a Department of Education liaison with volunteer and private sector groups (Office of the Press Secretary, The White House, 1983b).

Very recently, the Librarian of Congress, Daniel Boorstin (1985), called on the Federal Government and the private sector to set as a national goal the abolition of illiteracy in this country by 1989, the bicentennial year of the Constitution.

> There would be no better manifest of our determination to fulfill the hopes of our founders and justify the faith that a free people can provide themselves and their children with the knowledge that will keep them free (p. 27).

Boorstin's challenge was made in a report from a study commissioned by Congress on the role of the book in the society of the future.

In view of how difficult it has been to make significant headway on the problem of illiteracy in the past, the goal of abolishing illiteracy during the next few years is an enormously ambitious one — even assuming that it is clear what the abolition of illiteracy means. While we wholeheartedly endorse this goal, we believe that there is essen-

tially no possibility of realizing it, or of coming close to doing so, unless (1) very substantial national resources are committed to its attainment, and (2) methods of teaching literacy are developed that are more effective than those that have been used in the past.

2.5 Some New Perspectives

Fortunately, there is reason to believe that the prospects of developing more effective techniques for teaching literacy are greater now than heretofore. Much has been learned about reading and writing processes as a consequence of research in recent years. While this research has led to a greater awareness of the complexity of these processes — and especially their cognitive aspects — it has also provided the basis for a better understanding of various impediments to literacy and what might be done to address them.

Writing has probably always been viewed as an active, creative process. In contrast, reading was once viewed as the relatively passive process of extracting meaning from print. It was assumed that one did this primarily by recognizing the printed representations of words. The meanings of sentences were determined by the meanings of the words that comprised them, so if one recognized the words and knew their meanings, comprehension followed. The situation is now known to be far more complicated than this. To be sure, the meanings of sentences are determined by the meanings of words that comprise them; but it is equally true that the meanings of the words are highly dependent on the contexts in which they occur. And sentences, in turn, derive their meanings, to a large degree, from the extrasentential contexts in which they are embedded.

Reading now is viewed as a process of imposing meaning on print as much as one of extracting meaning from it (Adams, 1980; Anderson, Spiro, & Anderson, 1978; Bransford & Johnson, 1973; Collins, Brown, & Larkin, 1980; Rumelhart, 1980; Spiro & Stein, 1980). This is not to deny the importance of decoding skills but simply to recognize that reading is a process that depends heavily on knowledge of various types that the reader brings to the task: knowledge of linguistic conventions, of the specific topic, of the world in general, of the writer's (assumed) purpose and intended audience, of the genre of the written material, and so forth. Comprehension is not an either-or affair, but a matter of degree.

The current view of reading also recognizes the latitude readers have to approach a reading task in a variety of ways, to read for different purposes, and to monitor and manage consciously their reading behavior. Various techniques have been studied for facilitating

comprehension, and retention. Numerous studies have addressed the question of how competent readers differ in their approach from less competent readers. Much of this work has focused on strategies and metacognitive variables, and has been motivated by an interest in obtaining information that could be used to help improve the comprehension skills of less able readers.

2.6 A Challenge for Technology

It is in this context of a widely recognized national problem of major proportions that has not yielded to conventional solutions, and of a growing body of research findings relating to literacy and its development, that the question of the potential applicability of technology is raised. Does technology have anything of value to offer toward the rectification of the current situation? Might it help to address the problem of too few tutors by making the services of effective tutors available to more people or by opening new possibilities for self-tutoring? Can technology be the basis for the development of tools that will enhance the effectiveness of tutors? Does it have the potential to support the development of qualitatively different cost-effective training techniques? Might it help address the problems of motivation and commitment? Can it be used to provide greater flexibility with respect to time and place of training?

These are the kinds of questions that come to mind as we begin to think about the possible roles of technology in literacy training. The purpose of the workshop from which this report comes was to consider such questions with the intention of identifying some possibilities for applying technology to literacy training and of recommending some specific courses of action.

While this report focuses on the United States, we recognize that illiteracy is an international problem and an especially severe one for the third world, where in many countries the incidence is greater than 50 percent. We note in passing that increasing literacy worldwide has been a continuing goal of UNESCO (Blaug, 1966) and, indeed, is viewed by that organization as a fundamental human right (Blataille, 1976). Although it would be unwise to assume that approaches developed for application in the United States will be equally suitable for use elsewhere, it seems reasonable to expect some degree of transferability from one context to another.

LITERACY

3.1 What is Literacy?

In the most general terms, literacy might be considered to be proficiency in the production and interpretation of symbols that are used for purposes of communication within one's culture. In its narrowest use, it connotes the ability to interpret print and to write — ability with letters, to be quite literal about it.

But even with the narrower connotation, one is left with a sense of uncertainty about what being literate really means. Does it mean being able to write one's name, to fill out an application form, to read well enough to pass a driver's test, to read and understand a newspaper, to write a business letter, to express oneself grammatically and effectively, to read technically complicated material comprehendingly, to use language with a high degree of skill and competency? Sometimes the term literate is used to mean "well read" and, in particular, well read with respect to "literary" works. There are many people who can read the newspaper, who would not be considered literate by this definition.

Perhaps the least debatable observation that we can make about literacy, as the term has been used in the past, is that its connotation has changed considerably over time. It also has varied from place to place. In Scribner's (1984) words, "literacy has neither a static nor a universal essence." Until fairly recent times the primary evidence of literacy in the United States was the ability to write one's name (Clanchy, 1981, Resnick & Resnick, 1977). In the 1940 U.S. Census it was assumed that anyone who had completed the fourth grade could read (Graham, 1981); more recently the Bureau of Census criterion for literacy has been completion of six years of schooling. Bormuth (1975) has criticized the practice of defining literacy this way on the grounds that test results provide little evidence that the completion of a few years of schooling guarantees any given degree of literacy at all. In very recent years the idea of what it means to be literate has been expanded to acknowledge the role of higher-order cognitive skills in reading and writing, and increasing emphasis has been placed on the importance of determining what is needed by way of literacy skills to permit one to function in modern society.

If we define literacy as the ability to read *comprehendingly,* we must recognize that it is a gross oversimplification to think of the world as being populated by two classes of people: those who are literate and those who are not. The reality is much more complex than that. Literacy is a matter of degree. Moreover, a given individual may

be highly literate with respect to some knowledge domains, and relatively illiterate with respect to others. The fact that one can read comprehendingly about cooking or astronomy does not provide good evidence that one can do so also about biology or sports.

One can easily extend this line of reasoning to the conclusion that we are all illiterate with respect to many, if not most, areas of human knowledge. There is a thought here that is worth pursuing, but it would be a digression from the main focus of this report. For the most part, it will suit our purposes to think of literacy as the ability to read comprehendingly material that has been written for non-specialist readers or "general audiences," which is to say what one typically finds in newspapers and popular magazines, and to have sufficiently good writing skills to compose such things as a narrative description of one's work history, an opinion on a topic of personal interest, or instructions for an activity with which one is familiar.

3.2 The Concept of Functional Literacy

It was noted above that definitions of literacy have increasingly emphasized the importance of reading and writing in permitting one to function in society. The term "functional literacy" is frequently encountered in the educational literature and in the popular press, but what it is supposed to mean is not always clear.

Gray (1956, p. 24), in a widely distributed report of a survey sponsored by UNESCO, spoke of a functionally literate person as one who has "the knowledge and skills in reading and writing which enable him to engage in all those activities in which literacy is normally assumed in his culture or group."

A definition in a recent White House press release goes as follows: "the possession of the essential knowledge and skills to enable an individual to function in his or her environment — at home, in the community, in the workplace" (Office of the Press Secretary, The White House, 1983a). This is similar to Hillerich's (1976, p. 53) definition of literacy as "demonstrated competence in communication skills which enables the individual to function, appropriate to his age, independently in his society and with a potential for movement in that society."

Unfortunately, definitions that refer to one's ability to function in one's environment are not very helpful apart from an explanation of what is meant by "function" in this context. It is apparent that, in some sense, many people who lack literacy do, in fact, function in modern society. They hold jobs, pay taxes, raise families, and "get by."

The following definition, offered by the Coalition for Literacy, gives one indication of what might be meant by functioning: "the ability to complete the basic tasks necessary to function in today's society, such as reading and comprehending written directions, labels, applications, street signs, safety instructions, and job information" (Coalition for Literacy, undated). Again, one is left with less than closure, however, because of vagueness regarding what it means to comprehend. Clearly, comprehension is not a binary affair — we comprehend to different degrees, and what constitutes adequate comprehension for practical purposes varies with the context.

Guthrie and Kirsch (1984) have argued that the traditional view of literacy is an oversimplified one involving the assumption that literacy is a unitary capability — that there is only one kind of literacy — and the assumption that a person either has acquired it or has not. They defend the view that literacy, and in particular reading ability, is conditioned by the social context — including the reader's expectations and purposes — in which it occurs. Different social contexts imply different types of reading demands. It follows that an individual could be literate for some purposes, while not for others; and whether one was judged to be literate or illiterate could depend on the evaluation technique.

It is somewhat ironic that while the major indicator of literacy was for many years the ability to write one's name, most recent discussions of literacy have focused primarily on reading. In Clifford's (1985, p. 478) words: "Dominant conceptions of functional literacy stress reading competencies of a certain kind and relatively ignore writing." To be sure, one cannot be literate without being able to read. However, the ability to write is also part of being literate and there is some concern, legitimate we believe, that writing has been undervalued by many literacy-enhancement efforts, judging from the attention it gets relative to what reading receives.

Levine (1982) has taken a somewhat cynical view of what he sees as a disproportionate emphasis on reading and lack of attention to writing in functional literacy programs. The ability to read well enough to interpret instructions, labels, and signs has limited capacity, he notes, to help the possessors of such skill to remedy such problems as unemployment, low pay, or inadequate housing. Such limited abilities, he suggests, are representative of the

> types of communication generally intended to elicit passive behaviors or to encourage conformist responses that reproduce or further institutionalize existing social arrangements. It appears that a functional competence has been defined so that it is merely sufficient to bring its possessor within the

> reach of bureaucratic modes of communication and authority.... Writing, in all but its most rudimentary forms, is omitted from existing conceptions and operationalizations of functional literacy. Yet it is, on the whole, writing competencies that are capable of initiating change. Writing conveys and records innovation, dissent, and criticism; above all, it can give access to political mechanisms and the political process generally, where many of the possibilities for personal and social transformation lie (pp. 261-262).

The authors of the 1975 report of the National Academy of Education's Committee on Reading (Carroll & Chall, 1975) dismiss the claim that the teaching of reading is a form of political subjugation and argue that:

> the simplest, and to us, the most pervasive argument for literacy is that an individual cannot fully participate in modern society unless he can read, and by this we mean reading at a rather high level of literacy. The options available to a nonliterate person, or even to a person with "minimum literacy," are much more limited than those available to one who can read, and read *well,* at the twelfth grade level of difficulty or higher (p. 9).

We note the emphasis here on the importance of being able to read *well, at a rather high* (e.g., twelfth grade) *level,* which the authors of the report define operationally as: "roughly, the ability to read with understanding nearly all the material printed in a magazine like *Newsweek*" (p. 8). They see attainment of this level of literacy by all adults as a meaningful national goal. Carroll (1974) justifies such an ambitious goal by noting the widespread use of print in our culture and the fact that some of the ideas people are expected to be able to handle are of sufficient complexity as to require language of twelfth-grade reading difficulty for expression.

If we accept this view, we seem to be obliged to acknowledge either (1) that functional literacy should be defined in considerably more ambitious terms than it typically has been in the past, or (2) that if we accept a lesser criterion for functionality, we must conclude that functional literacy is not an adequate goal. In either case we recognize that an appropriate level of aspiration for a serious attack on the problem of adult illiteracy goes considerably beyond giving people the ability to interpret instructions, labels, and signs — which is not to deny the importance of being able to do these things.

To some readers of this report, a twelfth grade reading level may seem to be an unreasonably ambitious goal to set for adult literacy programs. It must be viewed, however, in light of the fact that ours is an extremely print-oriented society, in spite of the heavy usage also of other communication media. Using census and index data from various sources covering the period from 1962 to 1977, Pool (1983) has

estimated that the number of words read from print media per day by an adult in the United States averaged about 10,000 over that time. (Pool's figures show the number decreasing from about 11,000 in 1962 to about 8,500 in 1977.) Given that (according to estimates we have already considered) a significant fraction of the adult population reads little if anything at all, we must assume that the average for those adults who do read is probably somewhat higher than Pool's figures indicate. But even 10,000 words is rather a lot — about 40 pages of typed text (double-spaced on 8 1/2″ × 11″ paper). If anything close to this is what the average literate adult in our society reads, day in and day out, it is easy to understand how the ability to read at no better than a fourth- or sixth-grade level could put one at a serious disadvantage with respect to functioning effectively in mainstream activities — vocational or social — of modern-day life.

Moreover, setting a relatively high goal for literacy training is the obvious answer to those critics of literacy programs who have seen them as increasing people's susceptibility to manipulation by the government, business and other users of the printed word. As Clifford (1985, p. 496) wryly observes:

> If literacy has been demeaning as often as empowering, as the Left sometimes contends, and if the literate are only semi-literate because they have failed to learn the fuller ranges of the values of literacy, as the intelligentsia believes, the only solution seems to be more literacy, of the expansive kind that has brought such insights and values to the critics' consciousness.

3.3 The Teaching of Literacy

How best to teach reading has been a controversial question among educators. Quite different ideas on the subject have prevailed at different times. Singer (1981) traces the history of the philosophy of reading instruction in the United States through several periods that emphasized first the alphabet method (in which reading was taught through a focus on the smallest unit of text, the letter), the whole word method, the phonics method, the sentence method and the language-experience method. He notes also that there has been some switching back and forth between methods.

Chall (1967) characterizes approaches that have been taken to the teaching of reading as falling on a continuum, the ends of which are represented by an emphasis on coding and decoding at one end and on meaning at the other. Both methods progress from easier to more difficult materials. The evidence is not clear regarding which of them has been more effective (Singer, 1981). Moreover one cannot assume that because one teaching method gives faster results initially that it will

be a better method as judged by longer-term results (Ruddell, 1968). Conclusions about the effectiveness of any method must be interpreted in light of the criterion measures by which effectiveness was assessed. Because a method is effective in increasing students' sight vocabulary, for example, it does not follow that it is equally effective in increasing reading comprehension.

One widely accepted conclusion about the teaching of reading that has come out of recent research is that much greater attention must be given to cognitive and metacognitive aspects of reading than has been true in the past. Increasing recognition of reading as a knowledge-based, constructive activity that involves the generation and testing of hypotheses, the imputation of purpose and intent, the interpretation of contextual clues to meaning, and a variety of other "top-down" processes, dictates the need for approaches to the teaching of reading that take these factors into account.

Reading ability and knowledge are increasingly recognized as mutually reinforcing and interdependent entities. Certainly, one of the most effective ways of acquiring knowledge in our culture is through reading; a person who is unable to read has a serious disadvantage with respect to knowledge acquisition. On the other hand, reading itself is a knowledge-dependent activity, and one's ability to read can be seriously impaired by an inadequate knowledge base. The more one reads, the more one is likely to know, which in turn will make it increasingly easier to read and thereby to learn. Conversely, the adult who cannot read is sure to have a limited knowledge base, which will tend to inhibit development of the very skills that would facilitate the expansion of what he knows.

Writing instruction, like reading instruction, has changed over the years. The earliest writing instruction focused on the mechanical aspects of the process — skills that we would now describe as penmanship. Later, the teaching of writing included grammatical topics, and required students to memorize and apply language rules. Throughout the twentieth century, writing instruction has alternately embraced and rejected such features as oral language exercises, creative expression, letter writing, patterning exercises, and literature as a model. On the other hand, sentence construction, paragraph development, and grammar have been constants in the major textbooks of the past several decades (Donsky, 1984).

In the recent past a new approach to writing instruction has crystallized and grown (Graves, 1983). While the underlying principles of this approach have roots in earlier textbooks (Baker & Thorndike, 1912; Burleson, Burleson, & Cash, 1952), there is a coherence to the

new view that may herald long-lasting changes. The focus of the "process" approach to writing is on the complex development of a piece of text. Students are encouraged to choose their own topics, go through multiple drafts of a piece, confer about their piece with both teacher and peers, share their compositions publicly when they are ready, and question one another's writing decisions. Reading instruction and writing instruction are seen as intimately and inevitably connected, and teachers are urged to participate with their students as both readers and writers. While there have not been many formal experiments comparing this approach with more traditional methods, reports from researchers, teachers, and students have been strongly positive (Gordon, 1984).

What little is known about the relative merits of various approaches to the teaching of reading and writing has been learned from studies of the acquisition of reading and writing skills by children, and its applicability to the problem of adult illiteracy is questionable. Adult illiteracy differs from childhood preliteracy in a variety of ways. The adult brings to the situation more extensive knowledge about many aspects of the world, different motivation for wanting to be able to read, different time constraints, and different status as a consequence of being unable to read or write.

One thing is apparent: the general approach that is followed in primary school of devoting the first year or two of reading instruction almost entirely to the teaching of basic decoding skills, and only after this phase gradually increasing emphasis on reading for the purpose of acquiring information from text (Singer, 1981), is unlikely to work well with adults. Methods must be used that get people quickly reading for information and writing for the purpose of communicating, because few adults are likely to continue in a program that devotes months to basics before developing skills that they can perceive as useful in their present daily lives.

Recognition of the interdependence of literacy and knowledge makes it clear that one cannot hope to develop either very extensively without paying some attention to the other. Perhaps of greatest relevance in the present context, however, is the fact that illiterate adults face the task of learning to read with a qualitatively different knowledge base than do preliterate children. Adults have some knowledge of the world by virtue of having lived in it for several years. It is important to recognize also that adults are very likely to have misconceptions about many aspects of the world. The desire for explanations is a deeply ingrained human trait; lacking better sources of explanations, we make up our own. The ability of adults to comprehend what

they are reading when they are beginning to learn to read is as likely to be limited by misconceptions that they bring to the task as by the lack of information. Programs to teach literacy to adults should be designed not only to take advantage of the knowledge about the world that they have, but also to be sensitive to the misinformation and misconceptions that they have as well.

