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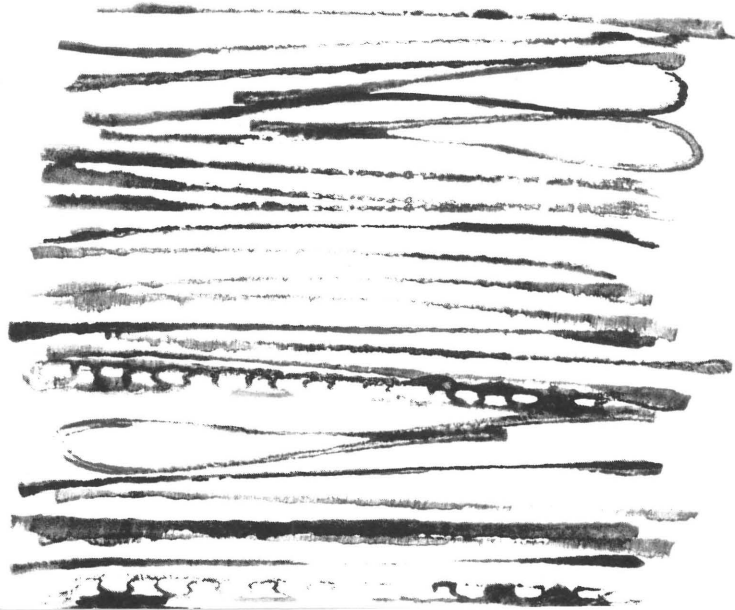
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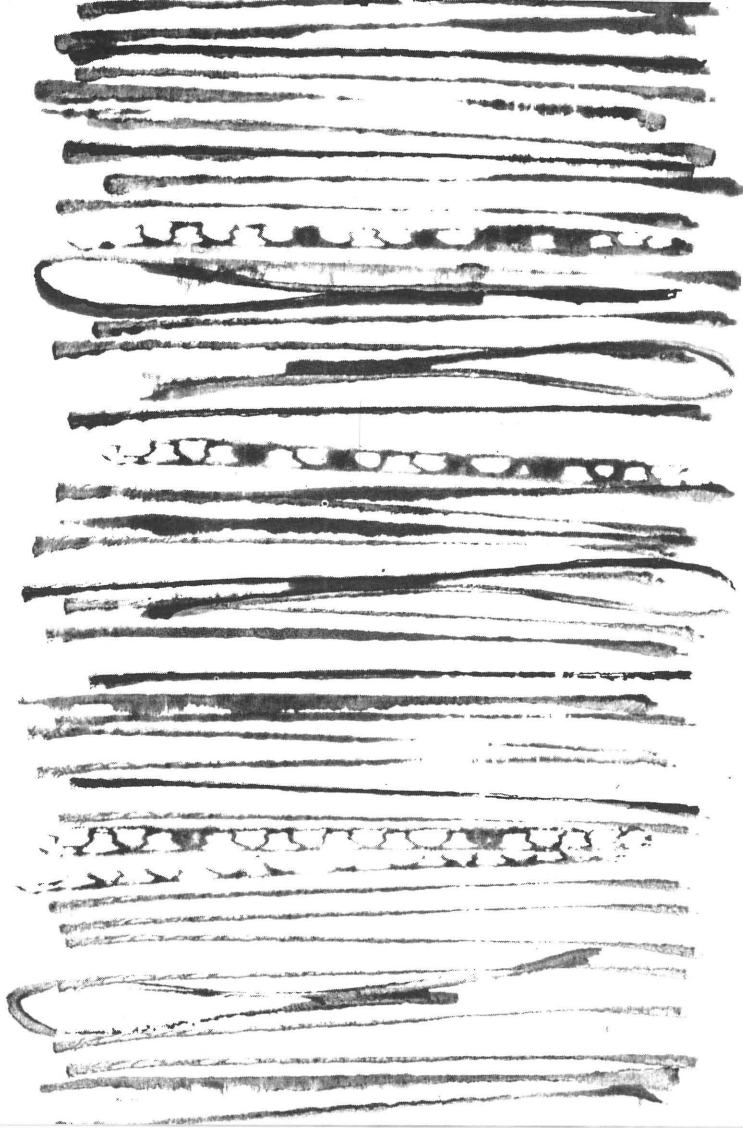
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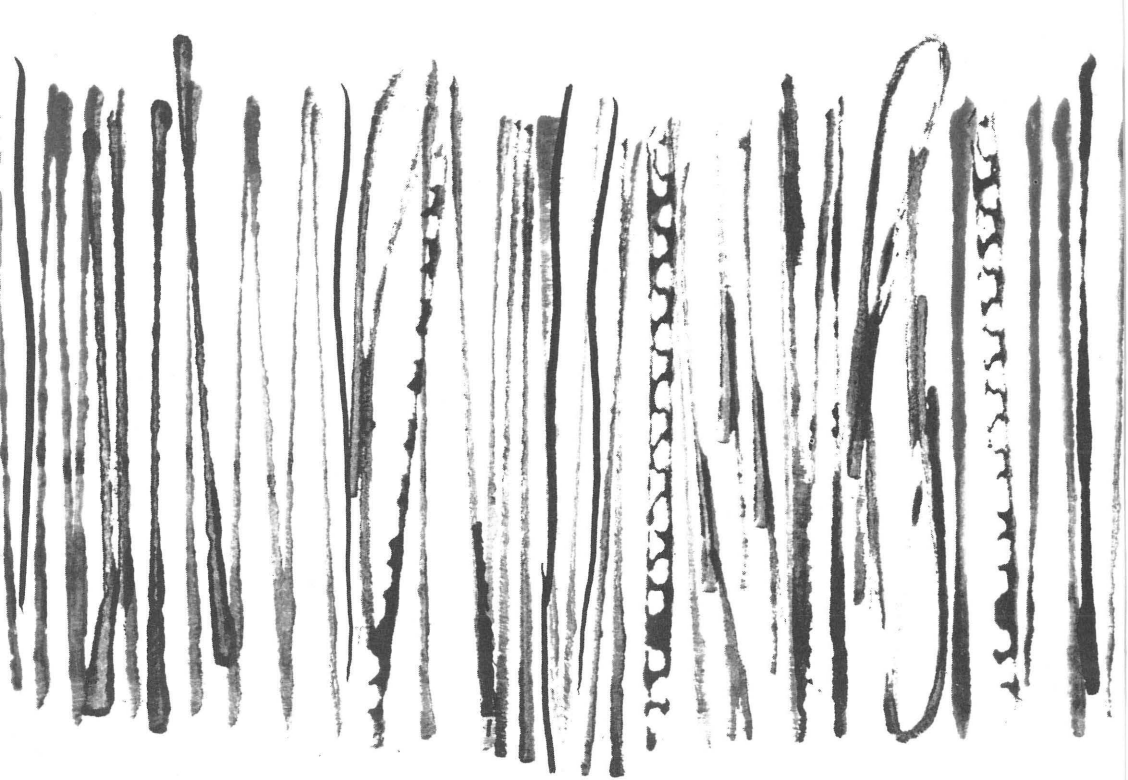
Value and Volume of **Literacy**

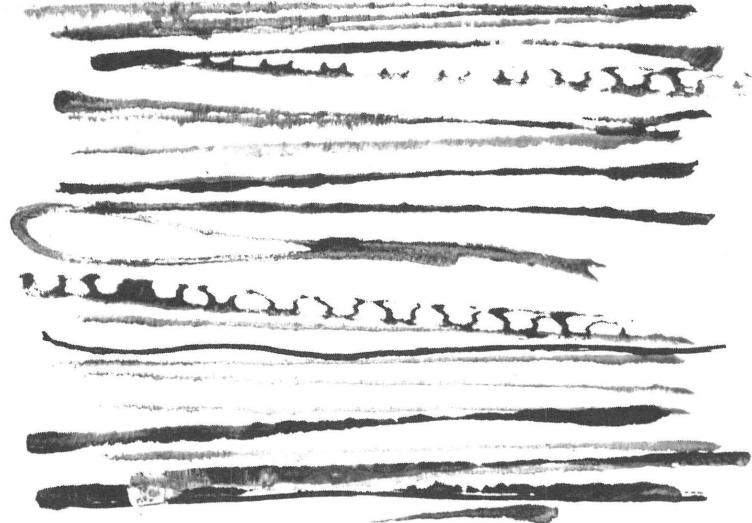
John R. Bormuth



This study set out to determine the volume and monetary value of literacy and to trace their growth over the past generation. The literacy consumed was taken to be the information that people exchange via the written word, and the literacy production industry was seen as having three major components – one that produces materials, another that distributes them, and a third that teaches people to read and write. Various product counts were used to index the volume of output for each production component, and the time that people spend reading and writing was used to index the volume of literacy consumed. These unit counts were examined individually within each component, comparing them to population size to determine their growth during the period studied. Then dollar values were assigned to these unit measures, and a national literacy account was formed, first, to estimate the total monetary value of the Nation's literacy and, second, to estimate the net value of literacy and the benefit-cost ratio of the literacy program and to examine their trends. It was possible to infer from these data that a large and growing fraction of the population has reached a high and increasing level of literacy, that literacy has been worth many times what it cost to produce, that literacy is one of the Nation's most important economic activities, that personal and social investments in literacy have been rising, but that the Nation has yet to reach the point where it would consider itself literate.







21 Three themes dominate supposedly informed discussions of the Nation's literacy, to wit, that the adult population is not very literate, that it is about to become less so since the reading and writing abilities of students are declining, and that literacy really doesn't much matter since electronic media are rapidly outmoding the written word. The first two themes take their primary support from surveys of adult and student performances on reading tests, and the third has been articulated primarily by McLuhan (1962, 1964, 1967, 1970), and mightily amplified by his followers from the electronic media who relied on evidence about the health and growth of certain elements of the publishing industry.

Efforts to interpret the public's reactions to these alarms, however, are highly problematic. When the literacy experts report that students' reading or writing skills are falling, for example, the public initi-

ally reacts with grave concern, showing that it is well aware of the vital role that literacy plays. But that concern quickly subsides, suggesting either that the public is as fickle as cynics would have us believe or that it knows something that the experts do not, that it is getting strong counterindications that are more credible than the experts' evidence. Could it be that the public sees more people reading and writing more materials than ever before and ascribes significance to the host of indicators of literacy that it sees published daily, such as the seemingly trivial fact that annual sales of paper clips rose from 7 to nearly 11 billion during the last decade? Is it possible that ordinary people understand how to assess literacy better than the experts? I will briefly examine the literacy experts' psychological test data and the evidence on which McLuhan based his claims and then examine in some detail the economic and social indicators of the sort that are readily

available to the public. It will be seen that they do indeed conflict with the experts' evidence and that the social and economic indicators presently yield the more plausible account.¹

Purpose

One goal of this paper is to understand the performance of the Nation's literacy program during the last 25 years, to understand it in the same pragmatic way and as well as the general public seems to. To that end, I have briefly examined some fallacies of the available test data but concentrated on gathering certain social and economic indicators that provide a modestly comprehensive view of literacy activities and then organized them in a common sense fashion and tried to extract a plausible account of the current state and trend of the value and volume of the Nation's literacy. In particular, this paper attempted to address the following hypotheses:

1. A large and growing fraction of our nation's population has reached a high and increasing level of literacy.
2. Literacy is and has been worth far more than it has cost to produce it.
3. Literacy is one of our Nation's most important economic activities.
4. Personal and social investment in literacy has been growing rapidly.

A second goal is to get a more basic than usual view of literacy, seeing it not solely as an esthetic endeavor, as a problem of educational concern, as a matter of social equity, or as a necessity of democratic government, but also and primarily as an *economic* activity that is deeply embedded in the culture at large and woven inextricably into the processes by which we win our bread and board.

Nature of Literacy

Many have criticized discussions of literacy, complaining that dictionary definitions of the term are ambiguous and that each author seems to exploit this fact to give the concept his own personal twist. In point of fact, investigators have measured an astonishing variety of things in their efforts to assess people's literacy, things as varied as the years of schooling a person has completed, his score on a test of his mastery of a list of either reading or writing skills, the quantity of materials that he buys or borrows, and even the linguistic complexity of those materials. Then to make matters worse, those authors often go to great lengths to deny that they have measured literacy itself, that they have instead measured only one of the several things that determine literacy, but without venturing to say just what literacy itself might be and what other variables they have left unaccounted for. Since this paper will describe several familiar measures of literacy and add several more to that inventory, it will be necessary to try to

remedy this matter by attempting to describe literacy: the thing its very self and its relationships to the things measured to assess it. The reader is asked to be both indulgent and critical of this effort — indulgent because space is limited but critical because literacy is a dearly sought personal and social goal and is not merely a scientific-technical matter to be defined to suit the convenience of social scientists. The definition that comes to prevail in society will strongly influence both whether people get what they actually mean by literacy and what prices they pay for whatever they eventually get bearing that label.

Literacy is somewhat like mobility in that each term refers to the potential or actual accomplishment of some act, in that each of those acts is the immediate end-product of a program or series of preparatory activities, and in that identifying the direct referent of either term can be done by identifying the principal means of producing that act and then describing the single end-product that fully accounts for those preparatory activities. Mobility, for example, is directly produced by activities such as making shoes, sidewalks, cars, roads, and the like. And these, in turn, are produced by a series of still more remotely related support activities. But all of these activities are merely the *means* of producing mobility and are not the *end*, mobility itself. Mobility itself is, of course, the ability to move about. Similarly, literacy is directly produced by instruction in reading and writing skills and by efforts to produce and distribute literacy materials. But each of these is only a means of achieving literacy and none is literacy itself, the single end-product of these activities. So literacy itself seems to be the *the actual or*

potential for exchanging information through the written word, for that accomplishment or capability alone can account for the activities that we identify as producing literacy while accounting for none that we do not.

This definition has a number of virtues, a major one being that it describes the crux of the literacy program and captures in one variable a measure of the final output of that program. That is, a direct measure of literacy itself would be obtained under this definition by giving a person comprehension tests for each of the materials that he reads. And his score on one of those tests would simultaneously indicate not only his literacy with respect to that material but also the literacy of the author of that material with respect to that reader. Then adding up those scores in various ways would yield literacy measures for individual readers or writers and for society as a whole or any subgroup of readers, writers, or materials. Another virtue is that it is compatible with the basic definition of literacy given in dictionaries. They generally assert that literacy means the ability to read and write which, among several other things, could mean the actual or potential for exchanging information through the written word. And a very important virtue of the present definition is that it has provided the basis for devising a model of the literacy program, deriving a production function that simulates certain of the program's behaviors, and then bringing the full force of microeconomic theory to bear on the analysis of literacy (Bormuth, 1978). But its greatest virtue for the immediate purposes of the discussions that follow is that it shows how to interpret the other things that are measured to assess literacy.

Tests of reading or writing skills have to be regarded as indirect indicators of literacy since they measure only an intermediate product of a component activity of the literacy program rather than measuring the end product, literacy itself. Similarly, people's literacy could also be measured and compared by counting the materials produced, distributed, or consumed or even by counting the products of still more remotely related activities such as the manufacture of paper clips and paper. But using any of these indirect indicators always presents the problem that we must either demonstrate or just assume, that all of the other things that determine a person's literacy are held at a level that is both constant and above zero. Just as two people would differ in literacy if they had differing levels of, say, reading skill but access to an identical quantity and quality of materials, they would also differ in literacy if they had identical levels of reading skills but access to very different quantities and qualities of materials. Moreover, the level at which these other things must be held constant must often be above zero, for people seem generally unwilling to attribute literacy to anyone who lacks any one of the essential means of exchanging information through the written word. That is, most are reluctant to ascribe any literacy at all not only to people who lack reading or writing skills but also to people who might have some skills but no means at all to either get or produce materials that they could or would read.

Next, nearly all usages of the term literacy carry a certain amount of qualitative or ethical freight, seeming to imply that we have objective and generally accepted ways to evaluate the

worth of a material and to determine if a person has reached a criterion of desirable performance on some scale of literacy, the level intended when it is said that someone is a literate person. Although some investigators have adopted one criterion or another, we presently have no rationally defensible one, so the credibility of the data offered by these authors is always impaired. However, most authors employ the practice followed in this paper, the practice of tacitly or explicitly assuming that nearly any direct or indirect measure of literacy already reflects these quality aspects of literacy to at least some extent. The basis of this assumption is that people simply do not labor long and hard to learn to read and write and later to produce, distribute, and consume materials unless in their eyes those materials convey at least an acceptable amount of information that at least they regard as being valuable enough to justify these activities. This, of course, permits us to measure and compare people's relative levels of literacy, but it provides us with no help at all in classifying them at being literate or otherwise. Such is the humble state of this art.

Finally, some discussions that follow invoke the concept of illiteracy, making it necessary to point out, as other have (Cipolla, 1956), that people rarely agree that everyone is either an illiterate or a literate. Most would agree that to be illiterate means to have essentially no useful amount of ability to read and write. But they will not thereupon agree that to be literate necessarily means to have a next-to-useless amount of ability to read and write. It follows that many people, at least implicitly, believe that a region of "subliteracy" contains people who are neither quite illiterate nor quite literate.

Current Zeitgeist

The test data currently available provide dubious support for the propositions that people are not very literate and are growing less so, and the evidence on which McLuhan based his claims that literacy is decaying is, to say the least, ephemeral.

Psychological Tests

A simple but slippery fact must be carefully understood and then firmly held when inspecting test data. That is, different kinds of reading and writing tests measure a person's literacy with very different degrees of directness and definitiveness. The ultimate and pragmatic purpose of literacy activities is to *transfer information* of some sort from writers to their readers. Hence, that *transfer of information* is the literacy process itself, and all other activities leading up to that transfer, such as learning to read and write, are merely secondary support activities that are not literacy itself. Then a direct and definitive measure of literacy would test the amount of information transferred between a writer and his reader and that single test score would indicate not only the reader's literacy with respect to that material but also the literacy of the material's author with respect to that material for that reader. As a corollary, then measures of the products of support activities, such as learning reading and writing skills, would necessarily yield only remote and partial accounts of a person's literacy.

In particular, a student's achievement of reading skills — as measured by a reading achievement test — may indicate either a high or low level of literacy, depending on such things as the number of useful materials available for him to read and the obscurity of the writing in those materials. Similarly, his score on a test of achievement of writing skills may indicate either a high or low level of writing literacy, depending on such things as the availability of means to publish his work and the level of reading skill of his intended readers.

Student Literacy: Astonishingly little can be said about the trend of literacy among high school students. Seemingly there are no reports of repeated observations of their actual literacy, their ability to comprehend actual materials, and only sparse, spotty, and often poorly designed studies reporting comparisons of achievement test scores over time. And all of the latter dealt either with reading skills or with low level writing skills such as spelling, grammatical usage, and punctuation. Two extensive and careful reviews (Harnischfeger and Wiley, 1975; and Farr, Tuinman, and Rowls, 1974) have been made of the studies that have been conducted. Although most of the studies were found to be seriously flawed, two results seemed fairly clear. First, from early in this century until about 1965 there seemed to be a slow but steady increase in reading scores of all students. Second, following that year, the scores of students below fifth grade leveled off and the scores of older students, especially those in high school, declined somewhat. (Farr was recently quoted [Banas, 1978] as having recent evidence that the scores of both upper and lower grade students had fallen clear back to

their 1944 levels.) None of these studies could address the issue of literacy definitively, since no concomitant effort was made to determine the concurrent trends in the availability and comprehensibility of the materials reaching print. So any inferences made about the literacy of students from these results must begin by making, among others, the highly problematic assumptions that the comprehensibility, price, variety, and usefulness of materials was constant throughout these years.