3.4 Reasons for Learning to Read and Write

What would people who lack literacy skills want to read, if they could read? Surely, the answer to this question is that different people would want to read different things, and that it is therefore risky to design programs around specific material on the assumption that that is what people lacking reading skills would naturally want to read, if they could. It is also risky to assume that most nonreaders would be interested in reading what literate designers of reading programs themselves like to read, or even what the designers would like nonreaders to read. More efforts to ascertain what specific individuals who lack reading skills would read spontaneously if they could would be helpful. There is, of course, the possibility also that not all adults who cannot read have a strong desire to read anything.

Among the reasons why an adult who cannot read, or write, might want to be able to do so are the following: to pass a driver's test; to fill out an employment application; to read to children; to pass a GED test; to qualify for a job; to read and write letters; to follow a cooking recipe; to read the TV guide, a road map, food container labels, warning signs, directional signs, a menu, want ads, entertainment notices, a bus or train schedule, medicinal instructions, newspaper headlines, or training material. Anecdotal data suggest that one of the more common desires is a very old one, and one that was a major driving force behind the mass literacy movement that followed the Guttenberg breakthrough in technology some 500 years ago; namely, the desire to read the Bible. There is also the possibility, which — strangely — seems often to be overlooked, that some people who cannot read would like to be able to read widely for both information and pleasure.

Several investigators have attempted to identify various purposes for which people who can read do read. Some of the lists that have been proposed contain a dozen or more entries (Gray & Rogers, 1956; Miller, 1982). These include acquiring knowledge, editing reports, filling time, understanding current happenings, self-improvement, and satisfying personal, social or spiritual needs. Guthrie and Kirsch (1984) suggest that, to the degree that purposes for literacy are diverse, competency must be diverse also.

3.5 Literacy and Motivation

It is tempting to make a distinction between people who cannot read or write, but are highly motivated to learn to do so, and those who have little or no interest in becoming literate. While motivation is an issue that must be addressed, this distinction is probably an oversimplification in several ways. First, motivation is not an either-or affair; people are motivated to do things to varying degrees. We suspect that most people who cannot read or write would, if asked, admit to wishing they could do both. The practical question is whether the desire is strong enough, given whatever opportunities and disincentives may exist. Possible disincentives include such obvious factors as financial costs (of tuition, transportation, baby-sitting fees) and time away from other activities. They include also more subtle, but no less real, factors such as the prospects of change of status within one's peer group, anticipated changes in life-style resulting from being literate, and added responsibilities that come with new skills. The problem of motivation is a multi-faceted one and needs to be addressed with sensitivity to the fact that literacy, or illiteracy, exists within specific sociocultural contexts.

Closely associated with the question of how to motivate people to learn to acquire literacy skills is that of how to motivate them to use those skills once they have been acquired. We assume that there are many people who have acquired marginal reading and writing skills in school, who neither read nor write when they are no longer forced to do so, and consequently never become very proficient at either activity. This workshop did not address the question of whether technology might be applied usefully to the problem of motivating people with marginal literacy to read and write outside the instructional context, but we recognize this as a problem in its own right.

3.6 Literacy as a Cultural Variable

In thinking about literacy training programs, one tends to focus on the individual. It may be, however, that in at least some cases, the cultural group to which the individual belongs is a more appropriate focus for training. As Scribner (1984, p.7) reminds us, "the single most compelling fact about literacy is that it is a *social* achievement; individuals in societies without writing systems do not become literate." Many people in the United States who lack literacy skills live within subcultures that make little use of writing systems. Moreover, the meaning and role of literacy can differ among different cultural groups (Reder & Green, 1984).

Focusing on the group forces attention to such questions as what would literacy mean to the group as a group, and what would it mean to individuals vis-a-vis their roles and status within the group. The individual who is attempting to acquire reading or writing skills as part of a group activity is in a rather different situation vis-a-vis the group than one who is doing it as an individual apart from the group. It seems likely also that the two situations have different implications regarding the relationship of the individual to the group after the training goals have been realized.

It is perhaps too easy to overlook the possibility that, for a person who lives in an illiterate subculture, not all the consequences of learning to read and write are positive. If becoming literate requires acting independently of one's peer group, status with respect to that group is likely to change and not necessarily only in desired ways. On the one hand, the ability to read and write may give one an elevated, or leadership status. On the other hand, it can also put one outside the group, especially if literacy and its perceived implications for one's lifestyle are not valued by the group.

3.7 Summary

Literacy is a complex and fluid concept. It has meant different things at different times and in different contexts. Recently the emphasis has been on functionality; what kinds of reading and writing skills must one have to function reasonably — without significant handicap — in today's society. There seems to be a general agreement that the demands are greater today than in the past and that a level of competence that might have been viewed as functional a few decades ago would not be considered functional today. Arguments have been made that the appropriate goal for literacy training should be reading and writing competence at a twelfth grade level.

The relationship between literacy and knowledge is now recognized to be a strong and bidirectional one. One can neither read comprehendingly about a subject nor write substantively about it unless one has more than a superficial knowledge of it. Knowledge of linguistics and of the world in general also play significant roles in comprehension. This has implications for the teaching of literacy; in particular it points up the importance of attending to the more cognitive aspects of reading and writing in literacy training programs. It establishes also the importance of taking account of the specific knowledge bases that beginning readers and writers bring to their tasks.

People read and write for a multitude of purposes. Efforts to teach literacy must recognize this fact and deal with the likelihood that

different purposes may require somewhat different competences. The problem of motivation is viewed as a critical one and must also be addressed by literacy programs if they are to have a chance of being successful.

Finally, literacy is a cultural variable. People read and write in sociocultural contexts. Literacy or the lack thereof has implications for one's standing and roles within the group or groups with which one most closely identifies. Efforts to teach literacy that overlook its cultural aspects and implications run the risk of floundering because of unanticipated difficulties that have cultural origins. On the other hand, explicitly recognizing literacy as a cultural variable encourages the development of approaches that capitalize on the existence of the group and its communication functions to enhance the literacy skills of its members.

4. TECHNOLOGY AND LITERACY

4.1 Recent Trends in Technology

Technology has developed explosively in the past few decades. Information technology, in particular, has developed more rapidly than anyone could have anticipated, and has affected our lives profoundly in countless ways. By information technology we mean technology that is applied to the problems of representing, storing, processing, and transmitting information. It includes, notably, computer and communication technologies. To provide a context for considering how information technology might be applied to the problem of literacy training, it may be helpful to note a few of the major trends in this technology over the recent past.

The cost of computing hardware, per unit of computing resource (e.g., executed instruction), has been decreasing by from 15 percent to 40 percent per year for 25 to 30 years (Branscomb, 1982; Knowles, 1982).

The number of active element groups (logic gates or memory cells) that can be put on a single semiconductor chip has increased by roughly an order of magnitude every five years since 1960 (Phipps, 1982).

The speed at which computations can be performed increased by about 6 orders of magnitude over a period of 20 to 25 years.

The available computing power in the U.S. is increasing at the rate of about 40 percent per year (Branscomb, 1982).

As of 1984 there were an estimated six or seven million personal computers in U.S. homes (*Business Outlook,* 1984).

Given these trends and the fact that there is every reason to expect them to continue for the foreseeable future, we cannot lightly dismiss predictions that by 1990 microprocessor systems will be available for 100 dollars that have the computational power of the 1980's supercomputers (Lesgold & Reif, 1983). It is but a short step from this view of the future to that of Sutherland and Mead (1977), who have proposed that in figuring out how to use computer power to advantage in the future, we should begin to think of the hardware as being essentially free.

One especially salient prospect for the future is that of multimedia systems that will provide in one integrated system the capability of speech (both in and out), other audio, high-resolution graphics, facsimile, film, animation, and a variety of manual input modes. Such systems, especially when connectable to resource-sharing computer networks, should have great potential for applications in education and training.

Some observers have speculated that the further development of information technology and its application to education may change drastically not only the way educational services are delivered, but the institutions that deliver them. A recent report from the Secretariat of the Organization for Economic Cooperation and Development puts it this way: "The market is already lavishly supplied with video games, calculators, video recorders, and microcomputers with an educational character liable, unless something is done, to create a new sphere of 'education' outside the formal system" (Secretariat, 1984, p. 1).

A general effect of recent trends in information technology has been a rapid increase in the computing and communication resources that are available to the average person. These resources have the potential, we believe, to help address the problem of adult illiteracy, but it is a potential that remains to be developed.

4.2 Roles of Technology Vis-a-Vis Literacy

The implications of technology for literacy are somewhat paradoxical. On the one hand, radio and television have provided alternatives to reading as a major vehicle of entertainment and information acquisition; and the telephone has made us less dependent on writing as a means of communicating with other people at a distance. So there is a sense in which people today who can neither read nor write may be

less isolated, better entertained, and better informed than were their nineteenth-century counterparts. On the other hand, as a consequence of the effects of technology in the workplace, the literacy requirements for many jobs are considerably greater than they were only a few decades ago.

While the potential role of computers in education has been widely discussed in books, journal articles, conference proceedings, and the general press, relatively little has been said about possible applications of computer technology to the development of adult literacy. To be sure, the possibility that technology might be applied to this problem has not been entirely ignored. Among the questions Commissioner of Education Allen asked the National Academy of Education to address in 1969 was the following one:

> What technologies do we have, and what technologies do we need to design, to make universal literacy a reality, given the heterogeneity of the American population, and assuming the increasing availability of educational institutions other than the formal school system (Fischer, 1975, p. ix).

Among the actions suggested by the NAE Committee on Reading to increase adult literacy was the exploitation of "new developments in educational technology, such as programmed and computer-assisted instruction and 'talking typewriters'." The reason given for this exploitation was "the possibility of circumventing the problems of student motivation" that were seen to be "particularly acute" in adult literacy programs (p. 36).

Information technology can be used to address the problem of illiteracy in several ways. First, as we have already noted, it can and does provide alternatives to *print* literacy for acquiring and conveying information. The telephone, radio, and television are the most obvious examples of products of technology that supplement print as means of communication. The telephone makes it possible for us to communicate with others from a distance without knowing how to read or write. One can stay reasonably well informed about what is going on in the world through radio and television, again without print literacy. It is reasonable to expect that as information technology continues to evolve, additional and still more effective ways of acquiring and conveying information will be developed, and that many of these also will not require print literacy in order to be useful.

Second, technology could help bridge the gap between nonliteracy and literacy. It could facilitate the development of tools to help the nonliterate person manage print as a communication medium, at least to some degree. Speech-to-print and print-to-speech technologies, both of which are receiving a great deal of attention currently, are exam-

ples of aspects of information technology that have considerable promise in this regard.

Third, information technology has the potential to serve as an instructional medium to facilitate the development of literacy skills by those who lack them. It provides the basis for developing teacher aids and amplifiers, as well as self-instruction or learn-alone facilitators. Planning for the application of technology to literacy training should take account of what is likely to become available by way of computer and video hardware over the next few years. In particular, it should take cognizance of the expectation that the cost of computing resources will continue to decline into the foreseeable future and that these resources will be widely used by people in many aspects of daily life.

4.3 The Continuing Importance of Facility with Text

In looking to the future, it is difficult to predict how further technological developments will change the importance of being literate. Some developments, such as systems that understand and produce speech, may decrease the need for reading and writing ability in certain contexts. However, as more and more jobs are automated, the intellectual demands of those that continue to be performed by human beings are likely to increase. Moreover, as we have already noted, our conception of what it means to be literate may change as computer-based systems become increasingly common and more and more people regularly use them.

We assume that literacy, even defined in the narrow sense of facility with text, will continue to be extremely important for the vast majority of people into the indefinite future, and that technology is unlikely to change that basic fact. While it is true that information sources that do not require literacy have increased markedly over the last few decades, one can take advantage of only a small fraction of the many sources that exist if one is unable to read. This is likely to continue to be so for the foreseeable future. With the development and proliferation of computer-based information services and utilities, the opportunities one will have for selectively obtaining information on a wide variety of subjects will increase further, and while we anticipate that computer-based information services will increasingly offer voice output as an option, we believe that print-based facilities will provide the backbone of this technology and will remain much more comprehensive than alternatives for a long time to come. Consequently, the potential user of such facilities who lacks reading ability will continue to be at a serious disadvantage.

Moreover, even if computer-based systems that accept speech as input become commonplace, we see not even a remote possibility that that eventuality will greatly lessen the importance of being able to write, at least if writing is conceived broadly as the composition and editing of text. Electronic mail systems that accept voice input already exist, but they have not been well received (Seaman, 1983). One hypothesized reason for their unpopularity is the fact that the technology is not yet able to provide a visual representation of what was said (speech-to-print) and a capability to edit it. When the speech-to-print capability is in place, one will be able to dictate a draft of a letter, look at it, and edit it, before sending it off to the addressee. This activity has all the ingredients of writing except the mechanical one of operating a pen or the keys of a typewriter.

In short, although technology may decrease the need to be able to read in some situations, and although it may continue to provide alternatives to reading as sources of both information and pleasure, reading ability is unlikely to become superfluous any time soon. Similarly, writing ability in the deepest sense will continue to be essential, even if the mechanical aspects of getting letters on paper or some other medium are partially replaced by other techniques. In considering the relationship between technology and literacy in the future, our focus rightly is on the question of how technology might be used to facilitate the teaching or acquisition of reading and writing skills.

4.4 Video as a Teaching Medium

One form of information technology that is already widely available, the potential of which for enhancing literacy should not be overlooked, is video. Video can be an extremely powerful medium for teaching. It can present situations and people with which the nonliterate learner is familiar and can model the value, uses, and techniques of literacy. It can be used to teach reading and writing skills, either by bringing the teacher (on camera) to the learner, or by manipulating text and speech in synchrony, or both.

While an interactive medium has many advantages, one advantage of noninteractive video is that of being nonthreatening and nonjudgmental to a degree that interactive techniques are unlikely to attain. Nonliterate individuals can learn from it (or not) as, when, and how they choose with no fear of testing or even of being observed. Any interactive medium, no matter how self-containedly resident in an individual microcomputer or other system, has implicit in its operation some kind of evaluation, or observation of the user's behavior at the very least.

As we have already noted, video is a major source of information for people who do not read. Moreover, it is a comfortable and pervasive medium. The vast majority of homes in the United States have at least one operating television set and many have more than one. If it is desirable to reach nonliterate people where they live, and where they feel most comfortable and least threatened, then video may be one medium of choice. This is not to argue against the use of interactive media but simply to point out that a noninteractive one that is widely available anyway may also be used to advantage.

4.5 Computer-Based Message Technology

Electronic mail, or computer-based message technology more generally, represents a more recent technological development that is especially relevant to literacy training, because it represents a new communication medium and provides a new social context for communication via written language. We need to try to understand the implications of this technology for literacy and the teaching of it. Does it provide an added incentive to be able to read and write? Are the reading and writing skills that are required for effective use of this medium in any way unique? Does the medium offer any special advantages as a vehicle for teaching literacy skills?

The use of word-processing software to facilitate the production of text permits one to take an attitude toward the process of writing or composition rather different from what would have been natural in the past. It is easier in this context to think of the desired product (e.g., letter, note, short story, memo) as something that one builds. The process involves deciding what it is one wants to say and perhaps trying out various ways of saying it, organizing and reorganizing parts and subparts of the composition, making corrections and modifications, at all stages of the process. One need not think in terms of a document, or portions thereof, as being right or wrong, but rather as in various stages of development. At some point, one becomes satisfied that a document is sufficiently close to what is wanted that the task may be considered done. But until that point, one is engaged in a dynamic process of shaping a product that may be changed in any way one wishes. Of course there is a sense in which one retains the flexibility to change a document that is being written in longhand. One is always free to tear up what has been done and start again. However, the inconvenience of doing so acts against the adoption of the same mind set or view of the process.

What effect electronic mail and word-processing tools will eventually have on the style and quality of the writing produced by their

users remains to be seen. There is at least anecdotal evidence that one of the effects these facilities have already had is that of making less formal styles of writing more acceptable, at least for some purposes. Often users of such systems use a "telegraphic" form of expression, which is characterized by abbreviations, incomplete sentences, non-use of capitalization, and so on. In the interest of time, messages are composed at the terminal and sent in relatively unedited form. Although, to our knowledge, no one has reported formal data on the question, our impression is that some of the effects can be described as bringing the style of written communication closer to that of oral conversation, which tends to be much less formal, less grammatical, and less well organized than written language.

4.6 Need for Collaboration

There is a need for a closer collaboration among educators, educational researchers, and computer technologists on the problem of developing effective instructional software. It is not realistic to expect teachers or researchers who do not understand computers to be able to specify what educational software should be produced. Nor is it reasonable to expect programmers who are neither knowledgeable with respect to teaching nor cognizant of the results of research that relate directly to literacy, to be able to produce software that will be educationally effective. What is needed in order to get effective educational software produced, therefore, is for teachers, researchers, and programmers who can work together to evolve something useful.

Use of the word "evolve" here reflects a considered choice. It will be an exception to the rule when educational software is produced that works precisely as it was intended to when it was originally conceived. What is far more likely to happen is that the ideas of the designers will be changed as the software is being developed. What often, perhaps typically, happens when one wants to produce a program to do a complex job is that one starts out to develop a program in accordance with some preliminary ideas, but then modifies and refines those ideas in the process of, and as a consequence of, producing working code and trying it out.

4.7 Summary

Technology, especially information technology, has been developing at an unprecedented rate during the last few decades. This has somewhat paradoxical implications for literacy. On the one hand, technology has provided alternatives to print as a means of disseminating information and for mediating communication between geographi-

cally separated individuals. On the other hand, it has increased the need for relatively high levels of literacy both to compete for jobs and to have a reasonable level of understanding of the world in which we live.

Information technology can be used to address the problem of illiteracy in several ways: by continuing to provide alternatives to print, by helping to bridge the gap between literacy and non-literacy — helping non-literate persons to manage print as a communication medium — and by providing instructional media for literacy training.

We believe that in spite of the fact that technology provides alternatives to print for communication, facility with print will continue to be important for the foreseeable future, if not indefinitely. Moreover as new ways of presenting information are developed, new forms of literacy will emerge that will represent further challenges to education.

The potential for applying information technology to the problem of literacy training is great. Possible vehicles range from television, which is now a well entrenched and widely available medium, to electronic mail, which is still in its infancy. Anything close to full realization of the potential that information technology represents for enhancing literacy skills will require close collaboration among educators, researchers, and computer technologists. The problem is enormous, the tools are complex, and the available resources are very limited.

5. SOME POSSIBILITIES FOR THE FUTURE

We believe there are many ways in which technology could be applied advantageously to the problem of teaching literacy. Identifying these possibilities is not a simple matter, however. Not everything that appears to be a possibility turns out to be realizable. Moreover, it has often happened to be the case in the past that the most significant technological developments were not recognized as possibilities before they were realized in fact.

Notwithstanding reservations about our ability to anticipate specific future developments, the effort to do so can be a useful exercise. It is from thinking about what appears to be possible, and from attempting to actualize some of those possibilities, that specific developments emerge. The actual developments may differ in many cases from what was originally imagined, but this does not diminish the importance of the role of the imagining as a causal factor in the chains of events that culminated in those developments.

One way in which technology might be used is to extend the outreach of the limited number of tutors by making more widely available, through computer software, approaches and techniques that are known to work. We agree with Jamison, Suppes, and Wells (1974) that the goal of applying technology to education should not be that of replacing teachers, but that of increasing their productivity. To the extent that the approaches of the most effective teachers can be represented in computer programs, those programs can deliver those techniques to many more students than could the teachers themselves. The use of small computers to deliver literacy training programs has the added advantage of facilitating the delivery of such programs to remote, otherwise relatively inaccessible, places (e.g., isolated rural areas).

A second possibility is that technology may make some new approaches feasible that would not be possible without it. The potential of dynamic, interactive, computer-based graphics has barely begun to be tapped for educational purposes. While we do not yet know how best to exploit this potential for literacy training, we believe that when the question gets the attention it deserves, it will be possible to develop powerful new techniques. The existence of computer networks provides not only some new tools for facilitating the development of reading and writing skills but also a new and different communication environment within which to exercise those skills.

In this section we note a few of the specific ways in which information technology might be applied to the problem of teaching literacy within the next few years. Some of these possibilities undoubtedly will be realized; others will not. On the whole they are representative of the types of things that it would make sense to try. Trying them will lead not only to some new capabilities that could be usefully applied to the teaching of literacy, but also to new ideas and an expansion of our conception of what the possibilities are.

5.1 Speech to Text

Concerted efforts are currently being made to develop computer-based systems that will accept continuous speech as input and provide a text display of what was said. While we do not know how long it will be before such systems exist, we can assume that they will exist eventually. There now are several commercially available systems that will recognize a modest number of isolated words after being "trained" to work with a particular speaker (Petre, 1985; Schoen, 1985), and progress is being made on the problem of recognizing continuous speech. The question of what potential current and future speech-to-text systems could have for literacy enhancement should be addressed.

5.2 Text to Speech

Text-to-speech systems — systems that will take text as input and "read out" that text as speech — already exist and are commercially available for some computer systems, although the technology is still young and somewhat shaky (Aarons, 1985; Nusbaum & Pisoni, 1984). Perhaps the best known example of application of this technology to a significant problem is the development of the Kurzweil reading machine for the blind (Kurzweil, 1984).

Text-to-speech systems should have considerable potential for application to literacy training. Uses of this capability that might serve this purpose include:

A conventional option-menu with the added feature that when one selects an item, not only does it blink, brighten, or change visually in some way, but also the selected item is spoken by the computer.

A system that can display text in the conventional way and speak words that the user identifies by moving a cursor or by pointing.

A system that can speak back to the user text that he has composed, as, for example, when writing a letter.

5.3 Personalized News Service

Many observers of trends in information technology expect that personalized news services will be widely available to subscribers through computer networks in the not-distant future. Consideration should be given to the possibility of using such facilities for the dual purpose of distributing news and enhancing literacy. One could imagine the same news items being prepared in two or three different forms, targeted for people with different levels of reading ability. The availability to the marginal reader of news of personal interest in simplified language might provide a continuing incentive to read and thereby to improve his reading skills.

5.4 Product Labels

One can imagine a program that used common product labels and brand names for teaching purposes. Consider, for example, a computer-based program that could display, in color, canned and packaged goods that one is likely to find on the shelves at one's local supermarket. The program could, in effect, read to the user the labels and various items of information appearing on the displayed can wrapper or package. As a given word is produced by a speech synthesizer, its visual representation could be intensified, made to blink, or otherwise highlighted on the display.

5.5 Scripts

One approach to teaching literacy that seems to us worth exploring is that of using scripts from prime-time television programs as teaching material. The learner could watch the program with script in hand. With a videodisk or video channel recorder (VCR), one would have the option of replay or of stopping action when necessary to allow more time for processing the written script. The use of captioned films, and especially captioned films recorded on videodisks or VCRs, so as to allow for replay, is also a possibility that should be explored. It would be desirable for this application of captioning that the captions be verbatim representations of what is actually said.

5.6 Games

The possibility of teaching some skills of literacy via computer-based games should be considered. Ideally, one wants games that are intrinsically motivating even to the person with minimum literacy to begin with, and that develop skills as a consequence of being played. One can imagine computer-based games or game-like situations in which interesting things happen when the computer is instructed by the right choice of words. The words could either be typed or, in a simpler mode, they could be selected from a menu of options.

5.7 High-Tech Versus Low-Tech

The question often arises as to when it makes sense to use a high-technology approach to a problem, and when it does not. In general, the question should be answered in simple cost-effectiveness terms. Of two equally effective techniques, the one that costs less is usually to be preferred. Of two equally costly techniques, one would normally select the one that promised the greater effectiveness. In evaluating cost-effectiveness, however, what is really important is *incremental* cost. One might properly question the use of a personal computer, for example, to implement an approach to learning that could as easily be implemented with, say, flash cards (e.g., for vocabulary drill). The flash cards are much cheaper, more portable, and, so far as we know, equally effective. However, in deciding whether it makes sense to implement a low-technology procedure on a computer that is already available for other purposes, the cost that should be considered is the incremental cost of adding that procedure. In other words, while one could hardly justify getting a computer for the sole purpose of simulating flash cards, given that there are other reasons for having the computer, the additional cost of bringing up flash-card-like programs

may be negligible. One might still argue that this would be an inefficient use of the computer, because it would fail to exploit its potential. An answer to that objection is that using the computer to implement relatively simple approaches that do not take advantage of its power in no way precludes the possibility of also implementing complex processes that do take advantage of it. The question that will be of greatest interest to the educator is not the degree to which a particular technique exploits the power of the computer, but rather how effectively it accomplishes a desired educational objective.

5.8 Learning Strategies

Learning strategies are strategies that one can apply to increase the effectiveness with which one undertakes any learning task. Much attention has been given by researchers in very recent years to the topic of learning strategies. Many of the learning strategies that have been studied assume literacy and are appropriate for people who are in a position to learn by applying the reading skills they already have. These include such strategies as representing the information in text by network diagrams (Anderson, 1979; Dansereau & Holley, 1982) note-taking (Weinstein & Underwood, 1980) and summarizing (Ross & Divesta, 1978). There are strategies, however, that may be applicable to the more fundamental task of increasing one's literacy. Among learning strategies that seem to have been effective in other contexts that might also be usefully applied to literacy learning are the self-management and performance monitoring strategies that have been promoted by Meichenbaum and others (Meichenbaum & Asarnow, 1979; Weinstein, Cubberly, & Richardson, 1982). The approach seems to have been effective in relieving anxiety and maintaining motivation.

The question of interest in the present context is whether technology could be applied effectively to the teaching of learning strategies that are especially well suited to the problem of literacy enhancement. This is a question for research; we believe the potential gain here is great enough to justify the necessary research effort.

5.9 Literacy Helpers

An approach to the teaching of literacy that deserves consideration is that of developing electronic "helpers" of various sorts. One can imagine, for example, a program designed to help a person who cannot read and write to compose a grocery shopping list. Icons could be used (along with words) as list items initially, but with the idea of gradu-

ally making the individual less and less dependent on them and increasingly able to function only with the associated printed names. Another possibility along these lines would be to develop a facility especially designed for people with marginal writing skills. Thus, for example, one can imagine a system that would provide help in composing a simple letter or that would critique a letter and suggest improvements.

Systems with the capability to correct spelling, detect some types of grammatical errors, and suggest stylistic improvements in written text exist (Frase, 1983; Heidorn, Jensen, Miller, Byrd, & Chodorow, 1982; MacDonald, 1983). The intended users of these systems appear to be people who have better than marginal writing skills to begin with, but the systems clearly have the potential of being adapted for use by those who do not. There also are some composition aids that have been designed specifically for children who are just learning to write (Owens, 1984; Watt, 1984; Rubin & Bruce, 1983). These too may have some potential for adaptation for use by adults. Independently of the question of the suitability or adaptability of existing writing-assistance software for use by adults who lack rudimentary writing skills, the existence of software that facilitates writing by adults who have such skills and of some that helps children acquire those skills strongly suggests the reasonableness of trying to design some writing-assistance software explicitly for adults who cannot write. Quite possibly the use of such software would strengthen the users' reading skills as well as their writing ability.

We suspect that a variety of types of help might be identified that would benefit a person, or a community of people, who lacked reading and writing skills. One reasonable research objective would be to identify those types that might be implemented in software.

The notion of literacy helpers is not a new one. Many communities have one or more people who read and write for those who cannot do so for themselves. The idea of electronic helpers can be extended to that of helpers of helpers. Providing the human helpers with technological support might make it possible to increase their effectiveness and multiply their efforts.

5.10 Multimedia Dictionary

A challenging and, we believe, particularly worthwhile goal for a project would be the development of an interactive multimedia dictionary, especially designed for literacy training. Such a dictionary could make use of both computer and videodisk technology, and should have the ability to: (a) provide definitions of unrecognized words in terms of

more common (higher frequency) words, (b) provide definitions in both written and spoken form, (c) supplement written definitions with pictorial representations of meanings (e.g., pictures of objects for concrete nouns, animated events for verbs), (d) accompany definitions with interactive activities to engage the learner in the use of the defined words, (e) provide (perhaps on request by the user) synonyms or antonyms for specific words, (f) provide (again perhaps on request by the user) examples of words that are related to the word in question in specific ways.

This dictionary should be a rich source of information regarding language. It should be designed in such a way that effective use of it does not require that the user be highly competent with language to begin with, and interacting with it should be intrinsically interesting. One can imagine that such a system might be sufficiently captivating that it could constitute an effective teaching instrument all by itself.

One can also imagine such a dictionary being customizable for specific user groups or even for specific individuals. In addition to general word frequency data (e.g., Thorndike & Lorge, 1944; Kucera & Francis, 1967), it could also contain information regarding specialized vocabularies (e.g., words that are especially useful for the purpose of producing grocery lists or reading about specific sports).

Development of such a dictionary, designed especially for use as a literacy enhancement tool, would be an ambitious undertaking. The cost of its development would only have to be borne once, however. And, assuming that such a tool could be made widely accessible to users through personal computers, its development costs could be amortized over a sufficiently large user population that the cost per user would be small.

The development of such a system would have to proceed in an evolutionary fashion. However, because the system would be computer based, something useful could be made available at various stages of the evolutionary process. That is to say, an evolving system could be "frozen" for production and distribution long before its evolution was considered complete. Indeed it is not clear that the evolution of the system ever could, or should, be considered complete. The goal should be to produce something useful and then continually to improve upon that.

5.11 Interactivity and Individualization

Two of the most promising aspects of computer-based systems from the educator's point of view are interactivity and the potential for individualization. While interactivity is a characteristic of many existing

programs, very little of the potential for customizing learning situations for individual learners has yet been realized. As Melmed (1983) puts it, "we are presently in the age of the Model T and the first flight at Kittyhawk in terms of our knowledge of how to individualize instruction."

One can imagine a literacy-enhancement system that has the capability of developing a model of an individual user and of tailoring training programs so as to be consistent with that model. The model would include, among other things, an internal representation of the learner's reading vocabulary and some estimate of the breadth and depth of his knowledge in specific domains; and it would be revised continuously to reflect changes in the learner's vocabulary and knowledge base as a consequence of the training. For teaching, it would use passages that reflected the literacy needs and desires of the individual learner. Assessment data, which would provide the basis for developing models of what individual learners did and did not know about written language, could be obtained in the absence of explicit tests, simply as a consequence of monitoring interactive training sessions (e.g., by noting the words that a learner is or is not able to recognize while performing a reading task). There is also the possibility of making use of adaptive testing techniques, which would allow the efficient assessment of the competency of individuals with respect to specific aspects of literacy and provide information that could be used to guide and tailor subsequent training.

5.12 Summary

The possibilities for applying technology to the problem of teaching literacy are many and diverse. They include techniques for facilitating and extending the delivery of existing approaches that have been shown to be effective and also the development of qualitatively different approaches.

We have noted a few specific possibilities that we consider to be worth exploring, ranging from relatively simple approaches, such as the use of common product labels along with pictographic representations and speech in a computer program, to the ambitious possibility of developing a comprehensive multimedia dictionary. This list of possibilities is not presented as exhaustive, or even very extensive. It is intended only to be suggestive of the kinds of things that might be tried. We believe that efforts to explore such possibilities will reveal that some of them can indeed be the bases of effective approaches to literacy training whereas others, perhaps, cannot. More importantly, it is primarily from serious attempts to develop and test specific approaches that new and better ideas are likely to come.

6. RECOMMENDATIONS

Our primary recommendation is that the problem of adult illiteracy be recognized to be the profound and recalcitrant one that it is. Its costs are high — both for those people who lack adequate reading and writing skills and for society in general — and it has proven to be remarkably resistant to efforts to reduce its magnitude. Significant progress on this problem will not be made without an abiding major national commitment commensurate with the problem's importance to the future of the nation.

Our specific recommendations pertain to five topics: principles and perspective, research, development, service delivery, and evaluation.

6.1 Recommendations re principles and perspective

Promoting literacy development is a broader enterprise than increasing literacy training or enhancing skills that are essential to literacy; it also must entail promoting increased *engagement* in acts of literacy, which is to say increased *activity* involving the use of reading and writing.

Efforts to develop programs to increase literacy should be informed by the findings of the considerable amount of research that has been done in recent years on reading and writing, and by the new conceptualizations of these processes that are emerging from that work.

Representative prospective users of literacy enhancement resources should be involved in identifying needs and evaluating experimental systems and techniques.

Programs to enhance adult literacy should put a premium on the teaching of useful skills from the very beginning. Ideally, a student should go away from an initial training session with the ability to do something that he wants to be able to do, but could not do before. Material that is used to teach reading skills to adults should be interesting, informative, and appropriate to the individuals' knowledge base; it should be material that the participants would really want to read if they were able to do so.

Priority also should be given to the development of literacy training packages that not only enhance reading and writing skills but provide opportunities for the meaningful use of those skills. The opportunity to apply the skills that one is acquiring to desired objectives motivates the practice that is necessary to assure the further development and retention of those skills. It also addresses the question of transfer in the most direct way possible. The fundamental ques-

tion in any training program is whether the skills and knowledge acquired in the learning context transfer to the applications context of interest. If the learning context *is* the applications context, the question does not arise. Examples of existing computer-based packages that could serve both as training tools and as vehicles for applying what has been learned include electronic mail systems and document preparation tools.

Literacy training should not be disconnected from education and training more generally. Literacy should be viewed as an indispensable tool for learning, and the problem of how to enhance literacy should be viewed as one aspect of the general problem of how to help people become better learners.

6.2 Recommendations re research

A report should be prepared under Department of Education sponsorship that describes what is currently being done by way of literacy training and summarizes whatever evidence exists regarding the effectiveness of specific programs and approaches. Such a survey document would provide useful guidance for future efforts to develop literacy training systems and procedures. In general, there is a need for better dissemination of information regarding what currently exists.

A study should be commissioned to attempt to determine what would constitute an effective, systematic approach to literacy training that would exploit computers and computer-related technologies, and would be informed by the best available research data regarding the acquisition of literacy.

One or more studies should be commissioned to investigate the potential for the use of computer-based games as vehicles for teaching (perhaps indirectly) skills essential to literacy.

Special attention should be given to the possibility that work sponsored by various government agencies, and in particular the Department of Defense, on expert systems has relevance to the literacy training problem.

Research should be done on the question of how to incorporate reading and writing activities into the communication patterns that already exist within social or cultural groups. Among other issues that should be considered is that of how a particular program could facilitate or improve communication among the members of the sociocultural group, and also how it could improve communication

between that group as a group and the rest of the world. What, for example, might ready access to an electronic mail system mean in a ghetto?

6.3 Recommendations re development

While we are not opposed to the development of independent programs that address specific aspects of literacy, or to the development of individual tools for use in literacy training, we see the need for an integrated, comprehensive approach to the problem, and we recommend that the Federal government support the development of such an approach.

An attempt should be made to develop a variety of electronic "helpers" to assist persons lacking literacy skills to deal with print. In providing assistance in dealing with print, such helpers would enhance literacy incidentally.

As one way of addressing the problem of adapting software to specific sociocultural contexts, authoring systems should be developed that will permit target populations (communities) to customize the context of the program to their particular needs. A major emphasis in software development should be on tools that can be used to build programs addressed to needs of specific target groups.

Developers of literacy-training software should develop software that addresses the literacy needs of adults in the workplace, and in society in general, in such a way that the relevance of the training to those needs will be apparent to the trainees. Insofar as possible, literacy should be taught in contexts that are very similar to those in which the newly acquired literacy skills are expected to be used. In general, communication skills are best taught in contexts in which people are communicating and are using what they are learning for that purpose.

An effort should be made to ensure that the reading material that is to be used to help teach nonliterate people to read is intrinsically interesting to the learners.

6.4 Recommendations re service delivery

Literacy should be perceived as a sociocultural variable; being literate (or illiterate) means different things and has different implications in different sociocultural contexts. Attention should be given to the needs and uses of literacy within the sociocultural group to which individuals who are receiving literacy training belong, so that training programs can be informed by, and responsive to, those needs and uses.