It seems fairly plausible that the historic increase in students' reading ability (though not necessarily their literacy) was indeed slowed or possibly even reversed beginning around 1965. But the popular belief that the reading abilities of students were actually declining is highly problematic. For one thing, all of the studies reviewed neglected to test and include the scores of school dropouts, and, as will be seen in Table VII, the dropout rate declined only slowly until about 1965 and thereupon dropped sharply. For another thing, those dropouts had had much lower than average IQ's (Bureau of Labor Statistics, 1960) and, of course, much lower than average reading abilities. Therefore, all or most of the decline in scores following 1965 could have arisen simply because larger and larger numbers of low ability students stayed in school where their ability would be tested and their scores would appear in and bring down the means in the studies that were reported and reviewed. Thus, the popular notion that students' literacy skills have fallen is based on highly questionable evidence and the notion that their literacy itself has fallen has even less support.

Adult

Literacy: Three national surveys — one by Louis Harris and Associates (1970, 1971), another by the Adult Performance Level Project (1973, 1975a and 1975b), and a third by Educational Testing Service (Murphy, 1973, 1975) — each identified a set of presumably useful reading tasks, tested a national sample of adults on them, and then counted as illiterate anyone failing to reach a criterion level of performance. Little sense can be made of the study by Educational Testing Service since it reported merely the proportion of people failing to answer a single question about each separate task instead of the proportion failing to reach a criterion level of performance on a criterion proportion of the tasks, as the other two studies had done.

In its first survey (1970) Louis Harris and Associates found an overall adult illiteracy rate of 3 percent, a rate of 2 percent among adults who had completed 12 years of schooling, and, inexplicably, a rate of 1 percent among college graduates. The second Harris survey (1971) reported an adult illiteracy rate of 4 percent among those who had completed 12 years of schooling and one of 5 percent among professional and managerial workers. The Adult Performance Level Project reported an overall adult illiteracy rate of 20 percent, one of 11 percent among professional and managerial workers. And then for whatever it may be worth, Educational Testing Service reported an illiteracy rate (i.e., average number of failures to answer the single question asked about a material) of 19 percent among those with 12 years of schooling and one of 14 percent among professional

and managerial workers.

It is difficult to say just how credible these results are. First, the illiteracy rate reported depends very heavily on the difficulty of the materials tested, how they were tested, and the criterion score used to designate the upper bound of illiterate performance on a material. None of these studies brought forth a plausible argument that the materials it tested were either very important to people or very representative of the difficulty of the materials that people actually want or need to read. And no effort whatever was made to justify the criterion cut-off scores used. Second, each of these surveys was conducted either by a government agency or by a commercial corporation under contract to a government agency on which it had to depend for income. And each of the sponsoring agencies had vested interests in leading the public to believe that the adult illiteracy rate was very high. And third, the proposition that astonishingly large percentages of college graduates and professional and management workers are illiterate is ample grounds for inugning the reliability of these studies, if not the motives of their sponsoring agencies. Fisher (1976), noting this anomaly, charitably assumed that this was the only source of bias in these data, and then adjusted the illiteracy rates for adults having 12 years of schooling, using the illiteracy rates among professional and managerial workers as an estimate of the bias in the data. This brought the illiteracy rates of the first and second Harris surveys down to .7 and .6 percent, respectively, and that of the Adult Performance Level Project down to 6.9 percent.

Thus, since over 98 percent of the school age population is now electing to remain in school (see Table VII) and since the median years of schooling completed by adults over age 25 recently stood at 12.4 (*Statistical Abstracts of the United States, 1976*) and was rising rapidly, it is not at all implausible to conclude that the adult illiteracy rate (whatever that might mean) must be so low that illiteracy is largely confined to recent immigrants and to people with severe mental or physical handicaps. However, one cannot then conclude with any plausibility that this gives much cause for celebration since to be nonilliterate may mean nothing more glorious than to have a next to useless amount of ability to use the written word. And, so far, psychologists have yet to come up with a plausible way to determine when a person is literate, when he has as much ability as he realistically ought to have. One behavioral scientist, after a thorough search and study of the relevant research, delivered a report that began with this lament: "I have lots of numbers to offer you today. But I must confess that, after a few weeks of working my way through published figures of one kind and another, I do not know with any precision the extent of illiteracy in our country today. I don't think anyone else does, either." (Sava, 1970, p. 1) If the scholars can do no better than that, how can they presume to tell the public whether or not it is as literate as it ought to be?

Other Indicators

McLuhan's argument was based, in part, on the demonstrable in-

crease in the use of television (Roper, 1971) and the other electronic media and, in part, on facts that he believed were indications that the use of the written word was falling into serious decline, facts such as that newspaper circulation (number of copies sold per issue) was declining relative to population growth, that well-known and widely read magazines such as *Life* and *The Saturday Evening Post* were forced to go out of print, and that the sales of novels and fiction materials in general had declined. Taking these facts to represent the true state of affairs, and noting the rising use of electronic media, he hastened to proclaim that literacy was falling into disuse. The data that appear in the remainder of this paper will show that these were isolated and false indications and that by almost every credible measure of this type the use of literacy in the United States, and hence its literacy, has been growing rapidly.

In summary, then the zeitgeist of the moment holds that the United States is not very literate, that it is growing less so, and that this trend does not matter much. But those beliefs rest on tenuous evidence, on biased psychological test data whose interpretation often entailed dubious assumptions or on fragmentary socio-economic indications. Hence, for all that we can really tell from the data heretofore available, the Nation's literacy may be rising, falling, or stagnating. The remainder of this paper will try to achieve some of the equanimity with which the general public views the literacy "problem" by taking a systematic look at the aspects that furnish them with their view of the state of the literacy program.

II

Volume Indicators

In this section we will examine only a few of the many possible economic indicators of literacy activity, staying generally with those that may be found in fairly standard reference works and particularly with those that figure directly into the cost of the literacy program when that cost is counted in a certain way. This presentation will begin with the factor most directly related to literacy: estimates of the amount of time people spend reading and writing. Then it will move to more remote factors, to measures of the quantity of literacy materials produced and distributed. Finally I will report on measures of the amount of instruction people receive in literacy skills. Initially, each presentation of data will focus, as far as possible, on physical measures and then shift to monetary measures of the factors. In the next section, the monetary measures will be brought together to obtain an estimate of the total monetary value of literacy activity for several of the years that roughly span the period since World War II. The size and growth of these sums will then be examined relative to each other and to the rates of inflation, population increase, and growth in the gross national product.²

Time Spent Reading and Writing

The time that people spend engaged in reading and writing activities is probably the most direct and accurate of the economic indicators of literacy. Several studies of this sort have been conducted, but limited resources forced most investigators to limit

their attention to special groups of people and to a limited type of material (e.g., Block, 1970; Greenberg and Dervin, 1970; and Sargent and Stempel, 1968). However, a study by Educational Testing Service (Sharon, 1972, 1973) did have adequate resources and may present a reasonably representative view of the reading and probably the writing performed by the American adult.

Time Spent Reading and Writing at Work: The Sharon study interviewed a carefully selected sample consisting of 5,067 people, age 16 or over, who were asked, among other things, to list hour-by-hour their activities of the previous day; eating, at work, shopping, etc. Then they were asked various questions designed to help them recall every scrap of reading they had done during each of these activities. They were also asked to state why they had done this reading, how important they thought it was to do it, and how much time this reading task consumed.

One set

of figures of special interest were the facts that 87 percent of those who were gainfully employed said they had to read as a part of their jobs. The typical working person spent a mean of 141.1 minutes of his actual working time engaged in reading tasks of some sort.

Table I shows a breakdown of the percentage of respondents doing various types of reading and the amounts of time they devoted to those activities. The first four rows show the time that respondents spent reading newspapers, magazines, books, and mail, regardless of what they were doing (having lunch or commuting) at the time they read them. Thus, for example, 73 percent of the respondents reported reading a

newspaper during the previous day for a median time of 35 minutes, and a mean of 44.5 minutes. The mean for the entire population, then, was $.73 \times 44.5 = 32.5$ minutes. The last nine rows were obtained by subtracting out the time spent reading these four kinds of materials and finding the portion of respondents who read still other kinds of materials while engaged in those nine activities. This manner of tabulating the results tends to distinguish reading that was required by the activity itself from reading that was done merely to kill time during a lull in the activity. Thus, for example, a commuter might consume nearly all of the time in transit with reading a book, magazine, newspaper, or his mail. But this time would be counted in the first, rather than second, set of categories, leaving in the second set of categories just the times spent doing such things as reading train schedules, signs, and the like. Thus, the 141.1 minutes spent reading at work is no doubt made up primarily of reading that had to be performed in order to carry out the work assignment. But it underestimates the total amount of work-related reading since a substantial amount of people do have to read books, newspapers, magazines, and mail as part of their duties. For example, 9.6 percent read newspapers at work and many of those said that doing so was necessary for their work.

An effort was also made to infer the importance of each type of reading task by using information about the number of people engaging in it, their socioeconomic standing, and whether they rated it very, somewhat, or not important. People in managerial and technical occupations strongly influence the efficiency

Table Percentages of people and amounts of time they spent reading.^a

materials read and activity in which reading took place	people saying that they had had done this type of reading			average adult in the total population	
	percent of population	median minutes	mean minutes	mean minutes	percentage of total time
<i>Type of Materials</i>					
newspapers	73.0	35.0	44.5	32.5	19.6
magazines	39.1	32.9	45.6	17.8	10.7
books	32.6	46.8	69.6	22.7	13.7
mail	53.0	4.9	9.2	4.9	2.9
<i>Other Materials by Activity^b</i>					
at meals	41.9	3.4	6.1	2.6	1.5
at work	33.5	60.7	141.1	47.3	28.5
working around the house	46.2	6.8	14.9	6.9	4.1
at school	5.1	68.1	93.6	4.8	2.9
traveling or commuting	69.7	3.3	7.7	5.4	3.3
shopping	32.9	6.9	12.2	4.0	2.4
club or church activities	9.6	16.0	26.6	2.6	1.5
theater, game, or event	4.3	7.0	20.4	.9	.5
recreation, free time	54.1	6.7	18.0	9.7	5.9
any other activity	22.7	6.0	18.2	4.1	2.5
Total				166.0	100.0

a. Data taken from Sharon, A. T., *Reading Activities of American Adults*. Princeton, N.J.: Educational Testing Service, 1972.

b. Times spent reading newspapers, magazines, books, and mail were not counted in arriving at the reading times shown for these activities.

with which the Nation's resources are used, generally enjoy the highest socioeconomic status, generally do the most reading of certain types, and rate certain of those tasks very important. This implies that those types of reading tasks contribute most to the welfares of these individuals and to the welfare of the society as a whole. These people, for example, spend more time than others reading on the job and much of that time is spent reading letters, memos, notes, reports, pamphlets, and articles from periodicals. Thus, one might argue that these reading activities make major contributions to the wealth and welfare of these people and the Nation. In addition, though, the workers who actually produce our goods and services also make substantial use of literacy. About 87 percent of those who are gainfully employed read at work and very large percentages of these people rated those reading tasks as very important, even when the consisted of nothing grander than reading labels and writings on packages. The results obtained by analyzing the other materials and occasions for reading ran in much the same vein. For example, those who said they had read mail on the previous day were of higher socioeconomic standing than those who said they had not, and these mail readers rated bills and statements as very important while they generally rated advertisements as unimportant.

Monetary Value of Reading Time: Employed people reported reading on the job a mean of 141.1 minutes per day. This fact can be used to estimate the value of the time that people spent reading at work during 1971. This estimate will be biased toward the conservative side, first, by the fact that the

data were not reported in a manner that permits us to take into account the fact that those who read the most get paid the most. The effect of leaving this fact out of the accounting will be to understate the value of the time spend reading at work. Second, Sharon's group subtracted from time spent reading at work, those reading times devoted to reading books, newspapers, magazines, and mail. It seems likely that much of this time was actually work-related reading. Hence, using this estimate of time spent reading at work would again understate the value of this time.³

The calculations proceeded in this fashion: The mean amount of time spent reading, and/or writing, at work (sans that spent reading books, magazines, newspapers, and mail) was 141.1 minutes per working day. This amounted to .294 of the eight-hour work day. Hence, at least this fraction of workers' total income was allocated to paying them to read. As may be seen in Table II the national income⁴ was \$859.4 billion during 1971, when the survey was conducted, therefore \$252.6 billion of that amount was earned while engaged in literacy activities. Since this time and money could have been used to buy goods and services other than these literacy activities, we are forced to conclude that these activities were valued more highly than either those other activities or the \$252.6 billion. When this amount is corrected for the inflation that occurred between 1971 and June 1976, it amounts to the equivalent of \$347 billion in 1976 dollars, or about \$1,676 per person in the total population during 1971. Also, it was 23.9 percent the size of the gross national product⁵ of that year.

The amount of money spent for literacy activities per-

Table Estimated cost of time spent reading (and presumably writing) while at work.

II

year	white-collar labor		reading at work		national income (billions)		implicit price deflator 1976=100	estimated cost in 1976 (billions)	cost per capita in 1976 dollars	percent of gross national product F (19 - -) GNP (19 - -)
	portion of total	portion relative to 1971	minutes spent	portion of work day	total	earned reading				
	$\frac{A (19- -)}{A (1971)}$	B x 141.1	$\frac{C}{480}$	D x E	$\frac{F}{G}$					
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
1947	.359	.740	104.4	.218	\$199.0	\$ 43.3	.348	\$124.4	\$ 863	18.7
1954	.388	.798	112.6	.235	303.1	71.1	.461	154.2	950	19.5
1958	.420	.864	121.9	.254	367.8	93.4	.515	181.4	1,042	20.9
1963	.440	.913	128.8	.268	457.7	122.8	.552	222.5	1,176	20.8
1967	.464	.954	134.6	.280	653.6	183.3	.606	302.5	1,522	23.1
1971	.486	1.000	141.1	.294	859.4	252.6	.728	347.0	1,676	23.9
1972	.479	.985	139.0	2.90	941.8	272.7	.752	362.6	1,736	23.5
average annual percentage increase								4.2	2.7	.9

formed on the job has undoubtedly been rising during recent decades, since the size of the white-collar labor force has risen faster than the size of the total labor force and since, as Sharon's data verify, white-collar workers perform much more of this activity than blue-collar workers. The rate of this spending increase over time can be estimated if we are willing to assume, among other things, that the time spent in literacy activity at work depends solely on the ratio of white-collar laborers to total laborers. The major steps in these calculations are shown in Table II. In 1947 there were 57,492,000 people in the total labor force, .359 of whom were white-collar workers.⁶ This was only .740 the size of this ratio, which was .486, for the year 1971 when the average worker read 141.1 minutes per day on the job. Invoking our assumption, we see in columns *B* and *C* of Table II that the average worker spent $.740 \times 141.1 = 104.1$ minutes or .218 (column *D*) of his working day engaged in some literacy activity. The remaining columns then show that the cost of this time was \$43.3 billion, in current (i.e., 1947) dollars, which converts to \$124.4 billion or \$863 per person in the total population when inflation is taken into account. The last column shows that these expenditures were 18.7 per cent of the size of the gross national product. Finally, by doing the same for each of the other years in the table, and then comparing across years — down columns *H*, *I*, and *J*, respectively — we can see that expenditures for literacy activities have grown at a compound annual rate that is 4.2 percent faster than the rate of inflation, 2.7 percent faster than the rate of population growth, and .9 percent faster than the market value of all the goods and

services produced by the national economy.

Production of Literacy Materials

Literacy activities consume materials as well as time, so we can expect the extent and state of people's literacy to vary directly with the amount of materials they buy. Table III summarizes measures of the production of books and pamphlets, newspapers, periodicals, miscellaneous reading materials, and writing supplies for the period from 1947 through 1972. The upper half of the table presents measures of the total quantities produced; the lower half presents measures of the quantity produced per person in the total population; and the bottom line shows the compound annual increase in production per person over this time span. Thus, during 1947, 890 million copies of books and pamphlets of all kinds were manufactured and sold in the United States. This amounted to 6.8 books or pamphlets per person, since there were roughly 144,126,000 people in the total population during that year. This figure rose about 26 percent, to 8.6, by 1972, yielding a compound annual increase of about .9 percent which was that much faster than the population was increasing during this time span. It was not always desirable and possible to present figures for number of copies sold. In the case of newspapers, figures are available but misleading. In the remaining cases they are either absent or exceedingly costly to get. The monetary figures in this table have been adjusted for inflation by converting them to dollars having the value of those at the end of June 1976, at which time the Department of Com-

Table III Production of reading and writing materials.^a

year	books and pamphlets per year	newspaper pages per day	periodicals, publishers' annual receipts ^b	miscellaneous publications, publishers' annual receipts ^b	writing supplies, manufacturers' annual receipts ^b
<i>total quantity (millions)</i>					
1947	890	1,891	\$2,721	\$ 322	\$ 734
1954	1,038	2,504	3,065	501	769
1958	1,452	2,825	3,183	578	844
1963	1,173	3,363	3,688	749	1,068
1967	1,536	4,048	4,403	1,004	1,194
1972	1,801	4,241	4,253	1,407	1,227
<i>quantity per person^c</i>					
1947	6.8	13.1	\$18.88	\$2.23	\$5.09
1954	6.4	15.4	18.87	3.09	4.74
1958	8.3	16.2	18.28	3.32	4.85
1963	6.2	17.8	19.49	3.96	5.64
1967	7.7	20.4	22.16	5.05	6.01
1972	8.6	20.3	20.36	6.74	5.88
annual rate of increase	.9	1.8	.3	4.5	.6

a. All production figures were taken from issues of the *Census of Manufacturers*.

b. Expressed in constant dollars using the implicit price deflator and setting June 1976 = 100. Price index data were taken from *Survey of Current Business*.

c. Population data were taken from *Statistical Abstracts of the United States*.

merce reported in its publication, *Survey of Current Business*, that the implicit price deflator stood at 194.2, where 1967 = 100.

The statistics on books and pamphlets provide a somewhat biased and limited view of people's literacy with respect to this type of material. However, even when biases are taken into account and even when it is recognized that it is not possible to tell from these figures how much reading and writing any particular person did, it is still strongly indicated that a large and probably growing fraction of the population was reading and writing a large and growing number of books and pamphlets dealing with a rapidly expanding number of topics.

Newspaper publication data may be seen as indicating either an increase or decline in literacy, depending on what measure is chosen. First, newspaper circulation, the number of copies sold from all editions of one issue, is commonly taken to be the measure of usage. Table IV shows that the circulation of dailies rose from 51.7 million to 62.5 million copies, for an annual rate of .8 percent. However, the population grew during this period at a compound rate of 1.5 percent and the number of households (the typical consuming unit of newspapers) at a 2.2 percent rate. As a result, newspapers per household fell from 1.32 to .94, at an annual rate of 1.4 percent. This could seemingly indicate, as McLuhan claimed, that newspapers were conveying less information and precipitating a general decline in literacy. During this same time span, however, the average number of pages per copy of newspapers was increasing sharply, from 29

Table Usage of daily newspapers.

year	circulation (millions)	papers per household	pages per paper	pages per household
1947	51.7	1.32	29	38.3
1954	55.1	1.17	36	42.2
1958	57.4	1.14	39	44.4
1963	58.9	1.07	46	50.2
1967	61.6	1.05	53	55.4
1972	62.5	.94	56	52.5
annual increase	.8	-1.4	2.7	1.3

to 56 pages, at an annual rate of 2.7 percent. As a result, the average number of pages of newspaper-type information rose from 38.3 to 52.5 pages per household. An analysis of Sunday papers produced similar results: circulation rose from 45.2 million to 49.3 million copies per issue, .4 percent annually; papers per household plunged from 1.15 to .74, at a 1.8 percent rate; pages per paper rose from 94 to 176, at a 2.5 percent rate; and pages per household rose at a .7 percent rate. Thus, when pages per household is favored as the measure of the amount of information exchanged through newspapers, as clearly it ought to be, newspapers were conveying more information and contributing to a general increase in literacy.

While this second conclusion seems the obvious and correct one, it requires some explanation since it cuts away some of the ground on which rest predictions of the demise of the printed word and the dawning of the electronic age. Udell (1970), who has carefully studied the economics of the newspaper business during the last 25 years, pointed out that newspapers were definitely not dying but merely changing their roles to adapt to new social circumstances, only one of which was the rising use of television and radio for news coverage and entertainment. As Udell saw the matter, the decline in circulation did not result from a drop in the number of people who read newspapers but rather from a drop in the number of those who read more than one per day. As standards of living rose following World War II, people moved to the suburbs and commuted to work by car rather than by bus or train where it had been their custom to buy and read both the

morning and evening editions; evening foot traffic declined in the downtown districts leaving the newsstands without customers; the social situation in the central city residential areas deteriorated to the point where home delivery of newspapers was sometimes difficult; elaborate shopping centers sprang up in the suburbs and placed their advertising in their local papers which thereupon expanded their coverage of current content, making it unnecessary for many people to subscribe to both a local and a city paper; and finally the cost of papers rose sharply, making it undesirable to subscribe to more than one. The data available were not adequate to say for certain that the percentage of the population that read newspapers had either grown or contracted, but the best of that data suggested to Udell that the number of people who read at least one paper had not declined. And clearly this one paper had grown very thick by the end of the period.

The use of periodicals may be much more extensive than most people realize. While there are a few popular magazines with very large circulation and many more scholarly and trade journals having more limited circulations, almost every public and private organization of even modest size publishes one or more periodicals of some sort. And these latter publications probably account for the major share of the usage of periodicals. Unfortunately, the Bureau of the Census, in its *Census of Manufacturers*, maintained a fairly complete accounting of the number of copies produced per issue for periodicals only up through its 1958 census; *Ayers Directory of Newspapers, Magazines, and Trade Publications* reports annually on the number of periodicals

published and the frequency with which they issued. Using these data, it is possible to calculate that 8.3 billion copies were issued in 1947, 10.3 billion in 1954, and 14.7 billion in 1958. Thus, throughout these years, the circulation of periodicals was growing at the annual rate of 5.3 percent which far outdistanced growth in either the population or the gross national product. However, the Bureau of the Census did provide a reasonably complete accounting of the total receipts of the publishers of periodicals. As Table III shows, the total receipts of periodical publishers, expressed in constant 1976 dollars, grew from \$2.7 billion in 1947 to \$4.3 billion in 1972. The lower half of this table shows also that this rise outstripped the increase in total population by an annual rate of .3 percent, rising from \$18.88 per person in 1947 to \$20.36 per person in 1972.

Interpreting these data presents the usual questions about the size and content of each copy and about multiple, partial, and non-readership. And those questions can be answered neither more nor less definitively with respect to periodicals than they can be with respect to other kinds of materials. In addition, the use of a monetary measure to represent consumption of periodicals raises the question of whether a dollar would buy the same amount of printed information in each of the years examined. This question is probably not entirely answered by converting publishers' receipts to constant dollars using the implicit price deflator, which reflects only the increase of prices in general. Had the prices of periodicals risen either faster or slower than prices in general, the figures in Table III would make it appear

that people were reading either more or less, respectively, from periodicals than was actually the case. But, if there were a bias of this sort, it probably fell on the conservative side since the productivity of the printing and publishing industry, along with most other types of manufacturing, rose at a more rapid pace during this period than in most other sectors of the economy. Thus, the figures in Table III make it appear that people read and wrote less in periodicals than was actually the case. Therefore, it seems fair to assert that people's literacy rose steadily with respect to periodicals.

Miscellaneous publications is a catchall category that includes such things as catalogues, directories, almanacs, shopping news, racing forms, business data, sheet music, greeting and business cards, and many of the other things that clutter desks, mail, and walls. Neither a composite nor an individual count of this potpourri of materials would be of much use for the present analysis, and none is given in the *Census of Manufacturers*. But the total receipts of publishers are given. The fourth column of Table III shows that those receipts, expressed in constant dollars, more than tripled in size over this span of time and outdistanced the rise in population by the compound annual rate of 4.5 percent. There can be little doubt that people's literacy has increased with respect to materials of this sort.

A somewhat broader indication of writing literacy can be obtained by using a measure of the amount of writing supplies consumed. The *Census of Manufacturers* routinely reports the total manufacturers' receipts from the sales of pens, mechanical and lead pen-

cils, marking devices, carbon paper, and inked ribbons. These figures are shown in the last column of Table III along with the fact that expenditures per person in the total population have risen at an annual rate of .6 percent. Since this rise was somewhat less than the growth in the writing professions, it is tempting to conclude that writing literacy may have lost some of its importance for the average person. But to do so would be to overlook an important limitation of this indicator, one that would no doubt nullify and possibly reverse this conclusion if it were corrected. This variable excludes devices such as typewriters, stenographic devices, and computer terminals. These devices are expensive, have grown rapidly in use, and are used as much or more by nonprofessional writers as they are by professional writers. If receipts for these items were included in the account for writing supplies,⁷ then growth in that account might well equal, or even exceed growth in the production of materials. It seems very likely, then, that writing literacy may have retained, and possibly even gained importance relative to reading literacy.

Distribution of Literacy Materials

Another component of the literacy program consists of the activities that distribute literacy materials. As is the case with the other components, formal records of many of these activities are either not kept or not consolidated and reported in an accessible manner. However, it was again possible to piece together at least minimally satisfactory data for public libraries, the Postal Service, and the telegraph industry. Also, by extra-

Table V Measures of the volume of some materials distribution activities.

year	public library circulation ^a	pieces of mail of all kinds ^b	telegraph ^b	
			revenues ^c	revenue messages
<i>total quantity (millions)</i>				
1950	375	45,064	\$ 679	202
1953	444	50,948	761	186
1956	520	56,441	874	179
1959	621	51,247	980	159
1961	656	64,933	1,015	146
1963	779	67,853	1,034	134
1965	850	71,873	1,057	123
1967	824	78,367	1,091	119
1969	844	82,005	1,183	109
1971	792	86,983	1,050	75
1973	872	89,683	1,086	67
1975	930	89,266		

polating from some difficult and cleverly done work by Machlup (1962), it was possible to obtain crude but serviceable estimates of the costs of retailing books.

Table V presents figures for public library circulation, number of pieces of mail, and telegraph revenues and revenue messages. The upper half presents the total quantities, the lower half apportions these totals among the population, and the bottom line shows how these measures have varied relative to the population. Library circulation,⁸ the number of materials checked out of libraries, rose at a compound annual rate that was 2.3 percent faster than the population was rising, from an estimated circulation of 375 million or 2.47 items per person in 1950 to 930 million or 4.36 items per person in 1975. Pieces of mail of all kinds rose at a compound annual rate that was 1.3 percent faster than the population, from a total of 45 billion or 297 pieces per person in 1950 to 89 billion or 418 per person in 1973. An apparently anomalous situation obtained in the telegraph industry where revenues in constant dollars rose annually .6 percent faster than the population while number of revenue messages, the familiar telegram, not only plunged relative to the population but also in absolute numbers.

The nature of the rise in library circulation merits special examination with respect to its implications both for the funding of public libraries and for the accurate measurement of library effectiveness. Over this span of time, librarians have received large increases in appropriations for their activities. The fourth column in Table VI shows that these appropriations rose

quantity per person

1950	2.47	297	\$ 4.48	1.3
1953	2.77	319	4.77	1.2
1956	3.08	336	5.19	1.1
1959	3.55	344	5.51	.9
1961	3.57	353	5.52	.8
1963	4.12	359	5.47	.7
1965	4.38	370	5.44	.6
1967	4.14	394	5.49	.6
1969	4.16	405	5.83	.5
1971	3.92	420	5.07	.4
1973	4.14	422	5.16	.3
1975	4.36	418		

*annual
percent-
age*

increase	2.3	1.3	.6	-6.6
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- a. Figures compiled from R. R. Bowker's *Directory of American Libraries*.
- b. Figures compiled from *Historical Statistics of the United States*, and from *Statistical Abstracts of the United States*.
- c. Expressed in constant dollars using the implicit price deflator and setting June 1976 = 100.

steadily at a compound annual rate of 4.6 percent faster than the population was growing. Hence, if these moneys were being used effectively, we would expect to see measures of library effectiveness rising at an even faster rate or at least at an equal rate. However, library circulation per person rose at a compound annual rate of only 3.5 percent up to 1965 and then leveled off or declined while expenditures per person continued to mount. If we were to believe that library circulation is an accurate measure of library effectiveness, we would be forced to arrive at an unpleasant (and probably wrong) conclusion – that the added funds spent during the last part of this period were not effectively used and that, worse, the most effective funding level, the one producing the greatest return for the marginal dollar spent, had probably been exceeded at levels well below those shown in this table. However, these conclusions are likely to be wrong for two major reasons.

First, as may be seen from the lower half of the last column in Table VI, at least some of the added expenditures have been used to provide service to a larger proportion of the population. While this undoubtedly served egalitarian values, it was an expensive proposition since those who had not previously had ready access to libraries were for the most part people living in small towns and sparsely populated areas. In any case, the result to be expected was a large increase in cost relative to the added circulation generated by such efforts.

The second reason why this conclusion could be wrong is that the circulation statistic is a poor indicator of total

Table VI. Public library statistics estimated from the
American Library Directory.

VI	public	volumes	circulation	income^a	people
year	libraries				served
<i>total amount^b</i>					
1950	8,813	156.9	375.3	\$ 284.6	122.7
1953	10,056	164.8	443.7	327.1	132.0
1956	10,879	184.7	520.3	342.2	139.1
1959	10,843	202.4	621.0	485.9	157.0
1961	9,816	229.6	656.0	503.6	161.1
1963	9,540	259.8	779.2	641.3	174.3
1965	10,478	287.5	850.4	786.0	179.5
1967	10,775	307.1	823.5	890.9	186.2
1969	12,064	318.6	843.8	979.6	192.1
1971	12,014	352.1	792.5	1,122.9	194.6
1973	13,214	380.1	871.8	1,223.4	200.5
1975	14,008	428.5	929.6	1,237.1	205.0

library usage. In order to accept circulation as a valid indicator, we must at the very least assume that the number of items borrowed and used outside the library is a fairly constant proportion of the total library usage. Not only is this assumption false, it seems to break down most seriously in precisely those instances in which some libraries used their added income to improve total usage. For one example, the added income has enabled libraries to extend the sizes of their collections, as may be seen from the second column in Table VI. One of the most economical ways to do this has been to purchase microfilm and microfiche copies that generally have to be read on the library premises where the essential optical equipment is available and where their usage does not count as circulation. For another example, many libraries have added several copies to their holdings of certain popular titles and extended the length of the loan period by a week or two in an effort to increase usage by reducing a major cost to a borrower, the cost occasioned by his need to make extra trips to renew the loan of a material he is using. While this may increase total usage, it also deflates circulation counts since renewals count as circulations. For still a third example, the added funds have often been used to hire consulting librarians who help patrons find a material best suited to their needs. In the absence of such aid, a hurried patron often inflates circulation figures by checking out several materials in the hope of later finding that at least one of them will serve his needs. Finally, some libraries used their increased incomes to build specialized reference resources for groups such as the elderly and the business, professional, and trade groups. Since those

per person^c

1950	.058	1.03	2.47	1.87	.809
1953	.063	1.03	2.77	2.05	.827
1956	.065	1.09	3.08	2.03	.827
1959	.061	1.16	3.55	2.78	.883
1961	.053	1.25	3.57	2.74	.877
1963	.050	1.37	4.12	3.39	.921
1965	.054	1.48	4.38	4.05	.924
1967	.054	1.54	4.14	4.48	.937
1969	.060	1.57	4.16	4.83	.948
1971	.058	1.74	3.92	5.37	.940
1973	.063	1.79	4.14	5.77	.953
1975	.066	2.01	4.36	5.80	.962
average annual increase	.5	2.7	2.3	4.6	.7

a. Constant dollars, 1976 = 100.

b. All but libraries are in millions.

c. Except libraries which represent libraries per thousand people.

resources often consist largely of periodicals that usually must be used on the library premises, they do not contribute to circulation. For reasons stated earlier, monetary measures are usually less than ideal indicators of usage, but in this case income seems to be superior to circulation as a measure of total library usage.

When we try to use library income as an indicator of literacy, however, we encounter the problem that it overlaps somewhat with the measures of materials production, since a portion of the library budget is used to purchase materials. The data necessary to correct for this overlap are not available on a year-by-year basis. However, the National Center for Educational Statistics (Eldridge, 1976) conducted a fairly comprehensive survey of public libraries in 1974 and found that the purchase of materials accounted for about .13 of their total expenditures. If we are willing to assume that this ratio has held constant for the period of time in question, we can say that the cost of public library services, excluding the costs of materials, rose from about \$247 million in 1950 to about \$1,066 million in 1973. This assumption may be a bit dubious, however, since salaries and wages constitutes a large share of the public library budget, 53 percent in 1974, and since the costs of labor rose steadily, relative to other costs, throughout this time span.

The figures for pieces of mail are also inflated by double counting since second- and fourth-class mails are largely devoted to the delivery of books, pamphlets, newspapers, periodicals, and miscellaneous materials. *The Annual Report of the Postmaster General* gives separate figures for each type of mail, so this matter can be corrected to

a large extent. Taking just the air and priority mails and the first- and third-class mails, we find that 35.7 billion pieces (235 per person) were mailed in 1950; that 74.6 billion pieces (349 per person) were mailed in 1975; and that pieces of mail per person rose at a compound annual rate of 1.6 percent. This increase was even faster when it is expressed in terms of revenues in dollars of constant value (1976 = 100). Postal revenues from all sources attributed to these types of mails rose from \$2,346 million (\$15.47 per person) in 1950 to \$8,125 billion (\$38.06 per person) in 1975. Thus, revenues per person rose at a compound annual rate of 3.7 percent per year. The fact that revenues rose faster than volume of mail indicates that the Postal Service was becoming less efficient in terms of cost per piece of mail and constituted a growing impediment to the literacy program. The total cost of delivering a piece of mail of this sort was 7.8 cents in 1950 and 10.9 cents in 1975, a total increase of 39 percent or a compound annual increase of 1.3 percent. The fact that the use of the mails continued to grow in spite of this impediment indicates that literacy activities of the kind indexed by these figures was not only growing in volume but also growing in importance to people.

The two sets of figures on telegraphy are probably only casually related to the amount of information being distributed by this means. While they present no major problem of double counting, they do present either another case of declining efficiency or, simply, contradictory indications. The decline in cost efficiency is probably more apparent than real. Somewhat before 1950, the Bell Telephone

Company and the Western Union Company began renting teletypewriters and private lines that connect the offices of the renters. When this equipment is heavily utilized, the costs of this method of sending telegraphic messages is substantially lower than the cost of revenue messages. This type of service may have produced a very large increase in the use of telegraphy. In 1950 these private line services accounted for only 5 percent of Western Union's domestic telegraph revenues; by 1970, the most recent year for which the relevant data seem to be available, these services account for 31 percent of domestic revenues. This increase plus the way the charges are levied – by time rather than by the word – strongly suggest a very large increase has occurred in the volume of information exchanged via telegraphy.

Instruction in Literacy Skills

43 People cannot achieve literacy without the skills necessary to write, locate, read, and comprehend literacy materials. Psychological tests of literacy skills are the most direct way to measure the effects of these activities. In this study though, we have agreed to examine only overt things of the sort that are loosely termed economic indicators, things that indicate the amount and quality of instruction people get in literacy skills and what it costs them to get it.

Amount of Education: Table VII presents four measures of the amount of education that people have been receiving during the period 1946 through 1974. The figures in the first two columns show the now familiar facts that a growing

Table VII
Amount of instruction.^a

year	percentage enrolled		elementary and secondary	
	college, ages 18-24	elementary and secondary	days attended by enrollees	days attended by average child
1946	12.6	91.2	150.6	137.3
1950	14.2	92.3	157.9	145.7
1954	16.2	92.5	158.9	147.0
1958	21.2	93.5	157.4	147.2
1962	23.6	94.9	162.3	154.0
1966	27.7	95.9	163.5	156.8
1970	32.1	97.8	161.7	158.1
1974	33.5	98.3	159.5	156.8
annual percentage increase	3.6	.3	.2	.5

a. The basic data in this table were taken from *Biennial Survey of Education in the United States* and *Digest of Education Statistics*.

portion of our people are being educated at higher levels. Enrollments in colleges have risen from 12.6 percent to 33.5 percent of the people in the 18 through 24 year age range. And high schools have been able to retain more of their students through graduation causing enrollments to rise from 91.2 percent to 98.3 percent of people in the 5 through 17 year age range. In addition, the figures in the next two columns show the lesser known but equally important fact that those in school have been receiving a greater amount of instruction. The number of days in the school year rose causing the average enrollee to receive about 9 more days of instruction per year and the average child, enrolled or not, to receive about 19 more days of instruction per year. If we may assume, for the moment, that amount of schooling is an indicator of the amount of literacy instruction students get, then students have been getting an increasing amount of literacy instruction.

Costs of Literacy Instruction: The total costs of education and the number of students enrolled in each level of education have been routinely published in the *Biennial Survey of Education in the United States* and in *Digest of Education Statistics*. From these data it is possible to calculate the cost of literacy instruction, providing that one knows how much of the instructional time at each grade level was devoted to literacy instruction. Unfortunately, no effort is made to find out and report how schools allocate instructional time among the subject matters they teach.⁹ So anyone who would try to estimate the cost of teaching any particular subject matter is forced to fall back on personal knowledge of school scheduling and

teaching practices. And then, when that subject matter happens to be the literacy skills in which much of its instruction is integrated in instruction in other subject matters, it also helps to have a good knowledge of the theory and practice of curriculum design followed by the schools and to use a lot of Kentucky windage. To come to the point, it is my best guess that literacy instruction takes up *no less than* 70 percent of the time in grades 1 and 2, 50 percent in grades 3 and 4, 35 percent in grades 5 and 6, 25 percent in grades 7 and 8, 15 percent in grades 9 and 10, 10 percent in grades 11 and 12, and 5 percent throughout higher education.