Inasmuch as many people who lack literacy skills are unlikely to go to a school, ways should be found to bring the opportunity for literacy training to the people who can benefit from it. An attempt should be made to identify ecologically reasonable (natural) places for teaching literacy. These places would presumably include those where people spontaneously gather, such as churches, shopping centers, YMCAs, YWCAs, recreational facilities, social clubs, and union halls.

An investigation should be made into more effective ways to disseminate information about existing software and to make available software that there is reason to believe is effective. A clearinghouse or directory of programs and evaluation reports and data should perhaps be established. One of the most significant challenges facing the educational establishment generally is that of finding a way of making the best ideas embodied in numerous educational computer programs that currently exist more widely and easily available. There is a need for some effective mechanisms for collecting, cataloging, and distributing existing programs and ideas regarding the use of computers for educational purposes in general and for literacy training in particular.

More attention should be given to the question of how to get from participants in literacy training programs the commitment necessary to assure a reasonable chance of success. The problem of dropouts appears to be a particularly significant one. A sizable fraction of the people who enroll in literacy programs drop out after the first one or two training sessions. We need to understand better why people who have shown enough interest to enroll in a program fail to continue in it. Undoubtedly, there are several reasons for dropping out; however, it may be that a few of them account for a large percentage of the cases. The identification of these could be helpful in the design of more effective programs.

6.5 Recommendations re evaluation

An effort should be made to develop an approach to evaluation that is relatively certain to yield conclusive, or at least interpretable, data. This is a challenge to the educational research community and to the various agencies that support educational research. Evaluations that are intended to produce conclusive evidence of lasting impact require careful longitudinal studies.

More emphasis should be placed on formative evaluations that will yield the kind of information that can be of use in shaping and improving literacy-training tools and programs.

An effort should be made to articulate basic principles that can be used by the consumer to evaluate educational software. Something as simple as a check list of what to look for, what questions to ask of a developer or vendor, could be useful.

The government should promote and support the establishment of a facility for evaluating literacy-training software and disseminating the results of evaluations to potential users. There is a critical need for accessible evaluative information regarding educational software and software addressed to the problem of teaching literacy in particular. Who should do evaluations is, at this point, an open question.

7. CONCLUSION

Even if the figures that are widely quoted regarding the prevalence of illiteracy among adults in the United States are high by a factor of two, the country has a real problem. Moreover, it is a problem for which there is no quick and simple solution. Learning to read and write well enough to participate fully in mainstream activities of a print-oriented society is a time-consuming process that requires commitment and perseverance by both learner and teacher. The approaches that have been used to address this problem in the past have manifestly not worked very well. If the figures are to be believed, only a tiny fraction of the adult population that needs literacy training is receiving it; and there is little evidence that that training is highly effective, or that the magnitude of the problem is decreasing.

There clearly is a need for new approaches to the teaching of literacy. We believe that information technology has the potential to yield some new approaches. We have tried to say in this report why we believe that to be the case, and to identify some possible directions that attempts to exploit information technology for this purpose might take. We have not aspired to present anything like an exhaustive, or even an extensive, list of possibilities, but simply to point out a few examples of the kinds of things that might be done. We believe that concerted efforts to apply information technology to literacy training in specific ways would yield an abundance of ideas deserving of consideration.

The problem of adult illiteracy has been with us for a long time. It is not likely to disappear immediately no matter what is done to address it. Whether it grows to indisputably crisis proportions, or begins to diminish appreciably, will depend upon the strength of the nation's resolve to develop and apply approaches to the teaching of literacy that are more effective than those that have been used in the past. While information technology has great potential for helping to address this problem, it is a potential that, for the most part, is not only undeveloped but unexplored.

Looking beyond the problem of adult illiteracy in the United States, we note the desirability of developing approaches to the teaching of literacy that have general applicability across national, cultural, and linguistic boundaries. Literacy is a worldwide concern. The ability to read is fundamental to education, inasmuch as reading is the primary means by which individuals acquire the kind of knowledge that an educated person is expected to possess. Inability to write deprives one of a primary means of expression in a print-oriented world. Illiteracy is a special problem for lesser developed countries, because widespread illiteracy in a population greatly inhibits a country's economic and technological development. The ultimate goal should be to solve the problem of adult illiteracy by prevention. That will require the use of more effective approaches to the teaching of literacy to children than have been used in the past. Recognizing the universal scope of this challenge, we believe an effort should be made to develop technology-based generic approaches to the teaching of literacy that can be adapted to specific national, cultural, and linguistic contexts.

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This report follows from a two-day workshop on Adult Literacy and Technology, convened by the Adult Literacy Initiative of the U.S. Department of Education on October 1 and 2, 1984, and funded by the National Institute of Education under Contract NIE-C-400-81-0004. Members of the workshop were: Raymond Nickerson, Chair (Bolt Beranek and Newman Inc.), Thomas Duffy (Carnegie-Mellon University), Arlene Fingeret (North Carolina State University), Samuel Gibbon (Bank Street College), Richard Hagemeyer (Central Piedmont Community College), Stephen Reder (Northwest Regional Laboratory), and Andee Rubin (Bolt Beranek and Newman Inc.). The workshop was also attended by several federal managers responsible for programs relating to literacy training or educational technology: Patricia Butler (National Institute of Education), Susan Chipman (Office of Naval Research), Beatrice Farr (Office of Naval Research), Andrew Molnar (National Science Foundation), Judith Orasanu (Army Research Institute), Warren Simmons (Army Research Institute), Diane Vines (Department of Education), and Frank Withrow (Department of Education). The workshop organizers were Monte Penney and Mary Cross of the Adult Literacy Initiative.

A draft report was prepared by the chair, largely from notes taken during the workshop sessions, and circulated to participants for review and comment. Several people who did not attend the workshop were also kind enough to comment most helpfully on sections of the draft, namely, Bertram Bruce, Deborah Melone, Patti Price, and John Swets. Thus the report incorporates ideas from many people, some of which emerged during workshop discussions, and others of which were evoked in the process of reviewing the draft. Of course, the opinions expressed do not necessarily reflect the position or policy of the National Institute of Education or the Department of Education.

The workshop's mandate was to explore how technology — and in particular computer and communication technology — might be applied to the task of teaching literacy to adults. The restriction of attention in the report to approaches to literacy training that make use of technology reflects that mandate. Clearly, technology-based approaches are not the only ones possible. The workshop participants share the belief, however, that technology has great — but largely unrealized — potential for beneficial application to this problem area. This report was prepared in the hope that it will help motivate efforts that will bring some of those possibilities to fruition.

The New Imperative in Literary Criticism

W. John Harker

The purpose of this paper is in the first instance to situate the relative importance of the reader and the text in contemporary literary criticism. The basic tenets of the New Criticism are explored and illustrated, and the doctrine of the reader response criticism which has followed it is examined through the work of two of its leading proponents, Stanley Fish and Wolfgang Iser. It is argued that the decline of the New Criticism and the rise of reader response criticism can be explained in terms of a diminished notion of public verse and the ascendancy of a countervailing notion of private verse. Reader response criticism is then assessed in terms of its contribution to an understanding of the process of reading literature. It is concluded that there is a need for a new imperative in literary criticism which conceives literary understanding in terms of a communication process in which both text and reader are granted importance.

In 1918 T. S. Eliot felt compelled to write that "there ought to be honourable vacancies for men who like to write about literature without themselves having a 'method' to deliver" (p. 111). If ever such vacancies occurred, which in light of what was to follow is unlikely, they must have been filled by those who looked back to Leslie Stephen's (1892) *Hours in the Library* and the confortable tradition of late nineteenth-century criticism which Stephen represented, rather than forward to the next decades of the twentieth century which Eliot himself was to influence so profoundly. For it was during the thirties and, with gathering momentum, into the sixties that what Randall Jarrall (1955) called "an age of criticism" (p. 63) evolved. During this time the New Criticism emerged and dominated literary studies in all their facets. If Denis Donoghue (1981) is right in his contention that "theory begins to matter only when it determines practice" (p. xiii), then the New Criticism certainly mattered since its "method," to return to Eliot's complaint, held sway over three decades of critical practice.

It has been conventionally argued that the New Criticism was initially a reaction against historicism, the approach to criticism exemplified by John Livingstone Lowes' *Road to Xanadu* (1927), and various contemporaries of the New Critics at the University of

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Chicago. Typical of this view is George Watson's (1962) comment that, when the New Critics assumed teaching posts at major American universities, their "anti-historical manifestoes become fashionable" (p. 221). There is clear evidence to support this view in Cleanth Brooks' (1947) famous statement in his introduction to *The Well Wrought Urn* that "I have been anxious to see what residuum, if any, is left after we have referred the poem to its cultural matrix" (p. x),[1] and Rene Wellek and Austin Warren's (1956) admonition in their *Theory of Literature* that "the identification of literature with the history of civilization is a denial of the specific field and the specific methods of literary study" (p. 20).

Yet, with the perspective provided by what now appears to be the certain demise of the New Criticism,[2] the view that its chief methodological characteristic was a reaction against historical criticism can be questioned. This is not because of what it was seen to be during the period of its ascendancy, but rather because of what has come to replace it and react against it today. While the New Criticism may have been initiated by a dissatisfaction with historical criticism, what emerged as its major critical tenet, while consistent with this dissatisfaction and to some degree evolving out of it, was not anti-historicism, but an insistence on the primacy of the text over the individual response of the reader as the legitimate determiner of literary understanding and value.

It is against this belief that contemporary criticism has reacted. And what has come to replace the New Criticism is not a revival of historical criticism, but an assertion of the role of the reader and the relationship of the reader to the text in the process of literary understanding. The common basis of contemporary literary theory — as wide ranging in its specific orientation as reception aesthetics, Geneva criticism, and neo-Freudian psychoanalytic criticism[3] — is the central importance of the reader's response in the process of comprehending literature.

Why this shift has taken place is a question which has received less attention than have the particular canons of New Criticism and contemporary reader response criticism. Yet it is important to understand our present critical orthodoxy in terms of the orthodoxy of the past if for no other reason than to test the wisdom of our current rejection of New Critical doctrine. In this paper an attempt will be made to situate the tenets of the New Criticism in terms of reader response theory. The fundamental statements of the New Criticism will first be analyzed, and this analysis will then be followed by an examination of the work of two contemporary reader response critics, Stanley Fish and

Wolfgang Iser, who, while by no means representing the full range of reader response criticism, represent an influential North American and European perspective. It will then be argued that the process which led to the decline of the New Criticism and the rise of reader response theory can be described in terms of a diminished notion of public verse and the ascendancy of a countervailing notion of private verse. The final part of the paper assesses reader response theory in terms of this dichotomy. Specifically, the question will be raised whether we have gained in our conception of literature and literary understanding through our current preoccupation with reader response criticism and our concomitant rejection of New Critical doctrine, or, put another way, whether our current absorption with private as opposed to public verse makes a significant contribution to our understanding of how literature is read.

The New Criticism

One of the anomalies of the New Criticism is that it was at once social in its outlook yet exclusive in its attitude. That it could be both was due largely to its educative impulse. For the New Critics the reading of literature was to be undertaken on the basis of a refined analytic capability. As Wimsatt and Beardsley (1954) stated in *The Verbal Icon,* the function of literary studies was to educate readers to a "full realization of poems themselves and hence to know good poems and distinguish them from bad poems" (p. 83). This education was to result from a deliberate learning process during which, according to Wellek and Warren (1956) in their *Theory of Literature,* the student of literature was to "translate his experience of literature into intellectual terms, assimilate it to a coherent scheme which must be rational if it is to be knowledge" (p. 15). The process of literary education was therefore seen to be one through which increasingly explicit, defensible, and sophisticated formulations of the meanings to be found in literary works could be acquired.

The belief that the process of proper reading could be learned and that correct readings could be distinguished from incorrect ones brought Wellek and Warren (1956) to describe literature in terms of "a super personal tradition, as a growing body of knowledge, insights, and judgements" (p. 19). Given this tradition, this external situating of the literary text with reference to the reader, it followed that, for the New Critics, a poem became, in the words of Wimsatt and Beardsley (1954), something which "belongs to the public. It is embodied in language, the peculiar possession of the public, and it is about human beings, an object of public knowledge" (p. 5). The liter-

ary object was therefore an external one, its meaning accessible to all who were educated in the methods through which this meaning could be revealed.

The critical process was public as well. As critics worked in public with public objects, the results of their work — the critical texts they produced — were themselves public objects, ones which were accessible to the scrutiny and judgment of others. Just as many of the New Critics saw themselves as public men engaged with the public concerns of their times,[4] so their criticism was a public criticism, something like the literary texts they sought to explain, standing outside themselves, detached and objective, as much the verbal icons and well wrought urns of their critical enterprise as were the literary works upon which their criticism was based.

All of this served to raise questions about the nature of literature, literary experience, and the meaning of literature. It was to these questions that the New Critics directed much of their energy and ingenuity. Definitions of literature abound in New Critical writings, and while they demonstrate varying degrees of opacity, collectively they illustrate a consistent view of literature, one which provided the necessary theoretical basis for their critical practice and pedagogical program. The common element in New Critical notions of literature was the fusion of form and content. In his essay, "What Does Poetry Communicate?" (1947), Cleanth Brooks stated that "the poem is not only the linguistic vehicle which conveys the thing communicated most 'poetically', but . . . it is also the sole linguistic vehicle which conveys the thing communicated accurately" (p. 74). Thus literature lay beyond a distinction between form and content in a new cohesion which defied division. Typically, Wellek and Warren (1956) contended that "'structure' is a concept including both content and form so far as they are organized for aesthetic purposes" (p. 141). It was in this structure, the ideational and stylistic fusion which literature exhibited, that its meaning was to be found.

In this vein Wimsatt and Beardsley (1954) wrote, "through its meaning or meanings the poem *is*. It has an iconic solidarity" (p. 23). The poem was a verbal icon, "a concrete universal" (p. 77), that which "illustrates the principle of structure and harmonious tension" (p. 239). It followed that the poem, as Alan Tate (1959) put it, "is its own knower" (p. 250), an unassailable unity, one which defied the logic of science. In the same way Brooks (1947) could pronounce "the heresy of paraphrase," since, in the end, "to refer the structure of the poem to what is finally a paraphrase of the poem is to refer it to something outside the poem" (p. 201). The meaning of literary works

was therefore seen to reside exclusively within the works themselves, inaccessible by any logic other than the logic established by their own structure.

Because of this emphasis on structure as meaning, the language and devices of literature took on particular importance. Literature was seen to be "hyperverbal," its "concreteness" resulting from "the interrelational density of words" (Wimsatt & Beardsley, 1954, p. 23). Not only was literary language somehow more verbal than ordinary language, but it was also different. For this reason Tate (1959) observed that "the poet is constantly forced to remake language" (p. 210). Through this remade language the unity of a literary work was forged, the icon was shaped. And it was shaped not only by the language itself, but more importantly, by the ways the full resources of language were marshalled to convey meaning. For example, Wimsatt and Beardsley (1954) maintained that the "value principle" of literature was "variety in unity or the reconciliation of opposites" (p. 51) and that this was to be obtained through the principles of ambiguity, polysemy, paradox, and irony. Similarly, Brooks (1947) wrote, "the conclusion of the poem is the working out of the various tensions — set up by whatever means — by propositions, metaphors, symbols" (p. 207). Of all these devices, the most basic was metaphor since it was through metaphor that the ideational and stylistic fusion of literature was achieved, and it was within the metaphoric framework that literary meaning resided. Typically, Wimsatt and Beardsley (1954) argued that the meaning of literature could be learned "by examination of metaphor — the structure most characteristic of concentrated poetry" (p. 79).

The meaning of literature was in this way driven progressively further into the text. If a knowledge of literature was to be gained, if judiciously derived (which was to say externally defensible) readings of literature were to be obtained, they were to be obtained by an examination of the ideational architecture of the literary work as revealed through its language and constructional devices. Extratextual excursions in search of meaning were *ultra vires*. From this arose Wimsatt and Beardsley's (1954) famous admonition against "the intentional fallacy," historical source-hunting for influences upon the author which might explain the meaning of the text. The meaning of the text was to be found within the text and nowhere else. As Wimsatt and Beardsley unequivocally put it, "the design or intention of the author is neither available nor desirable as a standard for judging the success of a literary work of art" (p. 3). In this same manner Wellek and Warren (1956) contended that "the meaning of a work of art is not

exhausted by, or even equivalent to, its intention. As a system of values it leads an independent life" (p. 42).

And where was the reader in all of this? The most immediate answer in New Critical doctrine is in Wimsatt and Beardsley's (1954) famous statement of the "affective fallacy." They described this fallacy as "a confusion between the poem and its *results* (what it *is* and what it *does*).... It begins by trying to derive the standard of criticism from the psychological effects of the poem and ends in impressionism and relativism" (p. 21). Just as the intent of the author was to be denied as a valid source of meaning, so was the affective response of the reader. Wellek and Warren (1956) warned that "anarchy, scepticism, a complete confusion of values is the result of every psychological theory, as it must be unrelated either to the structure or the quality of a poem" (p. 147). And because these affective responses lacked objectivity, they were inaccessible to evaluation: "Definition in terms of states of mind fails because it cannot account for the normative character of the genuine poem, for the simple fact that it might be experienced correctly or incorrectly" (Wellek & Warren, 1954, p. 150). If it became impossible to distinguish between correct and incorrect readings, the educative function of criticism would be lost since every reading would have equal worth. It would be impossible to educate the reader to more correct readings since the basis for evaluating these readings — the individual reader's response — would not remain public but would become private. What a poem said as a public entity would be replaced by what it felt like as a private experience.