The facts on which these estimates are based are as follows: Instruction in American schools makes extensive use of written exercises and printed matter as automation devices, as it were, that permit learning to proceed without the continuous direct intervention of a teacher, a practice that is justified on grounds that knowledge and technologies change so rapidly that a person must be able to use written materials to educate himself throughout his lifetime. Consequently, the curricula of schools are designed to teach not only the rudiments of reading and writing of popular materials but also the skills required to locate and comprehend specialized materials on whatever subject matters the student elects to pursue. The rudiments of reading and writing are taught in scheduled periods explicitly labeled as that, and this instruction usually extends up through grades 6 or 8 with composition instruction listed sporadically through the first year of college. During grades 1 and 2 nearly all the instruction centers on teaching the reading and writing

of language and arithmetic concepts. By grade 3, the student has begun to study from simple textbooks on substantive subjects. But much of that instruction is conducted as reading lessons in which the student is taught the spelling, recognition, and meanings of concepts and the organization of discourse, and in which he is quizzed on his reading and his understanding is corrected. This directed reading instruction, as it is often called, gradually diminishes at higher grade levels but is still present, often in appreciable amounts, throughout college and graduate study. At the same time, the student is taught to use references and reference aids such as indexes and card catalogues. Although teachers of advanced subjects often do not think of themselves as teachers of literacy skills, nearly all perform some or all the operations called guided reading. Moreover, it is a well known fact that people who have had a course in, say, physics have acquired specialized literacy skills that thereafter enable them to comprehend materials that deal with that subject. So in effect¹⁰ and intent the student receives literacy instruction at every level of his education, even though it does not always go by that name in the minds of his teachers.

I have assumed, further, that these proportions of instructional time spent on literacy skills have not changed materially during recent decades and then used the proportions in conjunction with figures on enrollment at each grade level to obtain a weighted average at, each, the elementary, high school, and higher education levels. These proportions were then multiplied by the annual cost of education at each of their respective levels and the three

Table Expenditures^a for instruction in literacy skills.

VIII

year	total for education ^b (millions)	attributed to literacy instruction ^b		
		total (millions)	per student	per person
1947	\$ 15,891	\$ 4,939	\$216	\$ 34
1954	29,013	9,605	351	59
1958	38,794	12,487	393	72
1963	55,463	16,540	440	87
1967	78,809	22,115	533	111
1972	110,371	28,199	635	135
annual percent- age increase	8.1	7.2	4.4	5.7

- a. Expressed in constant dollars setting June 1976 = 100
- b. The enrollment and population data needed to calculate these estimates were taken from *Biennial Survey of Education* and *Digest of Education Statistics*. Estimates of times allocated to literacy instruction represented the author's best guesses on the matter.

Table IX Some expenditures^a for the literacy program.

item	year						annual percentage increase
	1947	1954	1958	1963	1967	1972	
<i>Materials and Supplies^b</i>	10,109 ^a	11,383	12,585	14,958	17,983	20,029	2.8
newspapers	5,149	6,145	6,715	7,708	9,158	10,516	2.9
periodicals	3,006	3,065	3,183	3,690	4,403	4,253	1.4
books and pamphlets ^c	963	1,052	1,416	1,951	2,512	2,801	4.4
miscellaneous publications	356	501	579	748	1,005	1,407	5.7
writing supplies	810	770	845	1,069	1,195	1,227	1.7
less net exports	(175)	(150)	(153)	(208)	(290)	(174)	0.0
<i>Distribution of Materials</i>	3,715	4,336	4,790	7,185	8,807	11,390	4.6
mail ^d	2,233	2,792	2,946	4,687	5,734	7,903	5.2
telegraphy ^e	807	783	883	1,034	1,090	1,153	1.4
retail markup on books	428	499	643	917	1,216	1,267	4.4
public libraries ^f	247	262	318	547	767	1,066	6.0
<i>Instruction in Literacy Skills</i>	4,940	9,605	12,487	16,540	22,114	28,199	7.2
<i>Reading and Writing at Work</i>	119,676	148,372	174,217	213,061	289,744	347,426	4.4
all industries	124,439	154,232	181,386	222,535	302,464	362,629	4.4
less industries listed above ^g	(4,763)	(5,860)	(7,169)	(9,474)	(12,720)	(15,203)	4.8
<i>Total</i>	138,440	173,696	204,079	251,744	338,648	407,044	4.4
dollars per person	961	1,070	1,172	1,330	1,704	1,949	2.9
percentage of GNP	20.8	22.0	23.5	23.5	25.8	26.4	1.0

- a. In millions of constant (1976 = 100) dollars
- b. The figures making up these totals represent manufacturers' receipts.
- c. Excludes textbooks, workbooks, and published tests which are increasingly reflected in costs of instruction in literacy skills.
- d. Excludes second and fourth class mails since they are reflected in the costs of materials.
- e. Includes TWX and other telegraph services performed by telephone companies.
- f. Excludes estimated expenditures for materials.
- g. Calculated from contributions to national income by printing and publishing (SIC 27), paper and allied products (SIC 26), educational services (SIC 82) and annual reports of corporations.

amounts summed to obtain the estimated total cost of literacy instruction. This total for each of several years between 1947 and 1972 is shown in the second column in Table VIII in 1976 dollars. The third and fourth columns apportion these totals among students enrolled and total population during those years. The bottom line shows that cost per student rose at a compound annual rate of 4.4 percent and cost per person in the total population rose at the rate of 5.7 percent. Some of this increase from year to year and all of the variation among the rates of increase shown in this bottom line could be attributed to the "baby boom" following World War II. However, by 1967, the leading edge of this population bulge had passed through elementary and high schools where most of the literacy instruction is carried on, and still the year to year increase was substantial.

Now, since enrollments grew at all levels of education, since the effectiveness of that instruction

evidently improved steadily, and since people were producing and distributing large and increasing amounts of materials, it is probably correct to conclude that a large and growing fraction of the population was achieving a high and increasing level of reading literacy. And this, of course, means that people were also achieving a high and increasing level of writing literacy, even if, as seems likely, their composition skills did not improve, for a writer's literacy depends in part on the numbers of people who are able to comprehend his materials, a number that was seemingly growing.

III

Monetary Value of Literacy

Table IX presents estimates of the total expenditures for literacy for each of the years within the time span of interest in which

the *Census of Manufacturers* was reported. The variables are grouped according to the four major activities of the literacy program, with the subtotal for an activity appearing above its constituents. Thus, for example, in 1947 an estimated total of \$10,109 million (in 1976 dollars) was spent for materials and supplies, this figure being arrived at by summing the manufacturers' receipts from sales of newspapers, periodicals, and so on and subtracting (as indicated by parentheses) the net exports of books and pamphlets. The retail markup on books could have been summed into either this subtotal or the subtotal for the distribution of materials where it seemed more properly to belong. No effort was made to break down the costs of literacy instruction. But the total cost of reading and writing at work was broken down in order to remove the costs of reading at work in the industries that produce and distribute materials and produce literacy skills. This step was necessary in order to offset the fact that the costs of reading and writing at work had already been counted once as a part of the total costs of those industries. The column on the far right shows the compound annual rate of increase for each item. As might be expected, the costs of labor intensive services such as mail, libraries, and especially instruction grew much more rapidly than the cost of most manufactured goods.

The last three lines in the table show total expenditures for literacy, expenditures per person in the total population, and the size of the total literacy expenditures relative to the gross national product.¹¹ Total expenditures rose almost linearly through 1963 and then surged

sharply upward, the compound annual rate of increase being 4.4 percent for the entire time span. The expenditures per person followed a parallel pattern and exhibited an annual increase of 2.9 percent, which showed that total expenditures were outdistancing growth in the population by a wide margin and that growth in total expenditures was responding to more than simply a rise in the population.¹² The last line in the table performs two functions. First, it shows that expenditures for literacy were also outdistancing growth in the gross national product, rising from 20.8 to 26.4 percent of the size of the gross national product or at a compound annual rate 1.0 percent faster than the gross national product. And, second, these figures in the last line provide some basis for understanding the absolute size of the expenditures for literacy by comparing them to the gross national product, a measure of the total value of goods and services produced in the Nation during a year. Some other comparisons of this sort are that the expenditures for literacy were 2.82, 1.68, 2.25, 2.39, 2.55, and 3.34 times the size of the total outlays for national defense and 1.07, .96, 1.09, 1.06, 1.11, and 1.13 the size of total federal outlays for the respective years 1947 through 1972.

The foregoing estimates of total expenditures for literacy provide a useful way to assess the extent to which literacy permeates society and consumes its resources. But, by virtue of the fact that it lumps the benefits with the costs of literacy, it fails to reveal whether the literacy program is worth conducting — whether, and by how much, the benefits outweigh the costs.

It would be unnecessary to pose this question if literacy were produced entirely by the private sector of the economy; for then economic theory would allow us to reason that competition would generally drive prices down to just equal the costs of producing literacy, that people generally do not buy a thing unless its benefits are more than its costs, and that the benefits per dollar for each of the things that a person buys are about equal in his own eyes. Thus, we would automatically conclude that the literacy that people consume exceeds its cost by about the same amount as everything else they consume. However, much of the production of literacy is carried out by school, library, postal and other socialized systems that tend to obscure the true costs of their products and to be relatively unresponsive to the factors that discipline a free market, namely the costs of products and the preferences of the people. Hence, there are strong a priori grounds for asking whether literacy is really worth as much as it actually costs to produce it. A reasonably informative analysis of this sort can be performed using the figures appearing in Table IX.

The figures for reading and writing at work provide very conservative estimates of the monetary benefits of the literacy being consumed during each of the years shown. That is, they represent the money that employers paid people to read and write at work. And, as such, they represent the market value of literacy to the employers and permit us to infer that the benefits that the employers enjoyed from this consumption of literacy were at least as

great as the values that they put on these amounts of money. Thus, the amount of money paid for people to read and write at work during 1947 was \$119, 676 million, and that number appears in the first row of Table X as the measure of the monetary benefits of literacy enjoyed during that year. Then, the costs laid out for producing literacy would be the moneys spent for producing and distributing materials and those for providing instruction in literacy skills. Hence, in 1947 the total outlay for producing literacy was \$18,764 million, which included the \$10,109 million for producing materials and supplies, the \$3,715 million for their distribution, the \$4,940 million for instruction in reading and writing skills. The net benefits of literacy during 1947 would then be the difference between its benefits and its costs, \$100,912 million. And the ratio of the benefits to the costs for that year would be 6.4

Thus, according to these figures, the Nation enjoyed a net monetary benefit of over \$100 billion, or \$700 per person in the total population during 1947. And, between then and 1972, this net rose exponentially, at an annual compound rate of 4.6 percent, until it stood at about \$288 billion or about \$1,379 per person. The ratio of monetary benefits to costs, however, followed a different course. Between 1947 and 1954 it plunged sharply from 6.4 to 5.8 and thereafter remained about constant at this lower level.

However, both the absolute sizes and the trends of these numbers must be interpreted with caution, for undoubtedly net benefits were actually much

Table **Current monetary benefits relative to current outlays for literacy.**

X

	1947	1954	1958	1963	1967	1972
<i>Total amounts (millions)</i>						
Benefits	\$119,676	\$148,373	\$174,217	\$213,061	\$289,744	\$347,426
Costs	<u>18,764</u>	<u>25,324</u>	<u>29,862</u>	<u>38,683</u>	<u>48,904</u>	<u>59,618</u>
Net Benefits	\$100,912	\$123,048	\$144,355	\$174,378	\$240,840	\$287,808
<i>Amounts per person in the total population</i>						
Benefits	\$830	\$914	\$1,000	\$1,126	\$1,458	\$1,664
Costs	<u>130</u>	<u>156</u>	<u>171</u>	<u>204</u>	<u>246</u>	<u>285</u>
	\$700	\$758	\$829	\$922	\$1,212	\$1,379
Benefit-cost ratio	6.4	5.8	5.8	5.5	5.9	5.8

larger and rising faster than those shown here, and the benefit-cost ratios were not only larger but were no doubt rising about as rapidly as net benefits.

First, consider the biases that caused the absolute sizes of the net values and the ratios to be understated. The measure of benefits used here accounted only for the time spent reading and writing at work and disregarded the fact that most literacy activity does not occur on the job. The value of literacy activities performed off the job could be several times as great as that of those performed on the job. Thus, if this matter were corrected, it alone would increase the net benefits and the benefit-cost ratios several fold. The measure of costs, on the other hand, seems to give a more balanced and complete account of its domain, since it may account for nearly all instruction, the largest item in the account, and probably for at least a third to a half of the costs of producing and distributing materials. Hence, fully correcting these cost figures would probably not do much more than double their sizes, which were relatively small to begin with. Therefore, since benefits were vastly understated while costs were only moderately understated, both the net benefit and the benefit-cost ratio shown in Table X are much smaller than their true sizes.

Next, consider the distortions caused by charging off the costs of literacy instruction occurring during a year against the benefits consumed during that year. Table IX shows that the costs of this instruction rose at a compound annual rate of 7.2 percent, at 1.64 times the rate that the value of reading and

writing at work was growing. This suggests, at least superficially, that the cost of acquiring literacy skills were rising faster than the benefit of their use and that literacy instruction was increasingly interfering with the net benefits and the benefit-cost ratio of the literacy program. However, a closer examination of these figures shows that the true situation was much more complex, and possibly, that the reverse was true.

For one thing, the costs of literacy instruction in a given year should properly be seen, not as an expense of the literacy currently being consumed, but rather as a long term investment made to serve the literacy needs that will occur in the future. That is, it is reasonably plausible to charge off, say, the costs of producing and distributing materials against the benefits derived from literacy during the same year, since nearly all the use made of a material occurs very soon after it falls into the hands of its buyer. But a person ordinarily cannot enjoy very much of the use of his literacy skills until several years after he has acquired them. Taking this fact into account would ordinarily increase the costs of literacy instruction and the total costs of literacy, since doing so would require charging interest for the resources invested in instruction and adding these charges to the original costs of teaching people to read and write. Thus, had the population and amount of instruction purchased remained stable for a number of years before and throughout the years studied here, the actual costs of instruction would have been higher than those found by the method used to compute Tables IX and X. Hence, if only this problem had to be considered, these cost figures would have to

be regarded as being too low.

However, a problem having a very large reverse effect was created by the facts that the population was surging and more instruction per person was being purchased during this same period of time, increasing the costs of literacy instruction at a disproportionately faster rate than the benefits of literacy. Children born on the leading edge of the baby boom would have entered school in sizeable numbers by 1954 and caused a large increase in both current and capital expenditures for instruction, an increase that would not have been fully realized until after 1967. But at the same time, that surge would have had little effect on the consumption of literacy – reading and writing at work – until the “boom babies” had entered the labor market in large enough numbers to make their consumption felt. In addition, returning to Table VIII, it can be seen that expenditures per student rose at an annual rate of 4.4 percent, indicating that efforts were being made to purchase more literacy skills, compounding the costs of literacy instruction while having little immediate effect on literacy consumption. It is, of course, somewhat debatable whether this surge in expenditures actually did translate into more reading skill (Harnischfeger and Wiley, 1975; Farr and Feinman, 1974) and whether it could or will translate into a corresponding surge in the benefits that the American literacy program yields.

However,
we do have a basis from which to make some reasonable

guesses about the true nature of the trends in the net benefits and benefit-cost ratios of the literacy program. To begin with, since neither the population nor the expenditures for instruction surged during the generation preceding 1947, the estimated cost of literacy instruction for 1947 may be a crude but serviceable estimate of the annual costs of originally teaching the literacy skills possessed by the adult population of 1947. But, since that figure does not include interest charges for those investments, the cost figure for 1947 is probably much too low. Thus, both the net benefits and the benefit-cost ratios for that year are too high and their properly adjusted values could conceivably fall into line with the trends defined by those figures for the succeeding years. Then, the costs of literacy instruction during those subsequent years also failed to recognize these interest charges, but the effects of this neglect could have been counterbalanced by the effects of the baby boom and by the efforts of people to buy higher levels of literacy skills for their children. Hence, the trends of net benefits and of the benefit-cost ratios appearing in Table X for the years 1954 through 1972 may describe the true directions of these literacy indicators and, contrary to superficial appearances, be confirmed by the figures for 1947.

IV

Conclusion

By this time, some readers will have come to suspect that this

study was originally designed to do more than to serve the purposes explicitly stated in the introduction. And that suspicion is correct. The study was originally designed to explore technical problems involved in developing the cost function of an economic model that can be used to analyze, formulate, and evaluate literacy policies (Bormuth, 1978). But it soon became evident that, crude as they were, these data were also credibly addressing the hypotheses and problems described in the introduction, giving a clearer and more coherent account of those aspects of literacy than could be obtained from the psychological test data on hand and providing essential complements for interpreting even the most nearly ideal test data that we might obtain in the future. Part of that story remains only to be concluded by examining the hypotheses. But the remainder of that story, and perhaps the most basic conclusion of this study, should first be briefly sketched to provide a somewhat better notion of the breadth and importance of the uses to which data of this sort can be put.

Consider as one example the problem that we presently have no satisfactory way to decide if the policies that govern the literacy program result in the most productive use of the resources spent on the matter. The data in Table IX are divided along lines that roughly parallel one expression of the economic model of the literacy program. And that model might have asserted that, other things being equal, the 4.4 percent annual increases in the literacy consumed (reading and writing at work) could be seen to be the result of the annual expenditure increases of 7.2 percent for instruction in literacy skills, 4.6 per-

cent for distributing materials, and 2.8 percent for materials and supplies. Hence, hypothetically, the increases in expenditures for the instruction and the distribution of materials were rising faster than the value of the literacy they were producing and represented relatively unproductive uses of resources, while the increases in expenditures for materials and supplies were seemingly very productive. And an examination of the model would show that expenditures for materials are somewhat substitutable for some of the expenditures for instruction and distribution of materials. Thus, if the model and the data in Table IX were fully developed (and of course neither is) we could rationally conclude that we could get more literacy per dollar if we adjusted our literacy policy (including such things as school, library, and postal subsidies) to shift a larger proportion of expenditures into the production of materials and supplies.

Next consider an exercise in the evaluation of research proposals. A careful scientific and technical analysis of such a proposal could be made to yield a fairly credible estimate of the effects it would produce on one or more of the variables appearing in the model. Then the model itself could be used to estimate the effect that the proposed research was likely to have on the productivity of the literacy program. If the research were to increase the program's productivity by, say, .1 of one percent, Table IX shows that this increase would have been valued at about \$400 million (.001 x \$407 billion) in 1972, justifying an annual expenditure of at least a sizable fraction of that amount for the support of the research being proposed.

Neither of these examples should be taken literally. They merely illustrate the fact that information of the sort presented here can play very valuable roles in deciding issues of literacy policy. Government officials were at least partially aware of this fact when they authorized a study to develop statistical procedures for reporting on the information sector of the Nation's economy (Porat, 1977). That study utilized primarily the economic data gathered by the Bureau of the Census and dealt broadly with the information produced, exchanged, and stored, without regard to whether it was encoded in a written, oral, or pictorial mode. This was an important step in the right direction. But it now seems clear that the next step should be to recognize that the various modes of communication represent fairly interchangeable ways of doing the same thing, namely exchanging information. Thus, the data base used in further studies should be augmented to permit adequate modeling of the program that corresponds to each mode and then that data should be analyzed to permit the instrumentation of those models and to form up a model of the entire information program. In a very real sense, Tolstoy must compete with television, communications policies definitely affect the outcome of that race, and government statistical services should reveal which contestant the government's subsidies, taxes, and regulations are favoring. But while these matters are being worked out, we can be using data of the sort presented here to address issues closer at hand, namely the issues raised in the introduction to this paper.