It can be seen that the affective fallacy represented a fundamental challenge to the New Criticism. But the New Critics did not exclude the reader entirely; rather, they recognized the role of the reader but limited this role to a cognitive response. Their repeated recurrence to cognition and the intellect as the mechanisms of literary understanding gives ample evidence of this. That the reader's response could be cognitive only precluded any affective "contamination" from entering into literary understanding or literary criticism. Thus the critical enterprise could be maintained as a public activity with the reader's cognitive response remaining accessible to rational report and dispassionate analysis. But the cognitive activity of the reader, mapped in his explication of the text, was always a response to the text, in terms of the text. This was the vital consideration. The text remained the public object to be known; the reader's role was to gain access to this knowledge. But, while the direction of literary communication was from the text to the reader, the reader's presence remained vital. Without the reader, the text, while "being," would fail

to communicate, and communicating the public knowledge of the text was for the New Critics the primary function of literature.

From Public Verse to Private Response

Given the pervasiveness and intellectual rigor of the New Criticism, one is left to wonder why its authority waned. Answers to this question can be found in influences both within and outside the New Criticism. To begin with internal causes, it is evident in retrospect that the New Criticism fell from the weight of its own programmatic and pedagogical edifice. It was almost too demanding in the conceptualizations and procedures which it formulated. In its belief in exactitude and the external visibility and verification of the critical process, it invited attack from those who came to resent its prescriptiveness and dogmatic insistence on various "fallacies," "tensions," "heresies," and the rest of the paraphenalia of critical correctness which grew up around it.

Not only was it overly pedantic, it was also too restrictive in the literature it accommodated. In their emphasis on analyzing "modern" and metaphysical poetry, the New Critics were too intent upon finding literature which suited their critical theory rather than deriving critical theory which accommodated the general body of English literature. And finally, by remaining uncompromisingly text-based, by insisting on a synonymity of textual explication and critical practice that denied the validity of external sources of meaning (whether historical, authorial, or personal), the New Critics imposed too confining a program for the conceptualization of literature and literary meaning. Once the rigors of the method were mastered there seemed little else to do, especially given the demonstrable correctness — in theory, at least — of the "correct" reading of poems. Therefore, in the ultimate realization of the New Criticism lay its demise: As a method, its end resided within itself, and once this was recognized, either consciously or unconsciously by the critical establishment, its power declined and its pervasive influence expired.

Yet these internal flaws may not in themselves have been sufficient to bring down the New Criticism had they not become increasingly apparent during a period when public verse and public criticism were becoming antithetical to the increasingly introspective, relativistic spirit of the times. In philosophy Husserl's phenomenology dismissed the preoccupations of logical positivism and postulated new ways of knowing and structuring reality through exploring man's subjective, inner life. In psychology the security of behaviorism, which had been the predominant model of human activity during the period of the

New Critical ascendancy, was being challenged by the work of Jerome Bruner and others who were explaining man's behavior in terms of cognitively constructed models of reality, rather than the simple mechanism of the behaviorist's S — R paradigm. In linguistics Chomsky repudiated the behavioristic formulations of Skinner and set up in their place a model of human language which placed the mind at the center, thereby reducing in importance the visual and oral forms of language as the focus of linguistic study. And, finally, even the tenets of scientific method were questioned by the work of Kuhn who argued that scientific theory based on empirically derived "facts" was actually founded on a highly subjective empiricism, an empiricism based not on strict objectivity, but rather on broad conceptual outlines formed by prevailing climates of opinion.

So it was that the world seemed less certain. The philosophical reality of logical positivism, the psychological certainty of behaviorism, the linguistic "common sense" of sensorially received language, and even the unassailable objectivity of scientific method all fell before competing movements in their respective disciplines, movements which had in common an appeal to the inner consciousness of man as the determiner of relative meaning, rather than an appeal to external, observable, analyzable phenomena as the determiners of an objective reality. And as though this were not enough, what Christopher Lasch (1979) has called "the culture of narcissism" came into full flower at this time, and with it a discontent with all that was not personal, individual, and, some would say, self-indulgent. If for no other reason than the external conditions which surrounded it, the New Criticism was not sustainable. It was born of an age and of a constellation of common assumptions which were increasingly incompatible with the prevailing intellectual and cultural climate of the late 1950s and 1960s. While it had once worn, almost proudly, the mantel of conservativism and elitism, it could no longer appeal to an age whose collective sensibility had turned to the privacy of the self.

Reader Response Criticism

Stanley Fish and Literature in the Reader

If the development of critical theory is to be interpreted in terms of reactions against prevailing orthodoxies, the work of Stanley Fish must be seen as a frontal attack on New Critical doctrine. Rather than maintaining the objectivity of the text and insisting on the separate reality of a literary work, Fish, in one of his earliest and most influential essays in 1970 wrote that "the objectivity of a text is an

illusion" (p. 140). Moreover, in his preface to the paperback edition of *Surprised by Sin: The Reader in Paradise Lost* (1971), published a year later, he wrote, "making the work disappear into the reader's experience of it is precisely what should happen in our criticism, because it is what happens when we read" (p. ix). When Fish is compared with the New Critics, the relationship between text and reader is reversed: while the New Critics insisted on the primacy of the text as the center of meaning and condemned the reader's affective response as a fallacy, Fish embraces the affective fallacy and places the reader's response at the nexus of meaning.

Fish (1973) further maintains that the determination of meaning is not a consequence of the act of reading but a concomitant: "Meaning is not the property of a timeless formalism but something acquired in the context of an activity" (p. 89). Focussing on "the *temporal* flow of the reading experience," Fish would describe the nature of this activity through "*an analysis of the developing responses of the reader in relation to the work as they succeed one another in time*" (1970, pp. 126-127). It is during the development of these responses, and not in some holistic reflective interpretation after reading has ended, that meaning is conceived: "It is the experience of an utterance — *all* of it and not anything that could be said about it, including anything I could say — that *is* the meaning" (1970, p. 131). If meaning is to be formulated during and not after reading, the question follows, "When does the true meaning become clear?" Fish's answer is that it never does since to conceive meaning in this way is to acknowledge that there is some final and essentially context-bound meaning to be taken from a literary work. Therefore, Fish's critical method has no end while the reader is engaged with the text: It "has no point of termination; it is a process; it talks about experience and is an experience; its focus is effects and its result is an effect" (1970, p. 161).

The charge of radical relativism which Fish's doctrine seemingly permits — that all readings are valid since the interpretations they make are specific to the individual and can therefore never be challenged — Fish meets with his notion of "interpretive communities." This concept underlies some of his earlier formulations and becomes explicit in the final section of his "Interpreting the *Variorum*" (1976). His notion of an interpretive community is basically that of a group of readers who share a set of preconceptions about literature which permits only certain readings. This is not the externally derived, conscious prescriptiveness of the New Criticism, but rather the result of a community's internalization of certain assumptions about literature which predispose its members to bring similar

interpretive strategies to the text. Members of an interpretive community do not subscribe to some overt rule book which differentiates legal from illegal readings; they share similar conceptual frameworks about the nature of literature which predispose them to interpret texts in a similar manner. Their orthodoxy is an internalized one which, while shared, remains private. The notion of interpretive communities does not therefore eliminate the charge of radical relativism. What it does is to replace the private response of the individual with the collective yet still essentially private response of a group of like-minded individuals.

Fish provides an example of the workings of interpretive communities in a more recent essay which explores interpretations of irony in Swift's "Verses on the Death of Dr. Swift" (1983). He argues that irony, like any formal feature of literature, is not a matter of objective fact to be mined from the text, but rather a function of the assumptions of the interpretive community which reads the text. In this way, irony, like any literary device, "is neither the property of works, nor the creation of an unfettered imagination, but a way of reading, an interpretive strategy that produces the object of its attention, an object that will be perspicuous to those who share or have been persuaded to share the same strategy" (p. 189). Thus a literary text is made by the interpretive community which reads it, and the literary facts which are brought forward as evidence to support a given interpretation are those which the community has tacitly agreed to notice before and during the process of reading. As Fish puts it in his essay, "How to Recognize a Poem When You See One" (1980), "it is not that the presence of poetic qualities compels a certain kind of attention but that the paying of a certain kind of attention results in the emergence of poetic qualities" (p. 326).

There might seem to be the suggestion in Fish's doctrine that the literary critic will disappear and that the formal enterprise of criticism will end. But this is not to be. In the first instance, as Fish himself repeatedly demonstrates, the function of the critic is to make explicit the private experience of the reader. Through this activity the critic "brings texts into being and makes them available for analysis and appreciation" (1980, p. 368). However, there is more to it than this. Fish unabashedly acknowledges the role of the critic as a propagandist, but a propagandist of a particular type. While interpretive communities are in place, their limits are to be constantly tested. It is the role of the critic "to alter the conditions of seeing" (1983, p. 185) — to reformulate responses to literature so as to persuade others of his way of reading and thereby to create new interpretive

communities by straining the interpretive strategies of the old.

That the critical process is always available for exploration and that its procedures are constantly ripe for challenge provides the arena for much of the critic's work. But these conditions also provide the basis of the critic's responsibility since no longer is the critic simply describing the public literary objects before him; he is now in the business of persuading others to construct private meanings using his own interpretive strategies. Fish (1980) describes the critic as one who, "rather than being merely a player in the game... is a maker and unmaker of its rules" (p. 367). It is in this activity that Fish would see not only all critics engage, but all readers as well, since, in the end, critics are distinguishable from "ordinary" readers, if at all, only in the degree of their persuasiveness rather than in the kind of their interpretive activity. His critic is in the first instance a reader and only then an arbiter of the reading of others. And even as arbiter, other readers are free to reject his readings if they are not acceptable to their own interpretive strategies.

Gone is the public verse and public criticism of the New Criticism. These have been replaced by private response, albeit governed by the prevailing assumptions of the interpretive communities to which readers may belong. But membership in interpretive communities is both individual and voluntary and the communities themselves are constantly having their tenets tested by competing readings and readers who, as critics themselves, are in the process of persuading others to accept their new readings which is to say new formulations of their private responses.

Wolfgang Iser and the Act of Reading

Where Fish has the reader construct meaning through interpretive strategies brought to the text, Wolfgang Iser conceives comprehension as resulting from an interaction between the reader and the text. In the most fully developed statement of his critical doctrine, *The Act of Reading,* published in 1978, Iser writes in his preface, "the poles of text and reader, together with the interaction that occurs between them, form the ground-plan on which a theory of literary communication may be built" (p. ix). It is in the space between these two poles that Iser sees the process of literary understanding taking place. While he denies the dominance of the text, and therefore rejects the New Critical position (1978, p. 15), he does not entirely reject the text as a factor independent of the reader in determining meaning. Iser conceives the text as "a frame within which the reader must construct for himself the aesthetic object" (1978, p. 107). In this way the text

guides the reader's private response. Referring to what he designates as the "verbal aspect" (the text) and the "affective aspect" (the reader), Iser maintains that "effects and responses are properties neither of the text nor the reader; the text represents a potential effect that is realized in the reading process" (1978, p. ix).

With respect to the text itself, Iser is concerned with the extent to which it guides the response of the reader. He argues that the text is suggestive rather than prescriptive in the response it shapes. Although the text may be instructive, it can never take over the reader or exclude him. Rather, it provides a context into which the reader brings his preexisting knowledge and within which he interacts to produce meaning:

> The text mobilizes the subjective knowledge present in all kinds of readers and directs it to one particular end. However varied this knowledge may be, the reader's subjective contribution is controlled by the given framework. It is as if the schema were a hollow form into which the reader is invited to pour his own store of knowledge. (1978, p. 143)

The manner by which the text guides the reader's response is through what Iser terms its "degrees of indeterminacy." Iser contends that "the literary text performs its function, not through a ruinous comparison with reality, but by communicating a reality which it has organized itself" (1978, p. 181). He argues that the text provides certain perspectives which excite an interaction with the reader. But this interaction does not result so much from these perspectives themselves as from the "blanks" (1978, p. 195) or empty spaces which they reveal in the ideational fabric of the text. The text, then, is not seen as a separate object possessing a meaning to be explicated by the reader as it was by the New Critics, nor is it seen as a verbal entity to which the reader brings an interpretive strategy as argued by Fish. Rather, it is seen as a network of indeterminacies revealing conceptual spaces which demand filling by the reader; through filling these spaces the reader interacts with the text to give it coherence. In this way the text directs the reader, but how the blanks are filled — how the text is ultimately realized — remains the private activity of the reader.

The process by which the reader interacts with the text is more complex than simply filling in blanks, however. In order to explain the reader's role more fully, Iser introduces the concept of the "wandering viewpoint" (1978, p. 108), the activity of the reader's mind as it moves through the text. Since the text is never complete in the sense that it never provides a totally coherent and predictable reality in itself, Iser argues that the function of the reader's wandering viewpoint is "consistency building." He maintains that "consistency building is the indispensable basis for all acts of comprehension" (1978, p. 125). It is

through imposing consistency on the text by filling in its blanks and by accommodating to the perspectives revealed in the text that the reader's wandering viewpoint engages in an active process of constructing meaning. Thus Iser (1978) concludes that the act of reading is an "event" (p. 68): Reading is not a process of passive reception but rather an active search after a meaning which the reader determines through his ideational interaction with the indeterminacies of the text.

The question remains as to what meaning is produced through the reader's participation in the text. Iser implicitly answers this question in describing the role of the wandering viewpoint. He argues that meaning can be defined as what is privately experienced: "The meaning of a literary text is not a definable entity, but, if anything, a dynamic happening" (1978, p. 22). The production of meaning is therefore characterized as a "performance" (1978, p. 27). The reader acts on the text, but in doing so, enters into the text to undergo a dynamic experience of perspective shifting through which meaning is constructed. Thus, according to Iser, "we comprehend a fictional text through the experience it makes us undergo" (1978, p. 189).

Iser's concept of literary meaning provides the basis for his notion of literary criticism. He does not conceive the critic as a determiner of meaning, but rather, like Fish, as a determiner of how meaning is produced — one who analyzes and articulates the dynamic happenings which give rise to meaning. He contends that "what is important to readers, critics, and authors is what literature *does* and not what it *means*" (1978, p. 53). It is the process of constructing literary meaning — the interaction of the reader with the text — that should be the focus of the critic's attention, and not the result of this process. Since the meaning of a work is generated during reading, any search for meaning which ignores what literature does to the reader during the private experience of reading can only be arbitrary, incomplete, and lacking in a recognition of the temporal reality of literary understanding. Thus, the objective of the critic should not be to explicate the meaning of a literary work, but "to reveal the conditions that bring about its various possible effects" (1978, p. 18).

The New Imperative

Taken together, the criticism of Fish and Iser destroys the notion of the primacy of the text and with it any vestige of public verse. In the case of Fish, meaning evolves from the interpretive strategy the reader brings to his encounter with the text. The text has nothing to say in all of this; it is the reader who speaks to the text and the text obeys.

For Iser, however, the text plays a part in determining meaning. In setting up his polarity between the reader and the text, Iser points to the indeterminacies of the text as elements which at once excite and constrain the meaning the reader constructs. While he agrees with Fish that meaning occurs during an encounter between reader and text, he maintains that the text provides a framework for this meaning. Therefore, while Fish would exclude the text as a determiner of meaning, Iser admits it as a framework within which the reader constructs a meaning which remains in the end private. So it is that for both these critics, and for the reader response criticism which they represent, public verse and all that can be said to be autonomous in the meaning of the text, falls before private interpretation.

But is it as simple as this, or with the dismissal of the New Criticism and its emphasis on the text, have we thrown out one orthodoxy and replaced it with another equally limiting? Have we lost our legitimacy as readers in our pursuit of a radical relativism from which we cannot escape and within which we are left to read with growing tedium reflections of what must remain a condition of critical stasis relating to nothing more interesting than the repeated playing of ourselves? This would seem to be the danger which we face if we are to continue to read literature exclusively as private verse.

One thing is clear, and that is there can never be a return to the New Criticism. The reasons for its demise given above remain as valid today as they were a decade ago. It is equally clear that our current self-absorption with private verse emerged from a cultural and social milieu which was peculiar to the 1960s and early 1970s. It is as though literary criticism during this period allowed itself to be captured by movements in politics and mass culture which have disappeared almost as quickly as they arose. What has been left as a cultural artifact is a criticism in search of an object, a criticism predicated on the importance of the self but lacking in a recognition of the socially and culturally derived (which is to say public) nature of the texts it seeks to interpret.

While the dominance of the text should never assume the proportions it did under the New Criticism, the denial of the text as a condition of meaning, however this meaning might be manipulated and ultimately construed by the participating reader, eliminates an important element in a necessary equation between public texts and private readers. It is the nature of this equation and the balance it implies, and not a preoccupation with either side of it, that would seem to be the legitimate object of literary criticism and the necessary focus for future explorations of how we read literature.

One way of reformulating this equation is in terms of the communicative function of literature. The dominance of the New Criticism and reader response criticism has resulted in the loss of a sense of literature as communication — the notion that literary understanding results from the intentional communication of something beyond the reader by an author through a text. This notion is firmly established in the tradition of English literature. For example, writing in the "Preface to the Lyrical Ballads," Wordsworth (1800/1952) described the poet as "a man speaking to men" (p. 339), and in our century, T. S. Eliot (1942/1953), in "The Music of Poetry," says of poetry, "it remains . . . one person talking to another" (p. 55). However, when the New Critics[5] declared the intentional fallacy, they eliminated the author as the initiating force behind literary communication, and when they declared the affective fallacy they granted the text ascendancy over the reader as the legitimate source of meaning. But when reader response critics discount the text and return meaning to the reader, they do so at the expense of limiting literary understanding to the reader. While the reader is reclaimed, the text is largely lost, the author remains forgotten, and the communicative function of literature remains forfeit.

This sort of one-sided theory building denies the mutual dependence of the text as an authorially contrived system of language conventions independent of the reader, and the response of the reader as the necessary factor in actualizing these conventions to give the text meaning. This is not to suggest the idea of a one-way communication by the text to the reader as demanded by the New Critics, nor is it the private communication with the self through the text as proposed by reader response critics. Rather, it is a notion of literary communication which recognizes the text as the linguistic and ideational embodiment of an intended communication, and conceives the reader as one who actively integrates this communication to give it meaning. The notion of literary communication being posited here, therefore, is an interactive one combining the author's intention, the configuration of meaning in the text, and the reader as a conscious and independent agent in constructing meaning. A recognition of the relative importance of these elements in the process of literary communication is necessary to further our understanding of how literature is read. It is clear that the New Criticism and reader response criticism have from their different perspectives inexorably led us into the current confinement of the reader. It is from this confinement that literary criticism must escape if it is not to become moribund and ultimately irrelevant as a means of exploring the process of understanding literary texts.