It seems virtually certain that increasing amounts of information are being exchanged

through use of the printed word. With only one minor and easily explained exception, number of revenue telegraph messages, every measure of literacy examined and its monetary value rose at a rate that outstripped the rate of growth of the population and even the rates of inflation and growth in the gross national product. This conclusion is problematic when we examine just the rise in a single variable (such as sales of periodicals) or the rise in a single set of variables (such as sales of literacy materials and supplies), for it is always plausible to criticize some flaw in the variables and to suggest that still other variables or sets of variables (such as time spent reading) could be declining at much more rapid rates causing a net decrease in the extent of literacy. However, when all the major categories of literacy activity and many of the items within each had been accounted for, as they were in Table IX, and when the trends of those variables were univocal, the force of those objections was greatly reduced. Finally, when we then examined the variables that were omitted and saw that they were undoubtedly increasing by similar amounts, it became necessary to reject these objections and to assign almost certain truth to this assertion.

Although it is difficult to find any economic variable that directly supports the proposition that a growing fraction of people are participating in this exchange we can cast considerable doubt on the counterproposition that a constant or diminishing fraction of the population has been doing all the reading and writing being done. To begin with, the number of adults having less than five years of schooling who say they cannot read or write fell from 2.7 percent of the population in

1947 to 1.2 percent in 1970 while the median number of years of schooling among adults was rising from 9.7 years to 12.1 years. So, to defend this counterargument, we would have to argue implausibly that people do not exploit added education and literacy skills for the purpose of reading and writing and that they sacrifice large portions of their energy and wealth on education merely for its prestige or hedonistic value. In addition, we saw that books and pamphlets sold annually rose from 6.8 to 8.6 per person, that pieces of mail per person rose from 297 to 418, that library circulation per person rose from 2.47 to 4.17 items per year and that consumption of other materials seemingly rose apace. So we would also have to argue, with equal implausibility, that the fixed or diminishing portion of people that has supposedly been doing all the reading and writing has an exceedingly high level of demand for materials that has been growing at astounding rates. Indeed, at current rates of production and use of materials, this imagined elite must surely be swimming in the materials they are supposedly reading and writing.

155 Finally, whether one would call this fraction of people large or the amount of information they exchange great, depends on how one wants to use those adjectives. However, it is a bit difficult to use any others when 95 percent of the people say they can and do read or write at least something, when the typical person spends an hour and forty-six minutes per day doing so, and when he pays out over \$1,949 per year, nearly half the cost of a new car, to do so, and when total expenditures for literacy reach 26.4 percent the size of the gross national product, 113 percent the

size of all federal government expenditures, and over twice the size of the Nation's defense budget. When measures of literacy reach this size, it is a bit contrived to describe them by any adjective other than large and high. Literacy is in fact one of our major occupations.

The second hypothesis asserted that literacy has been worth more than it cost to produce it. Between 1947 and 1972, net monetary benefits ostensibly rose from about \$700 to about \$1,379 per person in the total population and the total benefits were consistently about 5 or 6 times larger than the costs. However, these figures counted only the money paid to read and write on the job as being the sole benefits of literacy and counted outlays for instruction and the production and distribution of materials as the costs of literacy. While this practice underestimated the costs to some extent, it underestimated the benefits to a very large extent. Thus, it can be said with certainty that the benefits of literacy exceeded the costs by at least a factor of five and probably by a factor considerably larger than this, perhaps two to three times as large.

The third hypothesis asserted that literacy is one of our nation's most important economic activities. Efforts to justify literacy have often missed their mark and trivialized the whole by dwelling primarily and even exclusively on its aesthetic, literary, and intellectual uses. While important, they do not even begin to comprehend the really central and critical roles that literacy plays in society, namely its economic roles, those involved in conveying the enormous volumes of mundane, workaday knowledge that we need

in order to win our bread and board. This hypothesis was framed to bring attention to these vital but humble uses of literacy.

Several figures and comparisons obtained from the data in this study should sustain that hypothesis. First, in 1972, total expenditures for literacy exceeded \$400 billion and were growing at a compound annual rate of 4.4 percent, indicating that by 1977 they were likely to have reached more than \$500 billion, a half of a trillion dollars. Second, the figure for 1972 was over one-fourth as large as that year's gross national product. Third, the moneys spent on literacy during that year were 1.13 times larger than all federal expenditures and over twice the size of the defense budget for that year. Fourth, they were 5.8 times larger than the total amount that the Nation spent on the purchase of new and used cars in that year (\$52.6 billion in 1972 dollars or \$69.9 billion in 1976 dollars). And, finally, literacy activities consumed about 29 percent of the average worker's time on the job and 17 percent of the average adult's 16 waking hours, regardless of whether he was employed. Moreover, these figures will probably also increase rapidly in the future. For, between 1947 and 1972, the white-collar work-force rose from a little over a third to almost half of the total work-force, and nearly all of these people are primarily involved in producing, processing, and distributing the information that controls the mechanisms that produce our goods and services.

The fourth hypothesis asserted that personal and social investment in literacy has been growing rapidly. In order to address this issue with the data at hand, it is necessary to recall three elementary facts. First, we must account for both personal

and social investments since literacy is both a private and a social good. Obviously the individual benefits from his literacy and can be expected to devote some of this private resources to acquiring it. But being the only literate in a society is about as desirable as owning the only telephone in town — the greater the number of literates in a society, the more valuable is the literacy of those who achieve it. So it is in the interests of society as a whole to subsidize and even to compel the instruction of those who, by reason of limited foresight or financial and intellectual resources, would ordinarily acquire little or no literacy skill. Second, the purchase of literacy has the character of an investment since a person and society must forego using resources for immediate satisfaction and instead spend them on an activity that produces no great immediate joy in order to reap rewards in the distant future. Third, although many tend to identify literacy instruction as being coterminous with curricula officially labeled reading and writing instruction, nearly all other kinds of instruction also make substantial contributions to a person's literacy. To be able to exchange information of some type — say on molecular biology — requires not only the rudiments of reading and writing but also a grasp of the basic concepts and logic of the disciplines that bear on information of that type.

Now, the rise in personal investment in literacy can be gauged with some accuracy merely by noting increases in the amount of instruction that people receive. Among children in the age range 5 through 17, school days attended rose by 14 percent, from 137 days per year in 1947 to 157 days per year in 1972. Or, to put it another way, if the use-

ful working life is the 60 years years between ages 5 and 65 and if there are 8 hours in the work day with 5 days a week and four holidays per year, then these children were investing 8.9 percent of their working lives in education in 1947 and 10.1 percent in 1972, an increase of 1.2 percent, which is equivalent to about 8 months and 23 days by the calendar. Then, using the rather conservative estimates of instructional time devoted to literacy skills, the average child in 1972 had invested about .4 percent more of his useful working life, about 3 more calendar months, in literacy instruction upon graduation from high school than had his parent in 1947. But this does not fully account for the matter since enrollments rose most dramatically among people over the age of 17 during that period. Thus, among the entire school age group 5 through 34, enrollments rose from about 28 million (13 percent of this age group) to about 59 million (about 33 percent of this group), a rise of 250 percent. Hence it seems fairly clear that personal investment in literacy has been growing rapidly.

157 Then the data presented in Tables VII and VIII make it comparatively easy to demonstrate the increase in social investment in literacy: total annual expenditures for literacy instruction rose nearly six-fold, from about \$5 billion in 1947 to over \$28 billion in 1972; annual expenditures per student rose nearly three-fold, from \$34 to \$135; and the fraction of the gross national product devoted to literacy instruction more than doubled, rising from .7 percent to 1.8 percent. Thus, not only individuals but also society as a whole have been increasing their investments in literacy, presumably in the faith that doing so will increase the level of their literacy skills and that that will ulti-

mately translate into an increase in the net benefits they receive from literacy.

The numerous problems notwithstanding, the data in this paper tend to cast in concrete the beliefs that knowledge is our most important resource, that literacy provides a primary vehicle for its exchange, and that literacy in the United States is pervasive and deeply rooted — and growing more so. To recite an oft repeated theme, as technologies advanced and as the population grew and organizations became more complex, our lives have come to depend increasingly on the knowledge of how to turn physical resources into things of use, of how to organize ourselves to produce and distribute these things efficiently, of how to provide ourselves with many services, and of how to structure and operate our social and political organizations. Although we have developed many other media for communicating some of this information, the written word has borne and continues to bear, a large fraction of the load. The amount, and perhaps the fraction, has been growing rapidly and steadily. To a large and growing extent the vital necessities of life depend on the American people achieving a high level of literacy.

The work reported in this paper was supported through a fellowship at the Center for Advanced Study in the Behavioral Sciences. It benefited in numerous ways from the pioneering work of Fritz Machlup and from the advice and criticism of an earlier version by Sidney Davidson. Responsibility for errors, however, remains entirely with its author.

1. In order to keep the footnotes and references in the text within reasonable bounds, I have generally not cited the source for statistics that can be found in the *Statistical Abstracts of the United States* and the *Historical Statistics of the United States, Colonial Times to 1970*. Both references are well indexed and are standard items of any library.

2. This essay has some precedent in, and was partially inspired by, the research that Fritz Machlup reported in his book *The Production and Consumption of Knowledge in the United States* (Princeton, 1962). His purpose was to estimate the costs of producing, distributing, and consuming knowledge of all types through the use of all media. The present work employed methods similar to his, exploited a couple of his results, and benefited generally from his examples.

3. Many of the inadequacies in the figures reported from this study seemingly arose from the fact that the sponsoring agencies insisted on undue parsimony in the use of funds for analyzing and interpreting the data obtained from this study.

4. Although people are more familiar with the concept of gross national product than with the concept of national income, its use would not be legitimate in this calculation since the latter includes, among other things, a substantial component that represents transfer payments, such as welfare payments, that do not represent earnings accrued in the production of goods and services. Some might object that national income, also, includes "unearned" income such as rents and interest and should not be

used either. However, I regard such payments as income earned from the management of capital placed at risk. When such payments are corrected for inflation, the rate of return on the essentially risk free and unmanaged deposits placed in governmental bonds and insured savings accounts is typically negative or zero while moneys placed at greater risk and presumably requiring more management effort tend to produce positive returns that vary with levels of risk and management attention required.

5. The gross national product is used here and throughout the remainder of these discussions for comparative purposes because of its greater familiarity. It is usually 10 to 15 percent larger than the national income.

6. The rather odd assortment of years used for these calculations arose from the facts that these figures will subsequently be used to calculate the total costs of literacy and that these years are the ones in which the Bureau of the Census conducted major surveys of the economy and provided much of the data needed to estimate the total cost of literacy.

7. In the *Census of Manufacturers* these devices are accounted for under the broad heading of office equipment from which it was impossible to break them out without making some highly dubious assumptions. Consequently, one is confronted with the horns of the dilemma of either excluding or including all office equipment in this indicator. By choosing to land on the former, I gained a conservative estimator but had to forego achieving a sensitive indicator of an important trend.

8. The figures presented for library circulation here and in the next table were all obtained from issues of the *American Library Directory* compiled by Helaine MacKeigan for the R. R. Bowker Company. This publication seems to represent the only effort made to gather and record statistics on libraries for an extended period of time. The data presented here were obtained by summing the total given for each of the States and Territories for each issue of this directory since 1950. In some issues, one or more State totals were missing or obviously erroneous. These were inferred first by finding a nearby issue in which accurate data were given, finding the ratio between a statistic for the surrounding States and the State in question, and then employing this ratio to estimate the missing statistic from the data for the surrounding States for the year in which data were missing. These estimates were then checked out against, and sometimes modified using, totals calculated from the corresponding figures given for the individual libraries within the State in question.

The National Center for Educational Statistics has performed several surveys of public libraries, the most recent of which was reasonably thorough (Eldrige 1976). If these surveys can be repeated often and long enough, they might eventually provide some very useful historic data for addressing significant issues on library and literacy policies.

9. Harnischfeger and Wiley (1975) and a number of others have also pointed out the seriousness of this omission.

10. The norms on the commercial reading achievement tests used by schools provide strong empirical support for this argument by

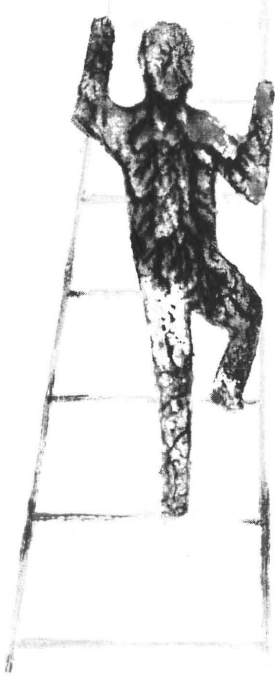
showing that the reading abilities of students continue to grow at a steady rate after the students have left the elementary grades and reading is no longer explicitly taught to any but a few seriously troubled students.

11. These percentages should not be interpreted as percentages that break out one of the components of the gross national product. The gross national product measures the final consumption of goods and services. The total expenditures for literacy are constructed along similar lines, but with one important difference. Some of the things counted in the literacy expenditure totals as final consumption of literacy, such as reading and writing at work, are not counted as final consumption in arriving at the gross national product. Thus, as the text indicates, these percentages of the gross national product do not represent allocations of the gross national product, but rather are offered merely to provide a frame of reference for understanding the size of expenditures for literacy.

12. Using total population in the denominator inflates size of the increase, but does not distort the pattern, since the population was increasing fastest among people in the lower age brackets and since much of the increased expenditure was for providing them with instruction. Expenditures per full-time student enrolled in public schools, for example, were \$2,977, \$3,104, \$3,136, \$3,291, \$3,963, and \$4,464 for the successive years shown in Table IX. The rise in these figures was substantial (1.9 percent per year) but only half the rate of increase shown in the table, where total population was used as the denominator.

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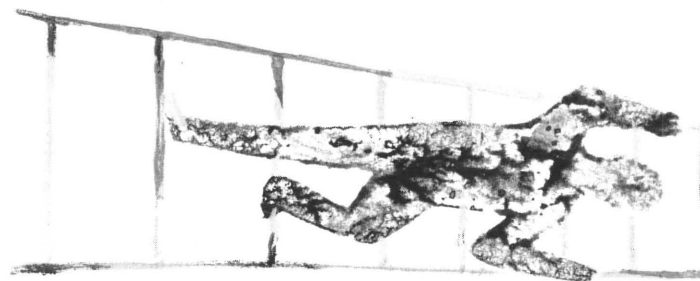


The spatial character of a piece of writing or reading is perceptually twofold. Writing and reading establish a close bodily and mental relation between a writer or reader and the surface on which letters are formed. This relation involves two different attitudes. Attitude I, an orthogonal relationship to letters, is dominated by vision and evokes a sense of rising and conquering or its opposite, stability. Attitude II, a horizontal relationship, is dominated by action and evokes the senses of near and far, outgoing and withholding, active and passive. In the process of writing or reading the attitudes fuse, combining a detached self with a self that actively engages in reaching a goal.

Spatial Aspects of Graphological Expression

Rudolf Arnheim

Writing and reading establish a close bodily and mental relation between a writer or reader and the surface on which letters are formed. This relation involves two distinctly different attitudes depending on the spatial position attributed to the writing/reading (w/r) surface in perceptual space. The perceived spatial position, in turn, exerts a decisive influence on the visual expression observed in the written and printed letters and thereby on the grapholo-



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gical symbolism inherent in that expression. Let me describe these attitudes which I call Attitude I and Attitude II.

In Attitude

I the writer or reader faces the w/r surface orthogonally. This spatial relationship is most perfectly realized when the surface is objectively vertical, e.g., a wall blackboard. In practice, of course, the line of sight meets the surface rarely at an exactly right angle. Depending on the position of the head in relation to the particular spot at a particular moment of the scanning process, the actual angle plays around the orthogonal. What matters psychologically, however, is that the relation between line of sight and surface is perceived as right-angled. This is the case even when the w/r surface or a book are on a table. The oblique angle of sight is viewed as a deviation from the orthogonal norm.

This right-angled relation is, in Attitude I, purely a matter between the line of sight and the surface. It is a narrowly confined system, largely independent of its orientation in the surrounding geographical space. Whether the viewer is standing upright or lying on his side or back, whether he looks at an inscription on a vertical wall, the ceiling, or the floor, the optical relation within the system can remain the same and the perceptual relation often does. The image projected upon the retinae does not partake in the absolute spatial position at which it is obtained.

Correspondingly, the spatial coordinates of the image can remain equally independent of those of the geographical environment. Experiments show that a rotated image retains its original up and down, left and right. If in a pic-

see

see

see

ture a man is seen climbing a ladder, he will be seen moving upward, no matter how the picture is oriented in physical space. The same is true for the spatial coordinates of written or printed letters. In the extreme case of someone bending forward and reading an upside-down text through his straddled legs, top will still be top and bottom will be bottom.¹ Since spatial directions are of fundamental influence in graphology, this perceptual fact demands attention. In Attitude I, verticality and horizontality are determined by the confined eye/surface system. The w/r surface is perceived as vertical and therefore possesses an up and down. This perceptual effect is strengthened, however, when it happens to coincide with the spatial framework of the geographical setting, as in the case of the blackboard on the wall.

For Attitude II the w/r surface is viewed as horizontal, that is, it runs parallel to the person's line of sight. Again this is merely the ideal or pure condition since in practice the person can see the surface only when he or she looks at it at some angle. This angle, however, is perceived as a deviation from a line of sight parallel to the w/r surface. The surface, in turn, displays its horizontality most compellingly when it coincides with the horizontal of the physical environment, e.g., when it is placed on a table top. But Attitude II plays its part also when there is no such spatial coincidence, e.g., when somebody writes or reads while lying on his side.

The point of the present analysis is that both attitudes determine the spatial conception of the writer or reader in each case with regard to one and the same objective situation. Suppose somebody sits

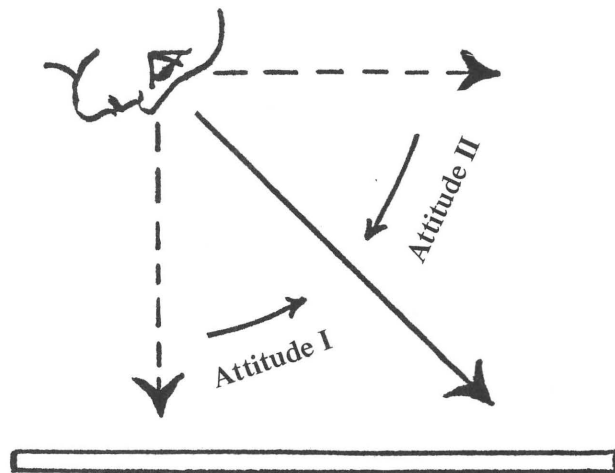


Figure 1.

at his desk and faces the w/r surface at an angle of 45° (Figure 1). With the w/r surface serving as the base of reference, Attitude I conceives of the tilted line of sight as raised from the vertical, while Attitude II conceives of it as dipping from the horizontal. The different spatial conceptions implied in the two attitudes merge and lead to a correspondingly complex symbolical expression.

Let me illustrate the implication by a reference to architectural space. Here again the perceptual difference between verticality and horizontality is decisive. The vertical acts as the dimension of *vision* by displaying the upright building to our sense of sight. Chartres Cathedral is what I see when I look at it orthogonally with my eyes directed horizontally. The building has an up and down direction, which determines its expression and symbolism decisively. At the same time, however, the building extends horizontally as described in its ground plan. The horizontal is the dimension of *action*. It has no up and down; instead it has a forward and backward. Its parts vary in their distance from the observer. For somebody standing before the west façade of the church, the entrance is near, the altar is far away. Vertical and horizontal aspects complement one another. The relation to the vertical is our Attitude I; the relation to the horizontal is our Attitude II.²

The comparison with architecture suggests that Attitude I is dominated by vision, Attitude II by motor activity. In the one case the viewer looks at the situation as though it were a picture; in the other he views a field on which he is acting or will act or on which someone has acted. If a painting on the wall

exemplifies the first case, a chess board or a road map illustrates the second. A chessboard is a field of action on which the player moves forward or backward. The directions and distances are defined in relation to him as the base of reference. Similarly, a traveler looks at a road map as a horizontal field of action forecasting moves through the landscape.³

We shall now be understood when we assert that the spatial character of a piece of writing or reading matter is perceptually two-fold. As a vertical expanse it presents a world characterized by up and down. The top of the page is up, the bottom is down. In consequence of our experience in gravitational space, moving upwards goes symbolically with rising, conquering, freeing oneself from the base; moving downward goes with digging in, refraining from the risks of flight, rooting in the solid foundation. This is the outlook of Attitude I, a view that has been widely acknowledged in the writings of graphologists.

The conception of the writing surface as a pictorial space in which the directions of up and down assume symbolic meaning was introduced by Max Pulver, one of the two founders of modern handwriting analysis. He speaks of the horizontal line created by writing as the "borderline between up and down, the horizon, the division between day and night. In spontaneous imagery, above is seen as heaven, sun, day, demonic (spiritual) powers, light. Below the line is the region opposite to that of light: night, darkness, abyss, depth."⁴

The other founder of modern graphology, Ludwig Klages, offers a similar interpre-

167 tation.⁵ He also speaks of “upper” and “lower” lengths thereby affirming the perceptual verticality of the image, and he attributes “for not yet fully clarified reasons” dominance of the upper lengths to a lightness of the spirit (idealism, enthusiasm, abstract thinking, but also eccentricity and superficiality) and dominance of the lower lengths to heaviness or weightiness of the spirit (realism, practical and technological leanings, conscientious observation, but also pedantry, sedateness, and materialism). Klages also refers to the ancient interpretation of the human body as the vehicle of the three levels of the soul. He may be thinking of Plato’s *Timaeus* 69/70, where God in creating the human body is said to have separated the head as the seat of the divine spirit from the rest of the trunk by the “isthmus and boundary” of the neck. The thorax as the seat of the inferior soul holds courage and passion in its upper section and the instinctual desires in the lower. Here again the symbolism of high and low presupposes, in its application to graphology, the conception of the writing surface as an upright visual image. Under the influence of Pulver and Klages similar interpretations reverberate in the writings of more recent graphologists, such as Klara G. Roman or Alfred O. Mendel.⁶

At the same time, however, Klages mentions kinesthetic factors that point to the spatial situation corresponding to our Attitude II. Handwritings in which the upper lengths of letters are taller than the lower lengths are attributed by Klages to a dominance of tensor movement in the writer’s arm, which leads away from the body, whereas in the opposite case flexor movement towards the body prevails. He also interprets

descending lines as due to a lessening of muscular tension caused by weakness and fatigue and therefore indicative of states of depression.

It will be seen that although Klages does not seem to have been aware of it, these kinesthetic factors do not fit the verticality of Attitude I. They define locations not by up and down but as distances from the person’s body, and directions as moving away from, and toward, the body. The spatial framework is that of the horizontal field of action. Being kinesthetic, these percepts refer most directly to the motor behavior of writing, but the corresponding visual conception is not separable from it. Also, to the extent to which a reader perceives written material as the product of writing behavior, kinesthetic overtones will resonate in the visual experience of reading. The muscular pressure of the stroke leaves its traces in the visual shapes produced by brush or pen and imitated in some typefaces. However, these kinesthetic connotations are not indispensable for the spatial conception of Attitude II, which interprets the dimension of top and bottom of the page as near or far rather than up and down.

While Attitude I makes us look at the w/r surface as a picture of life in gravitational space with the symbolic connotations to which I referred, Attitude II deals with the same surface as a microcosm of human activity, dominated by the symbolism of relations to the self: close and distant, far and near, outgoing and withholding, active and passive. In the more specifically kinesthetic sense, the contraction of the flexor muscles allows for more active or more passive expression. Actively it involves such behavior as hugging, squeezing, embracing, whereas passively centripetal

motion results from the relaxing of an effort to attain a goal located beyond the self. This abstaining from outreach may go with a resigned return to the self. Conversely, moving away from the body is perceived as muscular expansion, which stands in the active sense for reaching, yearning, stretching, invading the outer world; it stands passively for the tension release of letting go, letting it all hang out, surrendering to the outer world. Daniel S. Anthony has stated: "Emphasis on contraction implies an introverted increase in the writer's volitional, emotional, and intellectual controls. When release is emphasized, there is a relative increase in progression, exploration, goal direction, spontaneity, extraversion, impulsiveness, fantasy, and world directedness."⁷

From this point of view, the traditional Chinese writing in vertical columns, for example, would be perceived as starting with a wide outreach and moving gradually towards the self with a kind of raking gesture that assimilates the things of the world to the needs and principles of the self. The tension of the initial effort diminishes with the approach to accomplished acquisition. This experience may be compared with the view of similar material in Attitude I, for which the gradual return from an initial invasion of the heights to the safety of a ground level represents an objective happening, which often produces emotional resonance or empathy on the part of the viewer but has no direct spatial relation to an actively involved self.

The two attitudes we have separated for the purpose of theoretical analysis fuse in the actual experience of writing and reading. The resulting expression, to be interpreted by the graphologist, is necessarily complex. The extent

to which one attitude dominates the other will vary from case to case. The two attitudes agree with regard to some aspects of what is perceived. For both of them, the direction towards the top of the page means leaving the safety of the home base and reaching out, even though in the one case this means watching a detached ascent whereas in the other case the self itself, actually or vicariously, moves forward on the horizontal board of action.

But the differences are equally evident, especially in the interpretation of the lateral movement, which carries the writer and reader of Western languages along the line from the left to the right. For Attitude I this lateral displacement is the principal action symbolizing advance and progress, the road into the future. But whereas for Attitude I this lateral progression in writing and reading is the vehicle with whose behavior the observer identifies as though he were watching a racehorse, Attitude II perceives this same displacement more nearly as a part of the self's own actual or potential motor activity. From that point of view, however, the laterality of Western writing is not the primary but a secondary direction. It runs at right angles to the sagittal plane of the person's body, which determines the principal axis of outward and inward directed motion.

The twofold nature of the space perceived in w/r surface complicates the task of the graphologist. But the graphologist, just like anybody else who handles field structures as an artist or scientist, is accustomed and resigned to the teasing apart of components and to their integration in the whole.

1. For a recent paper see Gaetano Kaniza and Giorgio Tempieri, "Environmental and Retinal Frame of Reference in Visual Perception," *Italian Journal of Psychology*, 1976, vol. 3, #2, pp. 317-332.
2. Rudolf Arnheim, *The Dynamics of Architectural Form*, Berkeley and Los Angeles, 1977.
3. Cf. Rudolf Arnheim, "The Perception of Maps," *The American Cartographer*, 1976, vol. 3, #1, pp. 5-10, and Alan K. Henrikson, "The Map as an 'Idea'," *The American Cartographer*, 1975, vol. 2, #1, pp. 19-53.
4. Max Pulver, *Symbolik der Handschrift*, Zurich 1931, quoted after Oskar R. Schlag: "Max Pulvers Lebenswerk," Beiheft zur Schweizerischen Zeitschrift für Psychologie und ihre Anwendungen #20, 1953, p.11.
5. Ludwig Klages, *Handschrift und Charakter*, Leipzig 1916, pp. 122, 131.
6. Klara G. Roman, *Handwriting, a Key to Personality*, New York 1952. Alfred O. Mendel: *Personality in Handwriting*, New York 1947.
7. Daniel S. Anthony, *The Graphological Psychogram*. Maplewood, N.J., 1964, p. 23. For the preparation of the present paper I have much profited from a longstanding exchange of ideas with Daniel and Florence Anthony.

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Boniface

(c. 675-754): Archbishop, Legate and Postmaster General

Frederick J. Cowie

*Boniface was the prime mover in the transalpine Church during the eighth century, forming dioceses in Germany while reorganizing and reforming those in Bavaria and Frankland. To accomplish this, he made use of a *communio* of believers, including Anglo-Saxons, Franks, Germans, and Italians. Among the participants were monks, nuns, counts, kings and popes. To keep this *spiritalis communio* alive and healthy, Boniface had to devise a communication system which covered all of Roman Christendom. His postal service consisted primarily of highly-educated priests, performing the duties of mailmen, delivery men, and ambassadors-at-large. This network of envoys formed a “barbarian” answer to the Roman *cursus publicus*, while laying the groundwork for the *missi dominici* of Charlemagne’s empire.*

The pharaohs had the gift of the Nile. The Persians built the Royal Road so the imperial messengers might bring news to the Great King, the King of Kings. Ultimately, the Romans developed the *cursus publicus*, where at day's end the official traveler might have his cares tended to at the *mansio*. But the ancient world had crumbled, and the era of swift communication, at least in western Europe, had vanished by the advent of Boniface. Goths and Vandals, Moslems and Huns, Angles and Saxons — all speeded the demise of the Western Empire and its *cursus publicus*, while a new vision of empire as embodied in Charlemagne with his *missi dominici* had not yet emerged. Simultaneously, Roman Christendom had shrunk to include naught, save England, Frankland, and parts of Italy, and these but loosely bound. Into this Europe in need of rebuilding, Boniface was born.

Boniface. A few years after oblation, the young Boniface outgrew the school at his provincial monastery at Exeter and transferred to the more-advanced, educational center at Nursling, nearer to London and Canterbury. At length, he became the head of the abbey school and could member among his erstwhile students numerous, influential, monastic heads. His closest friends and mentors were Bishops Aldhelm of Sherborne and Daniel of Winchester. He once served as emissary to Canterbury for a royally-

sponsored, Church synod in Wessex. Fear of imminent, episcopal elevation then combined readily with a natural predilection to the apostolic life to lead Boniface, now nearing forty-five, to embark in 716 upon a thirty-five year missionary career.

Initial failure in Frisia soon sparked an appeal for papal approbation. Unable to elude ecclesiastical preferment, he was appointed bishop in 722 and archbishop in 732, though he remained without a see until obtaining Mainz in 748. For decades he united the roles of bishop and papal legate, ensuring the proselytism of Germany and the reform of Frankland proper. Consequently, Boniface had to maintain contact with the four cornerstones of Christendom — Italy, Frankland, Germany, and England — without the aid of the *cursus publicus* and often without even a Roman road to guide his couriers.

The Nature of Communio. It was a singular feat of organizational genius on the part of Boniface to regularize communications between his mobile command post, which traveled about Germany and Frankland, and his *communio*. A communications network was necessary for both the physical and the ecclesiastical well-being of the missionaries, while at the same time it supplied welcomed evidence of prayerful support. The correspondence fills one with an understanding of the spiritual bonds which united the disparate members of this union. The terminology itself is an adventure in Christianity. As the song says, you can tell they

were Christians by their love:

“The nature of the *communio* was that of a spiritual family—a *spiritalis societas* where *frater spiritualis* and *soror per Deum* were united in a *unitas fraternae dilectionis, communio fraterna* or *germanitas in Domino*. The letters of the communicants abound with explicit references to the *communio*. There, one finds a great feeling of love and friendship, a feeling of belonging to a *communio caritatis* or *communio dilectionis*, bound in *amore Christi* by *spiritalis adfinitas*. The nature of the Christian *communio* at hand is underscored by Boniface’s refusal to participate in the Eucharist, in *sancta communione corporis Christi*, with unregenerate clergy. *Spiritalis communio* and *sancta communio* were inseparable.”²

The Members of the Communio. Boniface’s confidants fell into five groups. First: Longtime friends, such as Daniel and Abbess Eadburga, who remained in England, yet maintained communication with him. Second: Anglo-Saxon missionaries who on their own initiative became disciples and co-workers on the Continent, such as Lullus, Burchard, and Eoban. Third: Missionaries called from the seclusion of their monasteries by the Archbishop, because he needed more workers in the field. Such were Lioba and Willibald. Fourth: There was also a group of foreign, i.e., non-Anglo-Saxon, missionaries, trained in the fine Anglo-Saxon tradition. Sturm and Gregory of Utrecht are two examples of Boniface’s introduction of a “native clergy.” Fifth: Fringe friends made up the final class, those

not involved in the mainstream of the missionary activity, but at one with the cause: Cuthbert, Archbishop of Canterbury; Optatus, Abbot of Monte Cassino; Fulrad, Abbot of St. Denis and advisor to King Pepin; Archdeacon Gemmulus at Rome. These men all were sideline supporters of the missionary movement.³ But it was not to members of his *communio* alone that Boniface sent messengers.

Levels of Communication. Boniface’s duties as archbishop and papal legate called for one level of communication, an official correspondence with the papacy. His relationships with the secular princes called for another. It must be remembered that they were the state, per se. His dealings with his *communio* called for a third level, while there are several letters which fit no specific category. To accomplish his somewhat heroic feats during his thirty-five years of dealing with hundreds of acquaintances, Boniface developed a personal parcel and post system, which we now will investigate at some length.

The Office of Messenger. When one reads Boniface’s letters, it is evident that the messenger was an important figure in the Bonifatian organization. He was the bishop’s eyes and ears, an emissary, an alter ego. Oral messages, too important to lend to written form, were entrusted to him. Books, letters, documents, gifts, clothing, gold — all were assigned to his care. And, although Boniface was a dedicated friend of the “little man,” it must be remembered that he dealt officially —

and one would think almost daily – with the elite of Europe: counts and kings, abbots and abbesses, bishops and popes. Necessarily, his representatives would have to be mature, literate, tactful, and of sufficient rank.

The Rank of the Messenger. Of the missions for which we have documentation of the rank of the messenger, Boniface used priests on all but one occasion, at which time he used Lullus, an archdeacon.⁴ The letters show that others, such as King Pepin and Bishop Daniel, also used priests.⁵ Due to the intense training of Anglo-Saxon priests and their minimal age of thirty – the canonical age for ordination, adhered to by Boniface unless emergency required otherwise – messengers would generally have been mature, well-trained, literate, and responsible.⁶ The priestly rank was not yet held by vast numbers, as in some modern religious orders, and this lent stature to its status. Besides, what could be more logical than sending ordained ministers on Church business? With the ties Boniface was developing in Frankland between Church and state, and with such bonds already existing in England, a priest was the perfect emissary.

The Number of People on an Embassy. Due to the precarious nature of medieval travel, it would seem priest-messengers did not go off unaccompanied. Yet, Boniface did not often have a sufficient supply of priests to send several on one mission. Often letters mention multiple groupings: “bearers,” “messengers,” “companions,” “men of yours,” and

“clerics.”⁷ We may take it that monks were sent along with the priests, although in one letter Pope Zacharias does mention using several strong and trustworthy priests.⁸ But where might an entourage, such as one containing two or three friends of Boniface, spend the nights while traversing Europe?

The Provisioning of an Embassy. Though most of Boniface’s correspondence is not extant, we have sufficient information to know that he was on good terms with many of the secular and religious leaders. His coronation of Pepin in 751 and his somewhat frequent communication with the court speak positively of his rapport with the Frankish crown. In one letter, Boniface asked Count Reginbert to look after his messenger, since the Count had been so helpful in the past. Another asked King Ethelbald of Mercia for personal assistance for an envoy, while thanking the monarch for aid rendered the previous year. In a third missive, Cena begged Boniface to send any travelers to her region to her personally, that she might supply their spiritual and bodily comforts.⁹ Can one imagine a continental monastery or other ecclesiastical establishment denying hospitality to the representatives of the Archbishop-Legate? Because of his widespread network of friends and his official capacity within the Church, Boniface’s messengers hopscoched, seemingly well-provisioned, across Europe.

Frequency of Communication. If it is hard to determine exactly the frequency of Boniface’s com-

municative expeditions, the reasons are not hard to find. The extant letters are far from being a complete corpus. Dating of the letters is often tentative and in some cases simply impossible. Documentation is better after the reform synods which began in 742, probably due to Boniface's renown, considering the fight for his remains in 754. Another gap in our information is caused by the fact that Boniface relied often upon oral communication, with written correspondence being used for long distances, extraordinary circumstances or when necessary record-keeping was dictated.

Regardless of these obstacles, certain general patterns do emerge from the graphs and plottings of Boniface's postal missions. Communication with England was fairly constant during his first decade on the Continent, 716-725.¹⁰ The period of work in Hesse, Thuringia, and Bavaria, 726-736, is all but devoid of extant correspondence, except for one well-documented effort in 735. After his third and final visit to Rome in 737, Boniface's Roman contacts became almost annual. Meanwhile, his English connection regularized again after 746. Finally, certain phrases appear which lead one to think messengers made regular excursions — phrases such as; "next time," "at once," "my tardiness." However, it must be kept in mind that these generalizations are gleaned from only sixty-six letters, carried on approximately thirty-six separate journeys.

Speed of Expeditions and Number of Stopovers. Walking is walking is

walking. (Two months in a Montana winter, without an automobile, has greatly heightened my appreciation of these messengers.) If a messenger averaged fifteen to twenty miles a day he earned his keep. Roman roads facilitated travel in some sections, mountains caused average mileage to fall in others. A river might lend aid here, dense forests deter there. Rome to London was a seven-week adventure, barring mishaps!¹² But it must be noted that Boniface's friends did not endlessly travel, for layovers were often encountered. An expedition mentioned earlier (the 735 affair) entailed visitation of not less than five places in Great Britain, from the Isle of Thanet to Whithorn in Scotland. Another peregrination which left from France included visits to Mercia's royal court, the bishopric of York, and the abbey at Wearmouth-Jarrow.¹³ A messenger might be enroute for months on end delivering messages, gathering information, and visiting old friends.

Encumbrances. Before remarking on the oral and written communications which were the *raison d'être* for the arduous ambulations of these couriers, let us examine briefly some of their particular parcels. Pope Gregory III loaded one crew with gifts and the relics of various saints. Others often carried spices, clothing, books, or articles for continental altars. King Ethelbert sent Boniface a silver, gold-lined cup weighing three and one half pounds. Boniface, obviously ridding himself of confiscated or donated materials, shipped to Ethelbal of Mercia three birds of prey, two shields, and two lances. Perhaps the gift most

typical of Boniface was that of two small casks of wine sent to Archbishop Egbert of York, with a plea that he share them with the brethren.¹⁴ Yet these were extra, non-essential, items. The final sections of this paper deal with the reason for the communication system; he wanted to communicate with his *communio*, the papacy, and others.