1. The term "poem" was used with considerable latitude by the New Critics, as it is in the writings of reader response critics today, to include any literary work, not only those arranged in verse form. Support for this notion can be found in William Butler Yeats' arrangement of Walter Pater's prose description of the Mona Lisa in free verse, and his inclusion of it in his edition of the *Oxford Book of Modern Verse* (1936). More recent support is provided by Louise Rosenblatt's (1978) use of the term "poetry" to designate "the whole category of aesthetic transactions between readers and texts without implying the greater or lesser 'poeticity' of any specific genre" (p. 12).

2. Any doubt concerning the demise of the New Criticism as a force in contemporary literary criticism is dispelled by the titles of several recent books including Frank Lentricchia's (1980) *After the New Criticism* and Iain McGilchrist's (1982) *Against Criticism.*

3. For an indication of the range and variety of contemporary reader response criticism, see Suleiman and Crosman (1980) and Tompkins (1980).

4. In this regard, see, for example, John Crowe Ransom (1936), *Who Owns America,* and Allen Tate (1936), *The Man of Letters in the Modern World.*

5. While it is true that the New Critics emphasized literature as communication, their notion of communication was a unidimensional one in which the text contained a meaning which was to be extracted by the reader.

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The Inner Functioning of Words: Iconicity in Poetic Language

Paschal C. Viglionese

Although it is generally believed that writing is the transcription of the union of sound and sense in speech which makes it appear to be a secondary mode of signification, it can be shown that the union of visual expression and content which constitutes writing is in reality the primary mode. The analysis in detail of several examples of Italian poetry will illustrate the special truth of this in the case of poetic language. The signification in unions of expression and content in poetry is visually motivated or iconic. To be iconic, a written sign need not be an isomorphic imitation of some real-world or natural shape; rather, its shape is the visual result of an "inner functioning" of words. The already culturalized world of meaning is the basis of the iconicity of the sign in poetry.

This study is in large part the practical, critical analysis of several texts of poetry in Italian with the intention of demonstrating that signs in poetic language are visual and that they may function independently of their relationship with spoken language. A Cratylian approach — signs are not arbitrary — will be followed, maintaining that poetic language is motivated in its visuality, that it is iconic in a fundamental way.

To say that a sign is motivated is not the same as saying that it is natural. The word *natural* is never free of ideological connotations and needs to be qualified if it is to be used at all. One should take note of what Umberto Eco (1978: Par. 3, *passim*) writes about iconicity and naturalness. If iconicity is to be taken solely as a quality of reference some sign may bear to a natural object whose shape is replicated in the perceptual form, the *expression,* of the sign, then, as Eco puts it, such a thing as iconicity is too problematical to be dealt with logically. It presents, among other things, contradictions hinging upon the differences observable among arbitrary expression forms (the words of different languages) referential to the same natural object. But there are some modes of sign production which involve a true motivation of the physical shape of the expression by the unit or units of *content,* the conceptual component of the sign, to which the expression is linked in the *sign-function.* There need not be some object in the natural world

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which imparts its own shape to an expression; a human mode of perception may determine that shape. The mode of perception may even impart some shape to the natural object which it does not have in nature, although for human purposes that shape remains entirely proper and acceptable. Eco's example of this is the drawing of a rhinoceros done by Albrecht Dürer: it errs in some details but is no less perfect an expression of "rhinoceros." The motivation of the iconic sign is not a natural, but a cultural phenomenon; units of content are humanly produced, cultural entities, not being part of the natural world.

Iconicity which is the result of cultural motivation has always been central to relations of signs in poetry. Futurist that he was, Carlo Belloli (1944, quoted in Solt and Barnstone, 1969: 41) denied historical precedent for his own kind of iconic texts which he called "audiovisual poems." According to Belloli, texts such as Apollinaire's "Il pleut," George Herbert's shaped stanzas, the *technopaignia* of the Alexandrian school (Klonsky, 1975), or any earlier manifestation of "visual" poetry, do not stand as forerunners from which his own poems trace their derivation. These earlier poems are for him merely texts whose external shape is intentionally stylized to resemble drawings of the objects the words tell about; they are naively mystical in intent, while in contrast his own poems are, he claims, the embodiment of "the inner functioning" of words. One has to agree that the iconicity of writing cannot be other than connected with some inner functioning of words, but one must also take historical instances of picture poems of all types definitely to be examples of the principle involved in such inner functioning, even though such poems may be done somewhat heavy-handedly, featuring mostly clever external effects. Not just picture poems, nor "audiovisual poems," but any poem will bear evidence of the inner functioning of words and will exemplify the principle of cultural motivation.

Poetry has been singled out for its directness of mediation between mind and world, achieved through its qualities of plasticity, its imagery, or perhaps its concreteness as an objective-correlative, to suggest some of the great variety of terminologies which have centered about the general aim of explaining what there is that characterizes the particular essence of poetry. The common factor underlying all such theoretical conceptions seems to be a foregrounding of the visually iconic attributes of the written sign in poetry. In other words, poetry pictures things, not in the sense that it tells about actions and feelings or describes in words the objects we see; but rather, its own physical presence amounts to a matter of true visual pattern and dimension.

Poets, both intuitively and consciously, have found written language to be much more than a technological device for the transcription of sounds. For poets, Cratylists all, as Roland Barthes (quoted in Merrim, 1981: 53) has called them, the meaning or the important information carried by language is identified with its physical substance. And not only poets (like Rimbaud) but Freud, too, as McKenna (1980: 219) has pointed out, look upon writing as "language as matter." Quoting Freud, "It is true in general that words are treated in dreams as though they were concrete things, and for that reason they are apt to be combined in just the same way as presentations of concrete things," McKenna (221) then adds: "Invisible to consciousness, language is visible in the unconscious and one can describe Freudian interpretation as an effort to make lanuage uninvisible."

Any poem has the potential of being perceived visually as a kind of picture. Whether this applies to all written language is not at issue at this point, but the case for the truth of this in poetic texts has been outlined effectively by Anthony L. Johnson (1977: 114–115), who holds that poetry differs from ordinary language by being the scene of operation of three hierarchical modes of generation of meaning which are: denotation, connotation, and anagrammatism. The first two, heavily involved with language, need to have little said of them here, but the third is central to the discussion because of the presence within it of what Johnson calls "iconico-graphic" modes of meaning generation. These are not usually consciously employed by the poet, but tend to be subliminal in their operation; as they are, in turn, in their reception by the reader of a poetic text. In this hierarchy of modes denotation has and must have primacy; if it did not, the other two modes might subvert it to the point of obliterating it, thus removing the preconditions for their own existence, and there would be no poetry, just "rhythmical gibberish." One might put this matter of the hierarchy of modes in a slightly different way: a word in a poetic text must somehow fit into the semantic scheme of a given language. The scheme is ordinarily the one belonging to the language in which the poem is written, but even in the case of foreign citations, where words in an unknown language may "mean" nothing (and here, it may be noted, when an unfamiliar foreign word appears in a text, the pure visuality of language will have its fullest impact), the reader will still usually be willing to assume that some semantic system is at work. The built-in semantic potential of a word is ultimately the only truly "natural" aspect of language. But this in no way precludes the operation of graphic and iconic signification within the word, for the anagrammatism of the written word will also always be present.


mus. te dominum confitemur.
eternum patrem. omnis terra veneratur.
tibi omnes angeli. tibi celi et universe

The simplistic premise of what is being proposed here is that when we read we *see*. Considerable importance should be given to the thought that the visuality of writing may be doing more before our eyes than just expressing language. In the semiotic system of language — in any semiotic system — content and expression never exist separately, but become realized at the moment they are joined together in the sign-function; in human language the joining together may be acoustic, as in speech, or graphic, as in writing. And while at times a close correlation between the acoustic and the graphic does exist, there are cases where the signification embodied in the graphic sign is simply beyond achievement in the elements of speech marked by it. For example, speech has no such thing as a capital letter: only in writing do such gestural distinctions as the attribution of special status to some of our nouns and the marking of the beginning of a new turn of thought become realized.

The illuminated capital in medieval manuscripts may seem a special case, but it really exemplifies a general principle. The relation of the capital to the semantic function of the word of which it was a part was usually overshadowed by the visual impact of the decorated letter. Figure 1 shows the capital "T" of the *Te deum* decorated by Giovannino de' Grassi in the book of hours of the Visconti family (Meiss, 1972) as the representation of an architectural space, a double-arched portal. Standing within each side of the portal is the figure of one of the two saints who are the supposed authors of the hymn, Jerome and Augustine. A connection is created between those conveying the sacred text and the text itself. The two authors are visually contained within the content of the text. In the case of a spoken utterance the text's producer is usually known (contained within the text) by acoustical presence in the context of sender and receiver; here, the presence is transformed into a visual one. This is an excellent instance of the iconic potential of writing, for it is nothing other than the letter "T" which performs this containment function by virtue of its very shape. An implicit signification residing within an alphabetic mark has been extracted and rendered explicit. The qualities of the illuminated capital, enhanced, to be sure, by the miniature painting, are ultimately the same as those possessed by any written sign, present in the most unadorned of letters: all the reader needs to do is to choose to see them.

Figure 1. Illuminated capital T by Giovannino de' Grassi in the *Visconti Book of Hours,* Millard Meiss, ed., New York: Braziller, 1972.

The signifying power of writing can be found in the shapes of the letters themselves. For example, human history is full of coded, symbolic significations of the circular shape (Peck, 1979). The circle is perhaps the most obvious example of an iconic shape, and it will be good to begin with it in the analysis of some actual examples of poetry which will show the visual or "iconicographic" processes of signification at the heart of writing. For human purposes the circle is a cultural shape already within our consciousness and ready to motivate the joining of expression and content in the sign-function. It is an important element of that reality we may call, in Eco's terms, our "previously culturalized content."

A most effective use of the circular shape of the letter "o" was made by the Czech poet Ladislav Novak (Williams, 1967: pages unnumbered) in a deceptively simple visual poem which may serve well as a first example. The poem consists of the single Latin word *gloria* arranged in special typography. (This suggests that it is a picture poem of the type of the shaped texts mentioned above, but it can be shown not to be the same thing at all.) A striking set of meanings may be evoked by this text, rendered approximately as:

O

G L R I A

One should note the combination of the circular shape and the superelevation of the letter. There is in such a combination the suggestion of the sun of revelation and grace, a possible outgrowth of a long tradition of meaning, along with the suggestion of the upward directionality of a hymn of praise toward heaven; or the raised letter may be an evocation of the elevation of the Host (shaped like "o") during the sacrifice of the mass; and not to omit another important possibility, in the context of song the raising of that particular letter, once again because of the shape it has, mimics the system of musical notation, especially as it is seen in early manuscript hymnals. Such factors, combined with the density of the connotations carried by the word itself in its historical context as a word in the ancient language of Catholicism and as the *incipit* of one of the most important segments of the liturgy, make this text a cogent religious poem.

The same word *gloria* appears at the beginning of a poem which Eugenio Montale included in his 1925 *Ossi Di seppia.* The first two lines of the text are:

Gloria del disteso mezzogiorno
quand'ombra non rendono gli alberi
(Montale, 1968: 68)

(Glory of full-spread noon when the trees yield no shade)

The letter "o" of the word *gloria* once again may evoke an image of the sun (later in the poem the Italian word for sun, *sole,* appears, and we see that it, too, contains the iconic letter). This image is reinforced in the subsequent appearance of the same letter in *mezzogiorno,* the word for mid-day. The brightness of the noonday sun, its parching, merciless heat is the predominant motif of the semantic component of this poem, what it appears that the poet would want us to think about as we read the text. The presence of the sun-shaped "o" in another word, *ombra,* which is "shade," the antonym of the sun, brings about the most striking effect of these lines. The shade, the thing that would be desirable as a relief from the scorching heat of the sun but is not to be had, since the trees cast no shadow at noon, has within its graphic substance the very shape of its opposing element. This is a cruel irony, one which fits quite aptly within this poem. The entire situation is rendered ironic by the traditional celebratory term *gloria,* which one expects to be expressive of joy, but which here is found as the opening of a text on the harshness and cruelty of life which is parched or scorched, and is only half over, as two later lines tell us:

Il mio giorno non è dunque passato:
l'ora più bella è di là dal muretto
(lines 6–7)

(My day then is not past: the best hour of it is beyond the wall)

Another illustration of the iconic power of the circular letter "o", but this time somewhat different in what it may evoke because it is functioning in very close rapport with another alphabetic sign, is to had be in the poem "Su" by Aldo Palazzeschi:

Le ultime finestre sotto i tetti
sono fatte a coni.
Anche le porte delle chiese
sono fatte a coni.
Come le vostre mani,
giovani che pregate,
sono giunte a coni.
I cedri,
i cipressi,
gli abeti dei giardini
sono coni.
Le ali delle rondini,
puntate per salire,
sono coni.
Coni dei tetti, coni delle mani,
coni delle porte, coni degli alberi,
coni dell ali,
coni, coni.

(Palazzeschi, 1973: 97)

(The topmost windows under the roofs are shaped like cones. The church doors too are shaped like cones. As your hands, boys who pray, are joined to form cones. The cedars, the cypresses, the firs of the gardens are cones. The wings of the swallows, pointed to soar, are cones. Cones in roofs, cones in hands, cones in doors, cones in trees, cones in wings, cones, cones.)

The references to objects which point upward, as would a geometric cone resting upon its base, seem to determine the theme of this poem as an evocation of upward movement, perhaps the direction of the yearning of the soul toward some divine or ideal destination, or some such traditional attribution of meaning to upward motion. Internal indications in the text like the mention of churches, prayer, and the cypress trees of Italian cemeteries and concomitant thoughts of an afterlife complement such a meaning. The line lengths of the text can be seen to change in such a way that the shape of the poem on the page (possibly an unconscious homage which Palazzeschi, contemporary of Apollinaire, made to the ancient forms of the *carmina figurata*) suggests several times the diminishing dimension of a cone observed with the eye moving from base to apex. This poem announces that it is not to be taken as a disquisition on a topic, but rather as a visual evocation of an image.

In Palazzeschi's text the scene of the most remarkable iconicity is the word *coni*. The letter "o" has already been singled out for the traditionally determined signifying power of its shape, but in this

word there is also found the letter "i", characterized by its linear and vertical configuration. We can discount for the moment that the spoken vowel sounds marked by these two letters may also be involved in some sort of phonetic iconism (Westcott, 1971: 421ff) and concentrate here on visual motivation: as the word *coni* is written in the conventional left to right direction, the motion from low to high is pictured as the progression from base ("o") to apex ("i") of the cone by the two graphic marks. (Following a different though related line of thought, we might connect "o" and "i" as symbols in as much as both suggest the notion of unity; and for this text the striving toward oneness is not to be excluded as its primary conceptual thrust.)

The revelation of such a correspondence between graphic image and conceptual content in a rather ordinary word can be the point of this poem by Palazzeschi. This is borne out by the relationship of the word *coni* ("cones") to the singular form of the word which is *cono.* The singular form is totally absent from the text (although its nearly identical image is mirrored in the third person plural of the verb "to be," *sono,* which appears five times); the singular form would not have the same effect, even though its semantic referent is still the same geometrical figure. One has to ask why the plural of the word is used when the singular might serve just as well to convey the idea of a cone, and the answer has to be that it is not really the *conceptual idea* in a word that figures importantly in this text so much as it is the *perceptual shape* of the word. Another question that may be put is why the plural seems to cohere with the rest of the poem beyond the obvious, pragmatic reason that the speaker compares multiple objects (roofs, hands, windows, etc.) with multiples of their prototype shape, and the plural, of course would make for the most logical connection. In poetry reasons of logic in semantics and grammar, certainly valid enough to the aim of comprehension, are not the only kind. In Palazzeschi's text the plural appears instead of the singular and reverses the logical imperatives of semantics: it is not because there are plural objects seen that we have the plural of the word, but that with the plural being so vital to the iconic functioning of the poem, only those objects which are multiple could possibly be allowed to serve as referents. The human habit of working from the inside outward, from mode of perception to object perceived in the world, which was referred to above appears to be functioning in this instance. In the internal context of this poem the plural is the motivated form. The singular may do no more than suggest the semantic concept of a cone and the extension of the word to its referent in the world, but the plural brings with it the full potential of the graphic sequence of its

two vowels. If we can see this, we are beginning to grasp what is meant by the inner functioning of words.

Poetry, where iconicity seems to rule, demands that certain words be present while others be omitted, as is the case with *coni* over *cono.* While one may not yet state fully systematic, universal laws, Johnson, who is only at the point of giving "theoretical preliminaries," writes (1977: 97) that it would be impossible to maintain that iconic rules are not at work. To maintain this one would have to fail completely to notice that in the Palazzeschi text the vowels "o" and "i" appear with great frequency throughout (within certain words the sequence of the two is exactly as it is in the key word: "sotto i tetti," "vostre mani," "giovani," "rondini"), making their presence in *coni* much more significant. One would also have to fail to notice that whenever the *sono* look-alike for the other form of *coni* appears, it is at the beginning of a segment which terminates in *coni.* And one would have to cast aside as insignificant the fact that when the verb which denotes the motion of rising occurs, it is *salire* (not *montare, ascendere,* or some other nearly synonymous Italian word), the tonic vowel of which is the iconic "i" of upward directionality.

"Nostalgia," a poem by Palazzeschi's much better known contemporary, Guiseppe Ungaretti, typifies his early production as a participant in the avant-garde of poetry of the era of the First World War. While the text displays innovation in its violation of prevailing codes not only in the omission of punctuation and the use of irregular, strophe-like groups of phrases, but also in its abandonment of traditional Italian metrics, there are certain principles of order and a relationship of the parts of the poem to its internal context which are definitely and most forcefully at work, and they are almost entirely iconic in nature. The elements of the text are far from randomly placed (there is no obvious attempt to achieve the effect of the "parole in libertà" of the Futurists of the time), despite the illusion of freedom or individual whim which is created whenever a poet chooses to go against the grain of the dictates of form prevalent in his time. The logic of conventional syntax is observed by Ungaretti, though he dispenses with the usual punctuation. The poem has upper-case letters at the beginning of each of the five short strophes, an initial indication that in this text graphic qualities will be of primary importance:

Quando
la notte è a svanire
poco prima di primavera
e di rado qualcuno passa

Su Parigi s'addensa
un oscuro colore
di pianto

In un canto
di ponte
contemplo
l'illimitato silenzio
di una ragazza
tenue

Le nostre
malattie
si fondono

E come portati via
si rimane

(Ungaretti, 1969: 854)

(When night is about to disappear shortly before spring and rarely does someone pass by A dark color of weeping thickens over Paris At a corner of a bridge I contemplate the limitless silence of a thin girl Our sicknesses fuse And as though carried away we remain)

It is immediately evident that the semantic structures of the poem pivot about several evocative images that employ language in a degree of violation of the rules of ordinary usage: the night disappears just before spring, not dawn; weeping or sorrow has a color, the dark color of thickening clouds; the persona of the text contemplates a girl's limitless silence (here it is impossible not to notice an approximate reinscription and condensation of the famous phrases "interminati spazi," "sovrumani silenzi," and "infinito silenzio," endless spaces, superhuman silences, infinite silence, from Leopardi's *Infinito*); the persona and the girl are joined by a blending of their sicknesses; as they are carried away they remain where they are. While figurative elements of this type could not be said to be unheard of in the centuries-old tradition of rhetorical expression through metaphor, their concentration within the space of this one text has something of a "modern" ring to it. Each of the images just noted is set off from the rest by syntax, but an even more effective division is achieved by the blank spaces occurring between the textual blocks. At the same time that such a visual separation is brought about, there is another

visual device which tends to join together what has been divided. A pattern of simultaneous disjunction and conjunction, the pause which is not really a pause, may be an iconic analog of the conceptual oxymoron which brings the text to a close.

The principal connecting link from one strophe to another is a graphic one. It has, incidentally, a phonetic counterpart as well. It is found on a level of microstructure at which phonemes and graphemes usually work together, but it can be shown that in this poem the graphic elements are well able to stand on their own with a system of articulation peculiar to them. Four of the five strophes contain words which have some arrangement of the two letters "c" and "p" in them. In two instances in the first strophe the letter "c" is not to be found; The letter "q" appears instead. In Italian as in English the phonetic values assigned to "q" and "c" are identical, but it is not required that one insist on phonetic identity to find a relation between the two letters. One need only note that the contrast between lower-case "q" and "p" (the optional case to the contrast of "c" and "p" in this text) is realized by nothing other than the reversal of the two graphic marks to form a mirror-image. This presents us with a case of difference based upon similarity, a relationship totally in harmony with the conceptual paradoxes of continuity and discontinuity in the poem's imagery. The force of a purely visual contrast in the "q/p" alternation heightens the graphic over the phonetic in the distinction of "c" and "p". The alternation of "c"("q") and "p" is seen to continue from the second to the third strophe with the repetition of the graphemes in these words: "colore" / "pianto" / "canto" / "ponte" / "contemplo".

There is no "c/p" alternation in the fourth strophe. Instead, the graphemes "l", "m", and "n" are found in increased number. In the fourth strophe graphemes predominate which were foregrounded earlier in a key phrase of the third strophe: "l'illimitato silenzio." This phrase seems, in turn, to have concentrated those three graphemes in one place after they had appeared scattered within words in which the "c/p" alternation had been most obvious, such as "qualcuno," "colore," and "contemplo." The final strophe contains a return to the alternation of "c" and "p" in the words "come portati."

Ungaretti's poem is about an emotional state. We do not see emotional states themselves, but only indices (smiles, tears, etc.) of their presence. The "pianto" (weeping) and the "Nostalgia" of the title make it evident enough that the emotion one deals with in the poem is sorrow of some kind. In Italian the word for sorrow is *dolore*. This word is not found in the poem. It should be noted, however, that a close approximation of the word (and here we have a situation not unlike the one seen in the Palazzeschi text above, where the absent word

cono was approximated by its look-alike *sono*) does in fact appear in the word *colore*. Through the presence of *colore* instead of *dolore* an appeal to sight is made: conceptually, the word asks the reader to see the color of weeping ("colore di pianto"), but perceptually, it does indeed allow the reader to see sorrow, both as an emotional state and as an absent word, without really seeing either. The clue that the reader is being asked to rely on what is visible about language in order to transform an emotional state into a code of perception is given by the insistent repetition of the "c/p" alternation as just outlined, leading up to the point at which "colore di pianto" finally appears. After that point in the text the alternation of the graphemes continues a little longer until there comes a word denoting the action of the persona: it is *contemplo,* the only action word which is specifically manifested in the text with the "I" as its subject, and in a strictly visual emphasis it comes at almost precisely the mid-point of the poem. It need not be pointed out that the word is a composite of both structures which have been shown to figure largely in the poem, "c/p" and "l/m/n", the latter being the preannouncement of "l'illimitato silenzio," the object of the direct contemplation of the persona. Is it possible to contemplate silence? To do that is perhaps something like seeing without really seeing; that is to say, in some way heretofore plausible only to the mystical mentality one may see something which is really something else. This poem seems to suggest that we can do that in spite of the paradox implied. In its iconic functioning the key verb of the text offers a solution to the situation of paradox: the verb contains its own object in the form of a visible index of shared graphemes.

While the demonstration of the inner functioning of words in poetry has been done with Italian texts of recent date, the translations of which have shown clearly enough that what is true for the graphic system of Italian may not be carried over into English in exactly the same way, nevertheless the same principles seem to be at work in different periods in history and in other languages as well. A single example may have to suffice at this point. A passage in *As You Like It* is frequently quoted in connection with the ancient metaphor of the *liber naturae,* but it is equally pertinent to the discussion at hand as an illustration of the pervasiveness of the visual, iconic functioning of words in poetry:

> And this our life, exempt from public haunt,
> Finds tongues in trees, books in the running brooks,
> Sermons in stones, and good in everything.
>
> (Act II, Sc. i, quoted in Lee, 1977: 5)

It does not seem at all fortuitous that in these words the three elements of nature which are mentioned ("trees," "brooks," "stones") as having language ("tongues," "books," "sermons") in them do in physical fact *contain* elements of the visual substance of the words which denote language: [T]ongue[S] in [T]ree[S]; [BOOKS] in [B]r[OOKS]; [S]erm[ONS] in [S]t[ON]e[S].

Such visual reinforcement of semantic values is more than a mere device. This is not a pun in the pejorative sense. It is, rather, a pun in the best sense of the word: that is, the pun which manifests the essential principle of iconic structure in language. The poetic function of a language may be so inextricably tied to its given system of iconic functioning that it cannot readily be translated into another language in any exact way; but the same iconic principles of inner functioning and motivation apply in all written languages.

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The Mind's Eye and the CRT Terminal: Towards a Diagrammatic Interface

Jeff Nickerson

The differences between humans and computers are drastic. The most significant for this discussion is the difference between the parallel processing of humans and the sequential processing of current machines. We can take advantage of parallel processing by combining the eye with the CRT. Computer memory is presented in a virtually simultaneous manner on the screen, and the image there presented is processed in parallel by the human visual system. The CRT is not only an input port to the eyes, but also a model of the mind. Renaissance practitioners of mnemonics appreciated the screen-like nature of human memory. This leads to a visual comparison between the Renaissance memory systems and the current trend toward windows on the CRT. It is appropriate to look at the sign process. We look at current interfaces in terms of Peirce's most used trichotomy, that between Icon, Index, and Symbol. Current interfaces involve mainly symbolic signs, with the recent addition of low-level iconic signs. Missing from the interfaces as a main component are the indexical signs and their realization through more sophisticated iconic representations.

> *A concept is the living influence upon us of a diagram, or icon, with whose several parts are connected in thought an equal number of feelings or ideas.* (Peirce 7.467)

The rapid spread of personal computers has stirred interest in making the computer easier to use. Since using a computer is essentially a process of handling signs, a look at the interface from the perspective of semiotics is revealing. This discussion concerns the visual aspect of the interface, calling on the nature of the visual system, the history of mnemonic techniques, the nature of the technology, and the nature of signs, in order to establish the significance of an interface emphasizing diagrams.

The Visual Realm

Given the specialized circuitry our minds possess, it is not surprising that we can imagine the world as well as see it (Figure 1). We can

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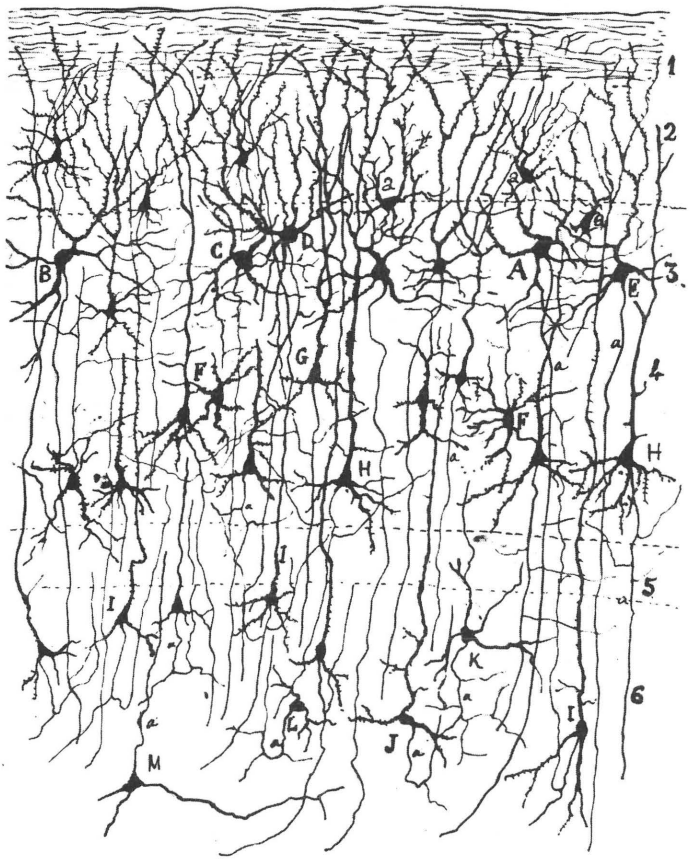
remember or construct images in our mind's eye, altering and examining them at will. Whether these inner images are intrinsic to thinking, or whether they are mere manifestations of some deeper structure is a question that has excited controversy (Kosslyn). Whatever the case, the imaging capabilities of the mind are not new, and the history of their recognition and use are instructive.

From the ancient Greeks up until this century, those studying rhetoric were exposed to mnemonic techniques for improving memory. These techniques involve linking pre-memorized spaces or images to other images that in some way represented the object in question (Figures 2a, 2b). A speaker would walk around a building, memorizing a certain direction of movement. In each room he would imagine an object corresponding to a concept he wished to discuss. A concept such as war that was to be discussed as a second topic might be represented by a sword placed mentally in the second room to be walked through (Yates).



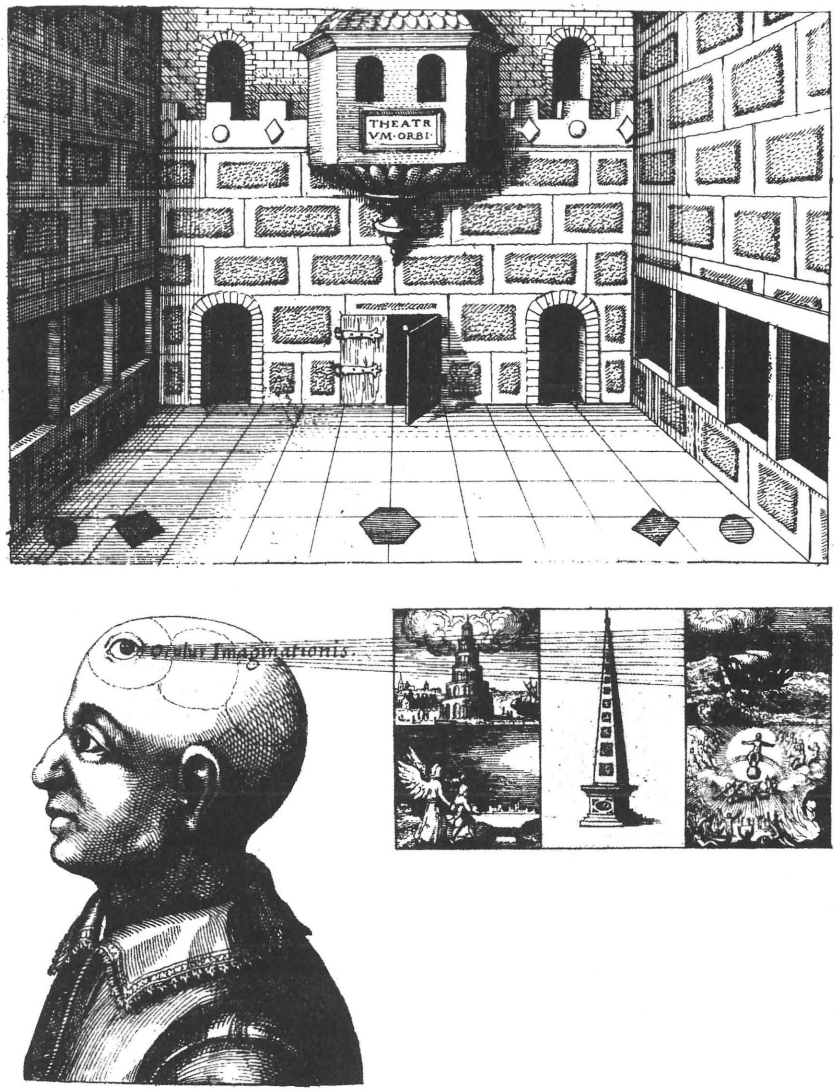


Figure 2a, 2b. The theatre memory system of Robert Fludd, circa 1625. The mnemonic practioner would pre-memorize the biblical images of 2b, which are arranged according to the windows of the stage-set 2a.

Figure 1. Visual cortex of a rat, drawn by Santiago Ramon y Cajal in 1888. The numbers identify cellular levels.

The more we find out about the psychology of the mind, the more the mnemonic techniques once taught as an integral part of rhetoric make sense. Research in cognitive psychology affirms what introspection tells us. The mind can remember images far easier than abstract concepts, hence the efficacy of representing the concept of war by a sword. The mind has a good spatial memory, so that the placing of objects in rooms or in windows of a facade take advantage of a psychological ability (Paivio).

From Simonedes to Leibnitz there were many famous practitioners of the art of memory. Cicero, Descartes, Lull, Bruno, and Leibnitz were familiar with the techniques. The practitioners of mnemonics, especially Bruno and Leibnitz, had high hopes for a universal language based on spatial, visual systems (Yates). We may realize their hopes through the displays of our computers, which will spread the conventions that make language possible.

The Computer Realm

The computer grew out of a need to automate the process of precise calculation. One of the earliest calculating devices, the abacus, would be described today as a dynamic memory device, with tactile input and graphic output. Embedded in the use of the abacus are the important concepts of the principle of position and the zero. The word algorithm for a period of time referred exclusively to positional numeration, before expanding into its current, more general usage (Dantzig). So this early device manifests a very important concept in a visual form that can be manipulated and changed. And this device was meant to be used in a strict manner that became an automatic program in the minds of those who used it extensively.

Mechanical devices were created to do the actual steps of addition and subtraction, but the harder tasks of multiplication and division were automated by Leibnitz. Leibnitz, in the earliest commentaries on user interface, said the computer should be used as a timesaver, to relieve good minds from the drudgery of calculation. He also suggested the machine would help in generating tables for curves, a foreshadowing of the eventual development of modern computers out of a need for ballistic calculations (Goldstine).

Peirce was the first to suggest the use of electricity for the computer (Burks). But it was Von Neumann and Turing who defined the electronic digital computer as we know it today. The model of a computer has changed little; it is still seen as a deterministic machine that reads and writes. Change has only taken place in the technological

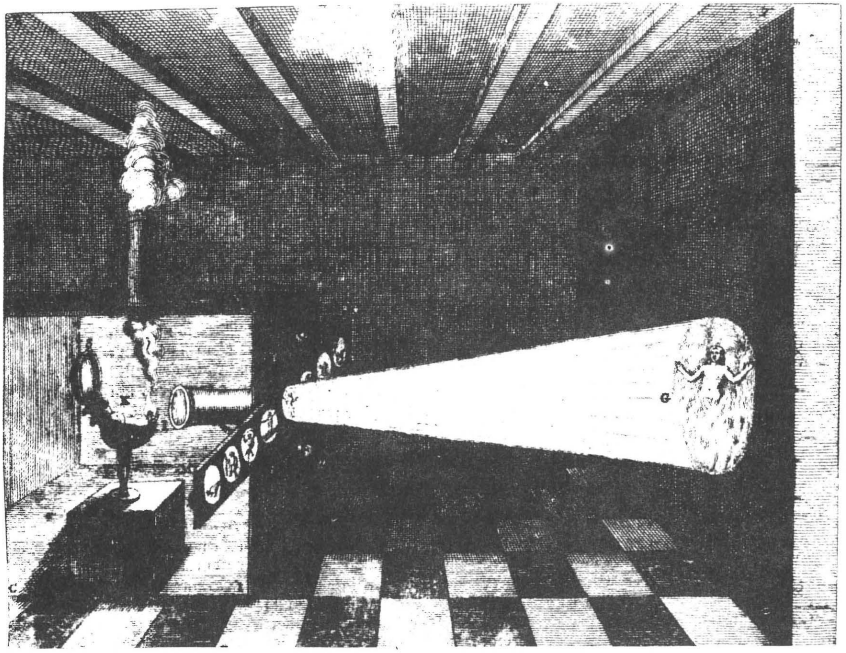


Figure 3. An illustration by Athanasius Kircher of the magic lantern, 17th century.

methods of reading and writing, change resulting in the present CRT terminal.