Oral Communications. The Bonifatian corpus contains numerous accounts of non-written communications. Letters contained specific information, but the messengers often augmented this data orally. Unfortunately, though the different aspects of oral communication now to be discussed will aid our understanding of the system, the words themselves have long since vanished. Just what did those monks say?

Greetings and salutations were often expressed orally by the messengers as personal representatives of the sender, cementing old ties of friendship. Local news and current events, not worth the time, effort, or vellum necessary for written communication, were often transmitted across Europe to be dispersed orally by messengers during leisurely layovers. The messengers were also called upon to expatiate and elucidate. Items covered only briefly in letters often needed clarification, and the senders regularly briefed the couriers as to the further intricacies involved. Finally, some confidential matters were transmitted orally to prevent interception, as mentioned in a 751 letter to Boniface from Pope Zacharias.¹⁵ Oral reports clearly complemented

written communication.

Written Communication. Boniface's greatest volume of correspondence with any one place was with Rome and the papacy. Extant items include his oath upon elevation to the episcopacy, papal patent letters seeking local Frankish secular support for Boniface, and reports of papal synods concerning Frankish affairs. But for the most part, the texts concern the day-to-day problems the Archbishop was having, problems he dutifully laid at the feet of the popes. These official letters are a mine of valuable information for anyone interested in papal affairs during the early eighth century.

As already mentioned, Boniface kept in contact with the secular leaders in England and on the Continent. In one letter to Pepin, Boniface mentioned he was returning a certain mendacious cleric named Ansfrid, in order to obtain royal justice. The man had surreptitiously appealed to the monarch, lying about his relationship with Boniface. It was the King's official duty, the Archbishop noted, to protect the Frankish people from such deceivers. In another letter to Pepin, sent through the good offices of Abbot Fulrad of St. Denis, Boniface sought protection and physical support for his missionaries after his death, because they were all foreigners, Englishmen, and would be in need of royal backing to complete their mission.

To the English Kings went letters seeking temporal and spiritual aid. Yet, in

one instance, when Boniface thought that the King of Mercia, Ethelbald, had strayed too far from the path of Christian charity, the aged missionary severely admonished the King. Simultaneously, he ensured himself of local English support in the matter by enlisting the aid of Archbishop Egbert of York.¹⁶

Many letters were sent as part of Boniface's role of spiritual advisor. Abbesses in England who had attended his classes relied particularly heavily upon his advice and spared no efforts in obtaining his replies. Boniface did not placate them with pious platitudes, but was usually rather straightforward, such as the time he suggested that Abbess Bugga delay her planned pilgrimage, at least until the Moslem invasions of Italy ceased.¹⁷ Other letters show us that Boniface was interested in the everyday affairs of his monks. One letter arranged the offices to be held by the monks of Fritzlar after the death of their Abbot, Wigbert; another, written and sent from Rome, reported to the monks his reception by Pope Gregory III.¹⁸

It is also interesting to see Boniface's untiring search for useful manuscripts. As a teacher he knew the need for good written materials, while as a bishop he had to provide the many works needed for Mass and the Divine Office in his new installations. Another popular set of manuscripts was the corpus of Gregory the Great's epistles to Augustine of Canterbury, for they contained many valuable papal rulings.¹⁹ The search for manuscripts was unceasing.

Boniface asked Abbess Eadburga for the *Epistles of St. Peter*, embellished in gold to impress the pagans. From Daniel of Winchester he requested an old copy of the *Book of the Prophets*, which he had used when he was in Wessex. This particular manuscript, written in large, legible letters, was easy to read for an old man with fading eyesight.

Both Egbert of York and Huetbert, Abbot of Wearmouth-Jarrow, were petitioned for works of Bede. Abbot Duddo of Nursling was asked to send a copy of the Pauline epistles, plus copies of any other interesting works in Boniface's old library. Many letters merely mentioned "books" which had been sent to the missionaries. New European libraries were being assembled: meanwhile, the scriptoria of England would have to provide the needed materials.²⁰

One important, though often overlooked, set of letters was sent during the Frankish reforms, 742-747. This was a period of intense crisis for Boniface. In need of spiritual solace and support, he sent messengers out carrying letters to friends, such as the beloved Lioba. Knowing the cost in priest-power, time and trouble, these embassies show us the emphasis Boniface put on prayer and on his *communio*, for he asked for nothing except prayers.²¹

One last letter need be noted, for it, more than any other specific piece of evidence, shows the lengths to which Boniface would go to take care of his friends. In it the priest Denehard,

himself once a Bonifatian messenger, was asked to look after and to stand up for a serf, Athalere. Athalere was about to marry and needed a character witness. Boniface supplied Denehard! The priest was informed he should pledge himself for Athalere in order that the menial serf might not fear because of his servile status.²² A concrete example of the *spiritalis societas* that Boniface created.

Summation. What might be said to bring all of the different aspects of the Bonifatian communications system into focus? An organizational genius, Boniface late in life was asked by successive popes to evangelize Germany and subsequently to reform Frankland. This necessitated the establishment of regular communications from the Scottish highlands to the retreat of Monte Cassino. Although a pragmatist and not beyond using pilgrims and other travelers such as Abbess Bugga to deliver messages, a more reliable and controllable system had to be devised. Boniface pulled from his corps of clerics a cadre of messengers who also were his eyes and ears. He kept open his lines of communication with the papacy, the secular princes and his *communio*. He even used this network of couriers as a training ground for future ecclesiastics, with messengers such as Eoban and Lullus appearing on the episcopal rolls.

When Boniface finally completed his *peregrinatio Christi* at the hands of the Frisians in 754, he was the most renowned man in Christendom. His remains were claimed, following a

strident struggle, by the monastery at Fulda. His letters were collected and edited. It is a tribute to the systematic communications he initiated that soon after Boniface's death a letter was received by his disciple and successor at Mainz, Bishop Lullus.

In it, Cuthbert, Archbishop of Canterbury, spoke of the mutual relations established through letters and trusty messengers.²³ Because of these ties, bonds of a *communio spiritualis* held firm by regular correspondence, Cuthbert reported that Boniface had been named by the English Church to join Gregory the Great and Augustine of Canterbury as Patron of England. As bishop, missionary, and papal legate he had spread monks, messengers and manuscripts across Europe like wildfire, and soon the Continent was aflame with the Carolingian renaissance.²⁴

1. This paper was originally read at the Third Saint Louis Conference on Manuscript Studies, October, 1976, under the title, "Manuscripts on the Move." It should be also noted that Boniface had similarly gone under another name, Winfrid, only to be renamed by Pope Gregory II. However, to avoid confusion, Boniface will be used throughout the text.

2. Cowie, Frederick J. "Boniface and *Communio* in the Eighth Century," *Communio*, III, No. 1, Spring, 1976.

3. Cowie, Frederick J. *Boniface (c.675-754) and His Friends: A Communion of Saints*; unpublished doctoral dissertation, Saint Louis University, 1975.

4. Throughout the essay, the numeration of the letters will be according to: *Die Briefe Des Heiligen Bonifatius und Lullus. Monumenta Germaniae Historica Epistolae Selectae Tomus I*. Edited by Michael Tangl (Berlin: Wiedmannsche Buchhandlung, 1916). Letters 26, 30, 32, 35, 51, 62, 63, 80, 85, 86, and 96.

5. Letters 63 and 77.

6. Jones, Charles W. *Saints' Lives and Chronicles in Early England* (Ithaca: Cornell University Press, 1947). See letter 25 for the papal permission to ordain at age twenty-five.

7. Letters 50, 69, 87, 93, 95, 105, and 111. Messengers of Boniface are also mentioned in the 731 embassy to Rome at the death of Pope Gregory III: Willibald *Vita Sancti Bonifacii. Monumenta Germaniae Historica Scriptorum Tomus II*. Edited by George Pertz (Hanover: Impensis

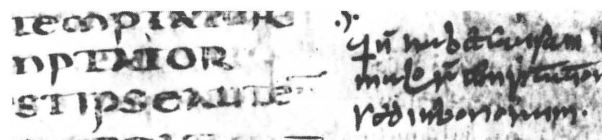


Figure 1.

Bibliopoli Hahniani, 1829).

8. Letter 77, concerning heretics Aldebert, Clemens, and Godalscius being transported by priests to Rome.

9. *Carolingian Chronicles, Royal Frankish Annals and Nithard's Histories*. Translated by B. W. Scholz and B. Rogers (Ann Arbor: University of Michigan Press, 1970), p. 39, for Pepin's coronation and letters 93 and 107 for communication with Pepin. Letter 95 for Reginbert, letter 69 for Ethelbald and letter 97 for Cena.

10. This seems to be due to his having only recently left his many close friends in England.

11. Letters 54, 34, and 108.

12. Haskins, C. H. "The Spread of Ideas in the Middle Ages," *Speculum*, I, 1926; and Boyer, Marjorie. "A Day's Journey in Medieval France," *Speculum*, XXVI, 1951.

13. Letters for the 735 trek are 32, 33, 34, 35, and 36. For the 746-747 adventure see letters 73, 74, 75, and 76.

14. For the Gregory III notation see: *Vita Sancti Bonifacii*. For Ethelbert's conspicuous bribe, letter 105. Ethelbald's presents from Boniface appear in letter 69, while the two casks of wine are in letter 92. Almost each and every letter contained some mention of gift or remembrance.

15. Oral reports are frequently mentioned in the text. For greetings and salutations see letters 54, 78, 105, and 108. For news and current events see 26, 50, 63, and 87. Many items required further clarification, see letters 34, 87, 105, and 112. On confidentiality, see letter 86. Sometimes it is evident that letters were forsaken completely for oral

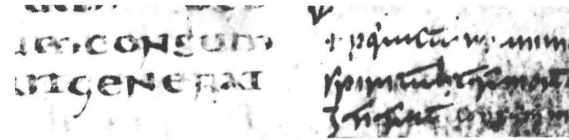


Figure 2.

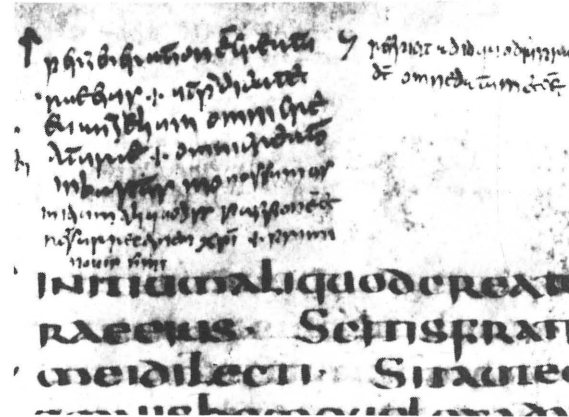


Figure 3.

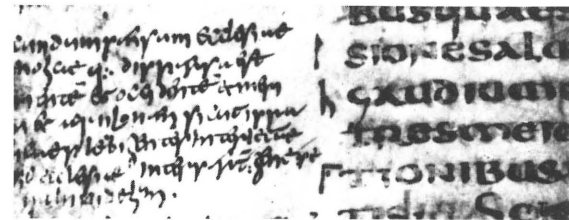


Figure 4.

and contrasts to show that the Douce Manuscript (Figure 7) and the Leningrad Manuscript were penned by a Glossator A at a different stage in his career. These three manuscripts form “Fuldensis-A group.”

Using paleographical evidence and the “contents (which include various texts of Isidore, and Aldhelm’s riddles with their solutions) and the affiliations of these texts,” Lowe and Bischoff, and now Parkes, assign the Leningrad Manuscript to southwest England. Insular cursive style and the glossators’ runes help assign the glossators of Codex Fuldensis to the south of England, while it can be shown that the Douce Manuscript was written in England at the end of the seventh century and annotated in southern England in the tenth. Thus the “Fuldensis-A group” can be assigned to a single scribe from south-west England. Parkes then proceeds to show that the Codex Fuldensis itself was copied in southern Italy before 546-7 and was “in the hands of Anglo-Saxon missionaries on the continent by the eighth century, and by the end of the eighth was at Fulda. “From this,” Parkes concludes, “our scribe (Glossator A) added his glosses to the Epistle of James in this manuscript on the continent.”

Finally, concentrating closely on the glosses to the Epistle of James where Glossator A is the first glossator (“presumably responsible for selecting the text”) and is “strikingly independent” of earlier commentaries on James, Parkes concludes: “The sense of personal authority which underlies his interpretations of the text, the ‘apostolic’

quality of this authority, and the way in which his literary personality accords with what we know about Boniface have convinced me that Glossator A, this Anglo-Saxon scribe who worked both in south-west England and on the continent, is to be identified with St. Boniface himself.”

Professor Malcolm B. Parkes has very kindly provided the photographs for the illustrations, which are used with kind permission of the libraries owning the MSS: Figures 1-6 are from HS Bonifatianus 1 (CLA, 1196), the Codex Fuldensis, from Fulda, Landesbibliothek; copyright the Library at Fulda, Photo-Archiv at Marburg. Figure 7 is from MS Douce 140 (CLA, 237), from Oxford, Bodleian Library; copyright the Bodleian Library.

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The Effects of Line Length and Paragraph Denotation on the Retrieval of Information from Prose Text

James Hartley, Peter Burnhill, and Lindsey Davis

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Grade-school children read either two-column (each column 20 ems) or a single-column (42 ems) of text in one of four ways that indicates new paragraphs. Students were assigned to find missing words to measure the readability of the various systems. The results suggest that a two-column layout with traditional paragraphing denotation is preferable to a single-column in terms of cost-effectiveness; however, an extreme line-length does not place an undue strain on the reader.

In this study four pages of text (excerpts from Maclean's [1965] *Master of Morgana*) were printed in 10 point on 12 point Mono-type Baskerville on ISO standard size A4 pages (210 x 297 mm) in either a two-column unjustified setting (each column 20 ems) or in a single-column unjustified setting (42 ems). For each setting the start of new paragraphs was denoted in one of four ways:

- (i) new line of text after a one line space, with no indent;
- (ii) new line plus indent but no line space (the traditional method);
- (iii) new line, but no indent and no line space;
- (iv) no indication: i.e., the text was set as a solid "slab."

These different systems produce variations in the amount of horizontal space that is available to cue the reader, and the aim of the study was to see whether or not this would affect the readability of the text. Of particular interest was the effect of these different systems of paragraph denotation on the readability of the single-column print – for a line-length of 42 ems lies far beyond M. A. Tinker's "margin of safety" (Tinker, 1963). These settings were chosen because A4 is the most commonly used page-size of the ISO page-sizes, and a line-length of 42 ems is about the maximum one can comfortably get on a page of this size. (Xeroxed copies of the materials used are available from the authors.)

Method.

Approximately five-hundred Grade 6 and 7 schoolchildren with a wide-ability range participated in this study. Classes were taken separately, and in each class the children were randomly allocated into one of eight conditions, paragraph system (i) to (iv) in single or double-column layouts. The children were asked first to read the extract as naturally as possible for a period of ten minutes, and then to mark where they had reached. After this they were then asked to scan the passage for a further period of ten minutes. (Scanning is a technique devised by Poulton [1967] which involves presenting readers with a list of phrases taken in order from the passage, each phrase with a word missing. The task of the readers is to scan the passage to find the phrases and to write down the missing words as quickly as they can.) The target words occurred on average every 4 to 5 lines apart on the single-column layout, and every 7 to 9 lines apart on the double-column format. Target words occurring at the beginning or the ends of lines were avoided and the position of the words in the lines was varied so that readers could not retrieve them by simply scanning vertically. Three target words were first done in class for practice, a total of forty target words provided on the search list.

2 Extract using layout *i*. Line length is 20 ems maximum: paragraphs denoted by line space, no indent.

As soon as Big Willie had gone, I made for the cliff top, keeping well away from the side of the gorge. I lowered myself over the edge of the cliff, and climbed down to the clump of bushes on the lip of the overhang. The thick branches of the centre bush formed a Y. I wedged my feet against them, my back to the cliff. Shielded by the leafy branches I settled down to wait.

I had intended to let Long John know of my plan but I had not got a chance to speak to him alone. Perhaps it was just as well, for I had a feeling that he would not have approved of it. That was the trouble, now that I had got him firmly on my side he would want to plan everything himself, and I would become no more than an idle spectator.

There was a haze over the Sound. The hills of the mainland had disappeared behind a thick wall of cotton-wool clouds. Far to the north, a fog hooter blared out. There was a sea mist creeping in, a sure sign of good weather at this time of year, but the worst thing that could have happened from my point of view.

At first I had been glad of the leafy shade of the bushes, but I soon started to chill. I could not have been there more than an hour or so when I started to get cramp in my legs. I tried bending them, one at a time, but I could not keep the cramp at bay.

could still see a patch of clear water, but great clouds of thick white vapour were rolling up to the river mouth, and drifting into the gorge.

It may have been the mist blanketing my view, or my cramped position under the bushes; whatever it was I felt as if time had come to a standstill. It seemed not only hours, but days since I had parted from Big Willie in the quarry. I was lost in a strange half-world, suspended between land and sea, it seemed, in a mist-shrouded world of absolute silence. I strained my ears for the sound of oars or an engine, but I could not hear a thing.

I think it was an insect that had got down my back, for I had a sudden, terrible itch between my shoulder blades. I twisted round to scratch it the better. Out of my eye I saw something move.

I pushed myself up out of the bushes, feeling my legs weak and helpless, and flattened round against the cliff. It was the red fellow. He was climbing carefully down the cliff towards me. My stomach turned to water. I stared up at him, immovable as a rabbit before a ferret.

He had his back to the cliff face, and he was letting himself down only inches at a time. With every step he dug his heels in firmly and he had his hands spread

3 Extract using layout *ii*. Line length is 42 ems maximum: paragraphs denoted by indent and new line.

As soon as Big Willie had gone, I made for the cliff top, keeping well away from the side of the gorge. I lowered myself over the edge of the cliff, and climbed down to the clump of bushes on the lip of the overhang. The thick branches of the centre bush formed a Y. I wedged my feet against them, my back to the cliff. Shielded by the leafy branches I settled down to wait.

I had intended to let Long John know of my plan but I had not got a chance to speak to him alone. Perhaps it was just as well, for I had a feeling that he would not have approved of it. That was the trouble, now that I had got him firmly on my side he would want to plan everything himself, and I would become no more than an idle spectator.

There was a haze over the Sound. The hills of the mainland had disappeared behind a thick wall of cotton-wool clouds. Far to the north, a fog hooter blared out. There was a sea mist creeping in, a sure sign of good weather at this time of year, but the worst thing that could have happened from my point of view.

At first I had been glad of the leafy shade of the bushes, but I soon started to chill. I could not have been there more than an hour or so when I started to get cramp in my legs. I tried bending them, one at a time, but I could not keep the cramp at bay.

The sea mist was coming in fast. Directly below me I could still see a patch of clear water, but great clouds of thick white vapour were rolling up to the river mouth, and drifting into the gorge.

It may have been the mist blanketing my view, or my cramped position under the bushes; whatever it was I felt as if time had come to a standstill. It seemed not only hours, but days since I had parted from Big Willie in the quarry. I was lost in a strange half-world, suspended between land and sea, it seemed, in a mist-shrouded world of absolute silence. I strained my ears for the sound of oars or an engine, but I could not hear a thing.