The modern CRT functions as a bitmapped graphic screen, in effect a visible array of computer memory. Each cell is given a light intensity value; the eye synthesizes these memory cells into an image, whether the image be a diagram or a page of text. In this way the CRT functions as an output device from the computer. Input to the computer can be made through a mouse, a pointing instrument that rolls across a flat desk area. The mouse allows the user to make choices directly off a CRT, speeding up and spatializing the interface.

The CRT has already been championed as a new model for the mind (Kosslyn). For a period, the mind was compared to mechanical devices: wheel-spinning, gear-meshing, hand-ticking machines. And internal images have been described as shadows on the wall, theater, paintings, photographs, and cinema, which all stress the dream-like, passive side of thought (Figure 3). Now the computer in conjunction with the CRT terminal forms the current model of the mind. It is an external object that is much closer to our conscious imaginings. Elements of both clockwork and cinema are involved, with the addition of the interactive qualities of the computer.

Signs

Interaction, whether it be between two people or a person and a machine, occurs by means of signs. We shall look at the visual realm in reference to Peirce's most fundamental division of signs, that between Icon, Index, and Symbol. This trichotomy explains the relationship of signs to the exterior (dynamic) objects that determine them. We concentrate on the Iconic and Indexical signs in order to point out the possibilities of the visual computer interface.

A *Iconic Signs*

An Iconic sign is a sign that represents its object through similarity. Peirce describes a further breakdown of iconic signs into images, diagrams, and metaphors:

> Those which partake of simple qualities, or First Firstnesses, are images; those which represent the relations, mainly dyadic, or so regarded, of the parts of one thing by analogous relations in their own parts are diagrams; those which represent the representative character of a representamen by representing a parallelism in something else, are metaphors. (Peirce 2.277)

A1 *Images*

Images are the lowest level icons. They are mainly mimetic, such as a drawing of an object (Figure 4). In current computer vernacular, the term icon refers only to these kind of signs, such as a line drawing of a file folder or an eraser. Such images have the advantage of being memory devices that can be used by non-readers, but also suffer from the possibility of misinterpretation. As soon as the object they represent is frozen by convention, they lose their iconic qualities and take on the role of symbols.

There is a current emphasis on this lowest level iconic sign, which is seen as an antidote for the over-symbolic nature of the older interfaces. The problem in the current interface is in the under-use of the really important visual signs, diagrams.

A2 *Diagrams*

A diagram is analogous to the object or process which it represents. The analogy is generally carried out by mapping a certain characteristic of the object onto a dimension of space. The diagram can appear analogous through its spatial connection (Figure 5). Peirce describes the diagram as being topological; the skeleton of set relationships.

The concept of projecting a characteristic onto a spatial dimension can be extended into projecting onto the time dimension. While on the

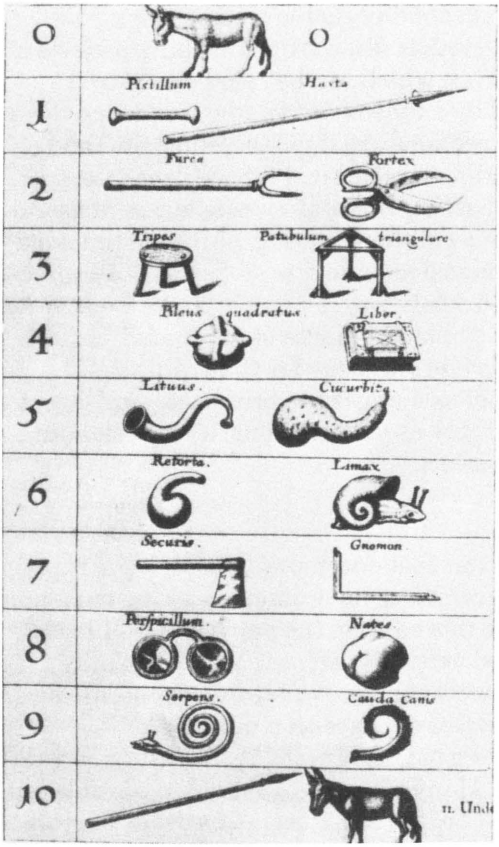
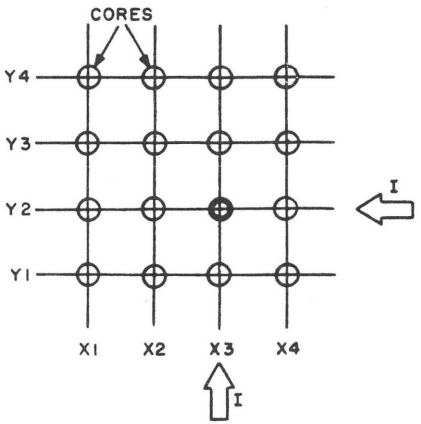


Figure 4. Robert Fludd's *Numerorum Descriptio,* 1617.

Figure 5. A diagram used to explain core memory. The topology of the lines is similar to the topology of the computer circuits.



printed page an arrow may indicate flow, using a computer a point may move across the screen. Another alternative mapping projects onto an auditory dimension. That which can be represented by a rising line can be represented by a tone of increasing frequency. These kinds of alternative projections are impossible in print, and a currently unused but potentially powerful tool for the user interface.

Pitts and McCulloch, in discussing the brain, write about "a useful general principle which we may call the exchangeability of time and space. This states that any dimension or degree of freedom of a manifold or group can be exchanged freely with as much delay in operation as corresponds to the number of distinct places along that dimension."

In the computer we have a crude analogue for the brain which allows us to perform the kind of exchanges the brain accomplishes. The time domain can be profitably used for the purpose of extending the dimensions of the user interface.

A3 *Metaphors*

A Metaphor is a general diagram that encompasses a series of mappings. Metaphors for the user interface have changed as the technology has improved. We have moved from the papyrus-scroll model, in which information streamed vertically off onto a roll of printer paper, to the current desktop metaphor, in which one is presented with an electronic version of series of pages on a desk.

This desktop metaphor is not a satisfying one; it suggests a certain kind of civil service drudgery. Many other metaphors are possible, all emphasizing a particular aspect of the interface. A model of the interface as that of a roomful of blackboards would suggest that not only text, but also diagrams might be scribbled on the board in the quest for the solution to a problem. A model based on the dashboard of a car would suggest a highly interactive, highly visual interface.

B *Indexical Component*

The above analogy between a dashboard and a computer screen brings forward the concept of an interface linked to the real world. Peirce sites a barometer or a weathervane as being diagrams that function as indexical signs. The list of such indicators can be extended to include speedometers, gas gauges, clocks, and all the other instrumentation we rely on to give us information about the world (Figure 6).

These instruments detect changes in the immediate environment, yet there exist broader, long term indexes, such as economic indicators. When one manipulates abstract lines on the computer termi-

nal, one is playing in the realm of possibility. When one generates a chart from statistics supplied by the marketplace (Figure 7), one brings the diagram into the realm of actuality. The power of such indexical signs is obvious, if only from their extensive use in science and business. Yet the user interface has not taken advantage of the computer's ease in generating such signs.

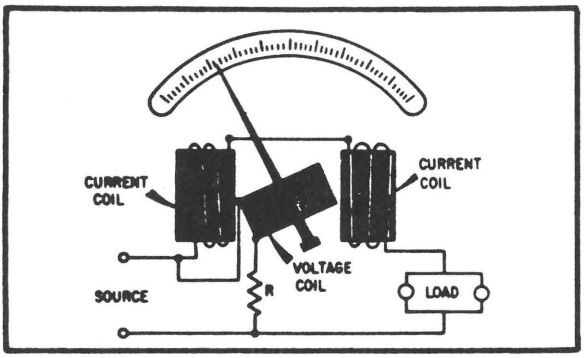
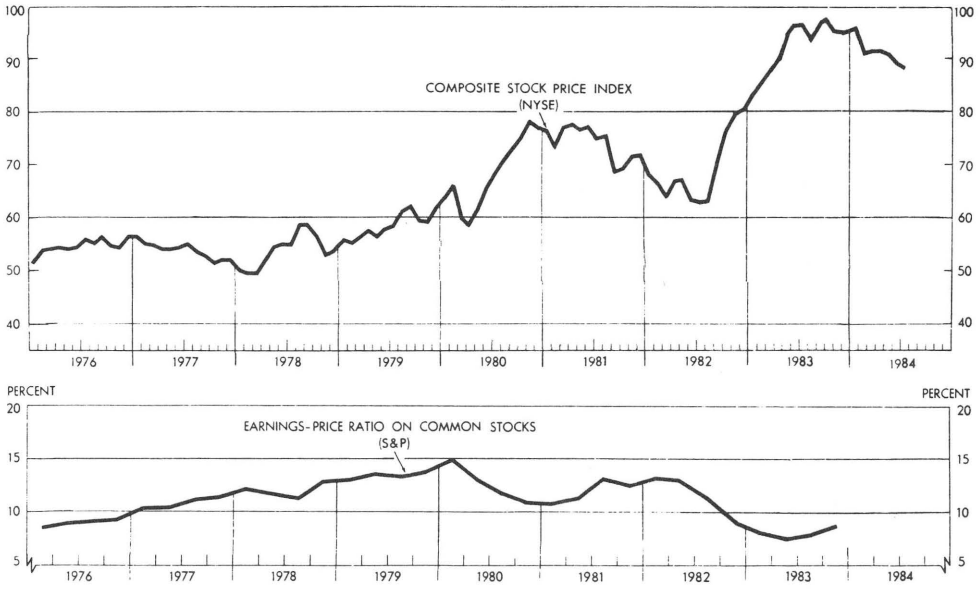


Figure 6. A wattmeter circuit, an example of an indexical sign generated electronically.

Figure 7. An economic index.



In a footnote about the indexical characteristics of language, Peirce writes:

> Once a logician had to construct a language de novo — which he actually has almost to do — he would naturally say, I shall need prepositions to express the temporal relations of before, after, and at the same time with, I shall need prepositions to express the spatial relations of adjoining, containing, touching, of in range with, of near to, far from, of to the right of, to the left of, above, below, before, behind, and I shall need prepositions to express motions into and out of these situations. For the rest, I can manage with metaphors. (2.290)

Peirce points out that prepositions are indexical in that they refer to a situation relative to the observer. This passage suggests a kind of visual language that links to the rest of the world through indices.

Significance

The diagram represents precise information in such a way that the human mind can determine the information's significance (Figure 8). Peirce writes:

> For a great distinguishing property of the icon is that by the direct observation of it other truths concerning its object can be discovered than those which suffice to determine its construction. Thus, by means of two photographs a map can be drawn, etc. Given a conventional or other general sign of an object, to deduce any other truth than that which it expicitly signifies, it is necessary, in all cases, to replace that sign by an icon. (2.279)

The importance of the icon is tied to the concept of similarity, which in turn is tied to the concept of continuity. Peirce saw the importance of this continuity, and more recent research in semiotics, mathematics, and computer science is affirming his concern (Nadin). In the field of neuroscience, the brain is being modeled as a continuous manifold of high dimensionality (McCullough, Anderson). Its nature is analogue, its algorithms statistical. In contrast, the computer is discrete, digital, sequential. If, as Peirce claims, discovery involves replacing symbols by diagrams, then the computer cannot discover anything. The computer can, however, display information in the form of diagrams that can be observed and manipulated by the human user. And the computer can compute statistics, which can provide the user with further refined information (Nadin).

Windows as Frames

The best way to represent statistics is through the diagram, and the best way to calculate them is often from different levels of globality, or different frames, or different degrees of resolution. The computer

x	$e^{-x^2}\int_0^x e^{t^2}dt$	x	$e^{-x^2}\int_0^x e^{t^2}dt$
0.00	0.00000 00000	1.00	0.53807 95069
0.02	0.01999 46675	1.02	0.53637 44359
0.04	0.03995 73606	1.04	0.53431 71471
0.06	0.05985 62071	1.06	0.53192 50787
0.08	0.07965 95389	1.08	0.52921 57454
0.10	0.09933 59924	1.10	0.52620 66800
0.12	0.11885 46083	1.12	0.52291 53777
0.14	0.13818 49287	1.14	0.51935 92435
0.16	0.15729 70920	1.16	0.51555 55409
0.18	0.17616 19254	1.18	0.51152 13448

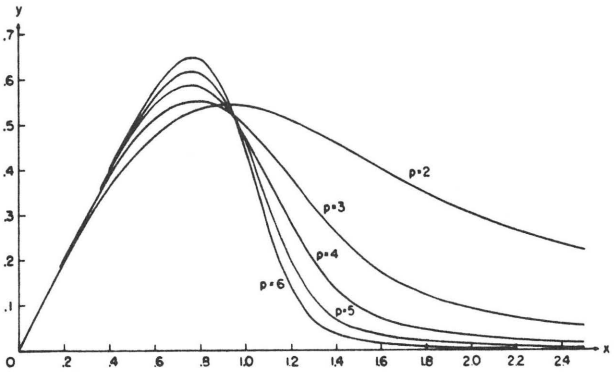


FIGURE 7.2. $y=e^{-x^p}\int_0^x e^{t^p}dt.$

$p=2(1)6$

Figure 8a, 8b. A table of values as it might be stored in computer memory, compared to a diagram of the same values as it might be displayed for a computer user.

should present its stored information and the results of its calculation in a form which will allow the mind to assess significance. Such a presentation takes advantage not just of the symbolic powers of language, but also of the continuous, parallel, multi-level nature of the mind. Peirce writes:

> All necessary reasoning without exception is diagrammatic. That is ,we construct an icon of our hypothetical state of things and proceed to observe it. This observation leads us to suspect that something is true, which we may or may not be able to formulate with precision, and we proceed to inquire whether it is true or not. For this purpose it is necessary to form a plan of investigation and this is the most difficult part of the whole operation.... But the greatest point of art consists in the introduction of suitable abstractions. By this I mean such a transformation of our diagrams that characters of one diagram may appear in another as things. A familiar example

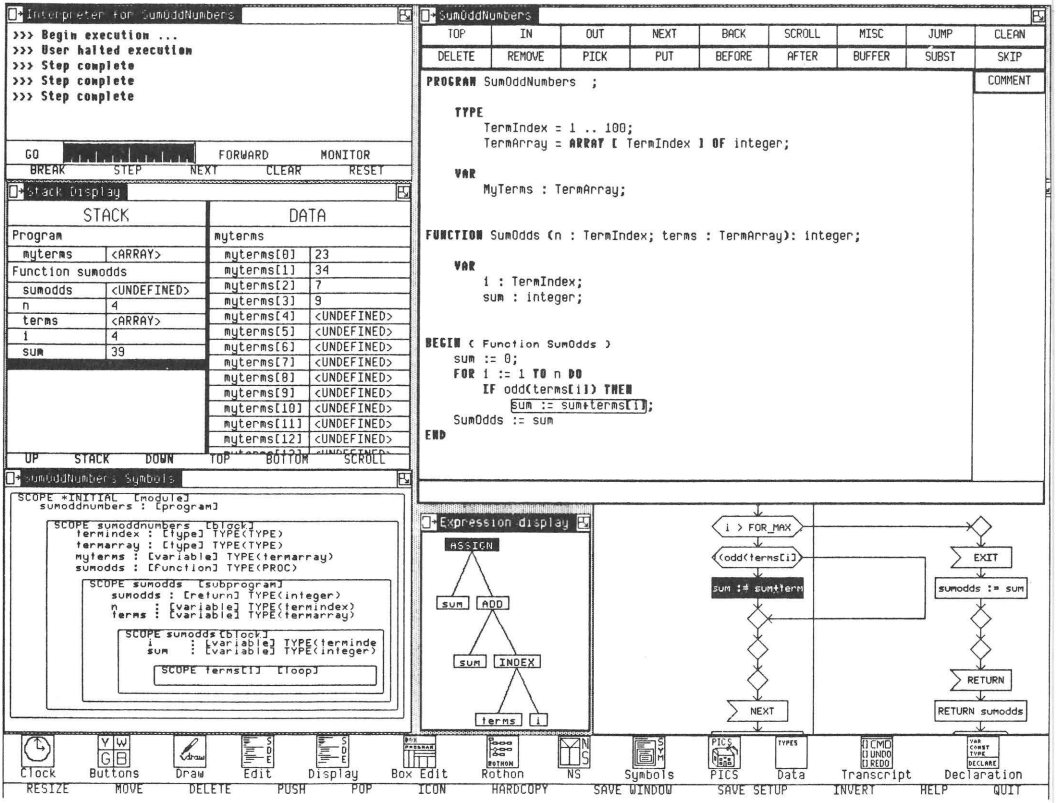


Figure 9. Steven P. Reiss's Programming Environment, illustrating the sophisticated use of windows with diagrams.

is where in analysis we treat operations as themselves the subject of operations. (5.162)

This passage suggests an interface in which a particular relationship, or diagram, is treated as an object, a node, in a higher level diagram. The human being is able to simultaneously keep both views in mind, the level and the meta-level, the details and the overview. Computers are notoriously bad at such tasks, but this process of framing is at the root of intelligence. Framing can be implemented in the interface with windows on the screen, simultaneously presenting the details and the overview, and allowing the user to steer through whatever level of detail is appropriate at a given point in time.

While windows exist in current interfaces, the software that uses them is still primitive. Outline processors are an attempt at a multi-

level interface, but these programs must be moved from their verbal emphasis to a more visual perspective if full utility is going to be gained from presenting windows in parallel.

Windows in the interface allow for multiple viewpoints based not only on hierarchy, but also on other criteria such as the location of certain data on the machine. The end effect is virtual parallelism, in which windows correspond to processes, in which one feels like one has many simultaneous jobs going and many different options for giving input or receiving output (Figure 9).

The user has the ability to create his own environment, an environment that becomes a kind of personal memory system, an environment that allows him to spatialize the sequential and linear nature of the machine.

The user interface should be tailored to take advantage of the human mind's abilities. The computer has precision, but cannot assess significance. The best kind of interface allows the user to determine significance, and steer the machine to the next set of retrievals or calculations. Such an interface makes use of the diagram, a form of iconic sign that allows new information to be deduced from it. Such diagrams can be tied to the actual world through indexical signs in the form of labels, or they can be determined by indexical data in the same way the direction of a weathervane is determined by the wind. Finally, a user needs an interface that allows for attacking multiple problems simultaneously, and attacking individual problems from multiple perspectives.

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