I think it was an insect that had got down my back, for I had a sudden, terrible itch between my shoulder blades. I twisted round to scratch it the better. Out of the corner of my eye I saw something move.

I pushed myself up out of the bushes, feeling my legs weak and helpless, and flattened round against the cliff. It was the red fellow. He was climbing carefully down the cliff towards me. My stomach turned to water. I stared up at him, immovable as a rabbit before a ferret.

He had his back to the cliff face, and he was letting himself down only inches at a time. With every step he dug his heels in firmly, and he had his hands spread wide to brake himself if he slipped. He was looking around for footholds, and he did not see me at first. When he saw me watching him, he stopped.

We stared at each other for a long time, neither of us moving. He never said a word, just drew in his bottom lip on

4 Extract using layout *ii*. Line length is 20 ems maximum: paragraphs denoted by indent and new line.

As soon as Big Willie had gone, I made for the cliff top keeping well away from the side of the gorge. I lowered myself over the edge of the cliff, and climbed down to the clump of bushes on the lip of the overhang. The thick branches of the centre bush formed a Y. I wedged my feet against them, my back to the cliff. Shielded by the leafy branches I settled down to wait.

I had intended to let Long John know of my plan but I had not got a chance to speak to him alone. Perhaps it was just as well, for I had a feeling that he would not have approved of it. That was the trouble, now that I had got him firmly on my side he would want to plan everything himself, and I would become no more than an idle spectator.

There was a haze over the Sound. The hills of the mainland had disappeared behind a thick wall of cotton-wool clouds. Far to the north, a fog hooter blared out. There was a sea mist creeping in, a sure sign of good weather at this time of year, but the worst thing that could have happened from my point of view.

At first I had been glad of the leafy shade of the bushes, but I soon started to chill. I could not have been there more than an hour or so when I started to get cramp in my legs. I tried bending them, one at a time, but I could not keep the cramp at bay.

The sea mist was coming in fast. Directly below me I could still see a patch of clear water, but great clouds of thick white vapour were rolling up to the river mouth, and drifting into the gorge.

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I think it was an insect that had got down my back, for I had a sudden, terrible itch between my shoulder blades. I twisted round to scratch it the better. Out of my eye I saw something move.

I pushed myself up out of the bushes, feeling my legs weak and helpless, and flattened round against the cliff. It was the red fellow. He was climbing carefully down the cliff towards me. My stomach turned to water. I stared up at him, immovable as a rabbit before a ferret.

He had his back to the cliff face, and he was letting himself down only inches at a time. With every step he dug his heels in firmly, and he had his hands spread wide to brake himself if he slipped. He was looking around for footholds, and he did not see me at first. When he saw me watching him, he stopped.

We stared at each other for a long time, neither of us moving. He never said a word, just drew in his bottom lip on his stained teeth, and stared at me. There was no need for him to speak. I could see all I needed to know on his face, and the sight of it made me tremble. With his eyes still on my face, he started to edge down the

5 Extract using layout *iii*. Line length is 42 ems maximum: paragraphs denoted by new line.

As soon as Big Willie had gone, I made for the cliff top, keeping well away from the side of the gorge. I lowered myself over the edge of the cliff, and climbed down to the clump of bushes on the lip of the overhang. The thick branches of the centre bush formed a Y. I wedged my feet against them, my back to the cliff. Shielded by the leafy branches I settled down to wait.

I had intended to let Long John know of my plan but I had not got a chance to speak to him alone. Perhaps it was just as well, for I had a feeling that he would not have approved of it. That was the trouble, now that I had got him firmly on my side he would want to plan everything himself, and I would become no more than an idle spectator. There was a haze over the Sound. The hills of the mainland had disappeared behind a thick wall of cotton-wool clouds. Far to the north, a fog hooter blared out. There was a sea mist creeping in, a sure sign of good weather at this time of year, but the worst thing that could have happened from my point of view.

At first I had been glad of the leafy shade of the bushes, but I soon started to chill. I could not have been there more than an hour or so when I started to get cramp in my legs. I tried bending them, one at a time, but I could not keep the cramp at bay.

The sea mist was coming in fast. Directly below me I could still see a patch of clear water, but great clouds of thick white vapour were rolling up to the river mouth, and drifting into the gorge.

It may have been the mist blanketing my view, or my cramped position under the bushes; whatever it was I felt as if time had come to a standstill. It seemed not only hours, but days since I had parted from Big Willie in the quarry.

I was lost in a strange half-world, suspended between land and sea, it seemed, in a mist-shrouded world of absolute silence. I strained my ears for the sound of oars or an engine, but I could not hear a thing.

I think it was an insect that had got down my back, for I had a sudden, terrible itch between my shoulder blades. I twisted round to scratch it the better. Out of the corner of my eye I saw something move.

I pushed myself up out of the bushes, feeling my legs weak and helpless, and flattened round against the cliff. It was the red fellow. He was climbing carefully down the cliff towards me. My stomach turned to water. I stared up at him, immovable as a rabbit before a ferret.

He had his back to the cliff face, and he was letting himself down only inches at a time. With every step he dug his heels in firmly, and he had his hands spread wide to brake himself if he slipped. He was looking around for footholds, and he did not see me at first. When he saw me watching him, he stopped.

We stared at each other for a long time, neither of us moving. He never said a word, just drew in his bottom lip on his

6 Extract using layout *iii*. Line length is 20 ems maximum: paragraphs denoted by new line.

As soon as Big Willie had gone, I made for the cliff top, keeping well away from the side of the gorge. I lowered myself over the edge of the cliff, and climbed down to the clump of bushes on the lip of the overhang. The thick branches of the centre bush formed a Y. I wedged my feet against them, my back to the cliff. Shielded by the leafy branches I settled down to wait.

I had intended to let Long John know of my plan but I had not got a chance to speak to him alone. Perhaps it was just as well, for I had a feeling that he would not have approved of it. That was the trouble, now that I had got him firmly on my side he would want to plan everything himself, and I would become no more than an idle spectator.

There was a haze over the Sound. The hills of the mainland had disappeared behind a thick wall of cotton-wool clouds. Far to the north, a fog hooter blared out. There was a sea mist creeping in, a sure sign of good weather at this time of year, but the worst thing that could have happened from my point of view. At first I had been glad of the leafy shade of the bushes, but I soon started to chill. I could not have been there more than an hour or so when I started to get cramp in my legs. I tried bending them, one at a time, but I could not keep the cramp at bay.

The sea mist was coming in fast. Directly below me I could still see a patch of water, but great clouds of thick white vapour were rolling up to the river mouth, and drifting into the gorge.

It may have been the mist blanketing my view, or my

cramped position under the bushes; whatever it was I felt as if time had come to a standstill. It seemed not only hours, but days since I had parted from Big Willie in the quarry. I was lost in a strange half-world, suspended between land and sea, it seemed, in a mist-shrouded world of absolute silence. I strained my ears for the sound of oars or an engine, but I could not hear a thing.

I think it was an insect that had got down my back, for I had a sudden, terrible itch between my shoulder blades. I twisted round to scratch it the better. Out of my eye I saw something move.

I pushed myself up out of the bushes, feeling my legs weak and helpless, and flattened round against the cliff. It was the red fellow. He was climbing carefully down the cliff towards me. My stomach turned to water. I stared up at him, immovable as a rabbit before a ferret.

He had his back to the cliff face, and he was letting himself down only inches at a time. With every step he dug his heels in firmly, and he had his hands spread wide to brake himself if he slipped. He was looking around for footholds, and he did not see me at first. When he saw me watching him, he stopped.

We stared at each other for a long time, neither of us moving. He never said a word, just drew in his bottom lip on his stained teeth, and stared at me. There was no need for him to speak. I could see all I needed to know on his face, and the sight of it made me tremble. With his eyes still on my face, he started to edge down the

7 Extract using layout *iv*. Line length is 42 ems maximum: no paragraph denotation.

As soon as Big Willie had gone, I made for the cliff top, keeping well away from the side of the gorge. I lowered myself over the edge of the cliff, and climbed down to the clump of bushes on the lip of the overhang. The thick branches of the centre bush formed a Y. I wedged my feet against them, my back to the cliff. Shielded by the leafy branches I settled down to wait. I had intended to let Long John know of my plan but I had not got a chance to speak to him alone. Perhaps it was just as well, for I had a feeling that he would not have approved of it. That was the trouble, now that I had got him firmly on my side he would want to plan everything himself, and I would become no more than an idle spectator. There was a haze over the Sound. The hills of the mainland had disappeared behind a thick wall of cotton-wool clouds. Far to the north, a fog hooter blared out. There was a sea mist creeping in, a sure sign of good weather at this time of year, but the worst thing that could have happened from my point of view. At first I had been glad of the leafy shade of the bushes, but I soon started to chill. I could not have been there more than an hour or so when I started to get cramp in my legs. I tried bending them, one at a time, but I could not keep the cramp at bay. The sea mist was coming in fast. Directly below me I could still see a patch of clear water, but great clouds of thick white vapour were rolling up to the river mouth, and drifting into the gorge. It may have been the mist blanketing my view, or my cramped position under the bushes; whatever it was I felt as if time had come to a standstill. It seemed not only hours, but days since I had parted from Big Willie in the quarry. I was lost in a strange half-world, suspended between land and sea, it seemed, in a mist-shrouded world of absolute silence. I strained my ears for the sound of oars or an engine, but I could not hear a thing. I think it was an insect that had got down my back, for I had a sudden, terrible itch between my shoulder blades. I twisted round to scratch it the better. Out of the corner of my eye I saw something move. I pushed myself up out of the bushes, feeling my legs weak and helpless, and flattened round against the cliff. It was the red fellow. He was climbing carefully down the cliff towards me. My stomach turned to water. I stared up at him, immovable as a rabbit before a ferret. He had his back to the cliff face, and he was letting himself down only inches at a time. With every step he dug his heels in firmly, and he had his hands spread wide to brake himself if he slipped. He was looking around for footholds, and he did not see me at first. When he saw me watching him, he stopped. We stared at each other for a long time, neither of us moving. He never said a word, just drew in his bottom lip on his stained teeth, and stared at me. There was no need for him to speak. I could see all I needed to know on his face, and the sight of it made me tremble. With his eyes still on my face, he started to edge down the cliff towards me. As he moved, I snapped out of my trance. I climbed up out of the bushes and moved awkwardly to the right, my legs feeling as if they did not belong to me. He worked across to his left, to cut me off. I stopped, panting, realizing that I would be within his reach before I could gain the safety of the cliff top. He took a

8 Extract using layout *iv*. Line length is 20 ems maximum: no paragraph denotation.

As soon as Big Willie had gone, I made for the cliff top, keeping well away from the side of the gorge. I lowered myself over the edge of the cliff, and climbed down to the clump of bushes on the lip of the overhang. The thick branches of the centre bush formed a Y. I wedged my feet against them, my back to the cliff. Shielded by the leafy branches I settled down to wait. I had intended to let Long John know of my plan but I had not got a chance to speak to him alone. Perhaps it was just as well, for I had a feeling that he would not have approved of it. That was the trouble, now that I had got him firmly on my side he would want to plan everything himself, and I would become no more than an idle spectator. There was a haze over the Sound. The hills of the mainland had disappeared behind a thick wall of cotton-wool clouds. Far to the north, a fog hooter blared out. There was a sea mist creeping in, a sure sign of good weather at this time of year, but the worst thing that could have happened from my point of view. At first I had been glad of the leafy shade of the bushes, but I soon started to chill. I could not have been there more than an hour or so when I started to get cramp in my legs. I tried bending them, one at a time, but I could not keep the cramp at bay. The sea mist was coming in fast. Directly below me I could still see a patch of clear water, but great clouds of thick white vapour were rolling up to the river mouth, and drifting into the gorge. It may have been the mist blanketing my view, or my cramped position under the

standstill. It seemed not only hours, but days since I had parted from Big Willie in the quarry. I was lost in a strange half-world, suspended between land and sea, it seemed, in a mist-shrouded world of absolute silence. I strained my ears for the sound of oars or an engine, but I could not hear a thing. I think it was an insect that had got down my back, for I had a sudden, terrible itch between my shoulder blades. I twisted round to scratch it the better. Out of my eye I saw something move. I pushed myself up out of the bushes, feeling my legs weak and helpless, and flattened round against the cliff. It was the red fellow. He was climbing carefully down the cliff towards me. My stomach turned to water. I stared up at him, immovable as a rabbit before a ferret. He had his back to the cliff face, and he was letting himself down only inches at a time. With every step he dug his heels in firmly, and he had his hands spread wide to brake himself if he slipped. He was looking around for footholds, and he did not see me at first. When he saw me watching him, he stopped. We stared at each other for a long time, neither of us moving. He never said a word, just drew in his bottom lip on his stained teeth, and stared at me. There was no need for him to speak. I could see all I needed to know on his face, and the sight of it made me tremble. With his eyes still on my face, he started to edge down the cliff towards me. As he moved, I snapped out of my trance. I climbed up out of the bushes and moved awkwardly to the right, my legs feeling as if they did not belong to me. He

Results.

The data from the reading speed measure did not meet the requirements of homogeneity of variance required by the statistical analyses, so in this report we shall concern ourselves only with the data from the scanning measure.

With these data we conducted an analysis of covariance: columns \times paragraph version \times sex with E.Q. as the co-variate. (E.Q. = English Quotient, a verbal intelligence measure available from the school records : these data were obtained one to two years before our experiment.) The results of this analysis were as follows:

1. There was a significant difference ($p < .05$) in favour of the two-column layout – although this difference was small. The average number of items scanned in the two-column versions (in ten minutes) was 17.6 and in the single-column versions it was 16.7.

2. There was a significant difference in the amount scanned which reflected the denotation of new paragraphs. The average scores obtained were as follows:

System (i) 18.2

System (ii) 17.6

System (iii) 16.2

System (iv) 16.7

System (i) was significantly superior to System (iii) ($p < .01$) and System (iv) ($p < .05$) (Tukey test), but it was not significantly different from System (ii).

3. There was a statistically significant sex difference, girls doing better than boys ($p < .01$). The average score for the girls was 18.2 and for the boys it was 16.2.

4. There were no interactions between these three different measures: i.e., scores on the single-column layout for the different paragraph systems did not differ significantly from scores obtained on the two-column one for the different paragraph systems, and boys did not score differently from girls on the different paragraph systems.

Discussion.

These results suggest that a two-column layout is probably preferable to a single-column one for the setting of straightforward prose, although the actual data suggest that a line-length of 42 ems does not cause a great deal of additional difficulty. In terms of cost-effectiveness, a two-column layout with paragraphs denoted by indentation (the traditional method) seems best because (1) it is possible to get more words on a page with a two-column layout, and (2) this layout uses less space than one which uses line-spacing for denoting paragraphs.

However, decisions concerning the number of columns for a page must not be determined solely by a concern for line-length but also by a concern for the structural requirements of the text. When material is typographically complex (as say in a hierarchically arranged technical document) or when it contains large tables, diagrams, and figures

that could cut across a two-column layout, then — as we have shown elsewhere — it seems preferable to use a single-column layout with line-spacing to denote the paragraphs (Burnhill, *et al*, 1976; Hartley, 1978).

For us, the importance of the results reported in this paper lies in the fact that our readers did not seem to experience any great difficulty in handling the single-column layout. (Very few errors were made in the experiment.) This does *not* suggest that everything should be printed in lines of 42 ems on an A4 page, but that if it is necessary to use this extreme line-length (because of the nature of the text) then this can be done without placing an undue strain on the reader.

Acknowledgements.

We are grateful to the teachers and pupils who participated in this study and to Penguin Education for permission to reproduce the materials used in this experiment. The research was funded by the Social Science Research Council, U.K.

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The Vowel Cluster

Pronunciation Preferences of Proficient and Non-Proficient Adult Readers

Frederick A. Duffelmeyer

The purpose of this research was to determine whether the results of a study conducted by Johnson and Venezky (1976) are generalizable to non-proficient adult readers. One hundred eight college undergraduates for whom grade-equivalent scores on a standardized reading test were available were administered the same pronunciation test used by Johnson and Venezky. The pronunciation test data of the subjects whose grade-equivalent scores placed them in either the upper (proficient readers) or lower (non-proficient readers) quartiles were subsequently analyzed. The proficient reader results coincided with the Johnson and Venezky results, but the non-proficient reader results did not. These data were interpreted as suggesting that the vowel cluster pronunciation preferences of adult readers vary as a function of reading competency.

Recently Johnson and Venezky (1976) investigated the influence of graphemic environment and frequency of occurrence features on the vowel cluster pronunciation preference of adult readers. Fifty-one college undergraduates enrolled in either a computer programming course or an elementary education course were administered a 24-item pronunciation test over four vowel clusters: *oo*, *ou*, *ea*, and *ow*. Six synthetic, monosyllabic words were constructed for each cluster type. The words within a given cluster had different consonant endings. Each word was accompanied by four real-word alternatives. One alternative within each set of four alternatives was characterized by the principal pronunciation of a given vowel cluster, while the remaining three were characterized by less frequently occurring pronunciations.

The subjects were told to read a synthetic word to themselves and to note how they pronounced the vowel cluster, after which they were to underline the real word that contained the same vowel sound. The actual number of principal

pronunciations obtained for each synthetic word was then compared with the number of principal pronunciations predicted by three different models: (1) a model based on the percentage of words selected from a list of common words which contained the same vowel cluster and the same consonant ending as the synthetic word, and which were characterized by that cluster's principal pronunciation (the graphemic environment model), (2) a model based on the percentage of words selected from the same list which contained the same vowel cluster as the synthetic word, and which were characterized by that cluster's principal pronunciation (the frequency of occurrence model), and (3) a model based on the assumption that all of the responses to a given cluster will be the principal pronunciation for that cluster. It was shown that the number of actual principal pronunciations was more consistently similar to the number of principal pronunciations predicted by model 1 than by either of the other two models, indicating that the vowel cluster pronunciation preferences of adult readers are more affected by graphemic environment than by frequency of occurrence features.

Although the authors did not characterize the subjects in terms of any attributes other than course membership, it seems plausible to assume that on the average they were proficient readers: Given the results obtained by Johnson (1970) in an earlier study, it also seems plausible to assume that the Johnson/Venezky results will not generalize to non-proficient adult readers; the subjects of high reading ability in the Johnson study consistently gave more principal pronunciations to vowel clusters than the low reading

ability subjects. In other words, whereas the vowel cluster pronunciation preferences of proficient adult readers may be more influenced by graphemic environment than by frequency of occurrence features, for non-proficient readers either the reverse may be the case, or the two features may exert an equal influence on vowel cluster pronunciation preferences.

The present study, then, was undertaken to determine whether or not the Johnson/Venezky results with respect to models 1 and 2 will generalize to non-proficient adult readers. It was decided to disregard the model 3 results since they do not pertain to the basic research issue of the relative influence of graphemic environment and frequency of occurrence features.

Method.

Subjects

The subjects whose data were analyzed included 54 undergraduates enrolled in a reading/study skills course at Drake University. They represented half of the total number of students who participated in the testing.

Tests

In order to test the research hypothesis, it was necessary to isolate two groups of readers: those who could legitimately be

characterized as proficient readers, and those who could legitimately be classified as non-proficient readers. This classification was accomplished by selecting the subjects included in the upper (proficient) and lower (non-proficient) quartiles on the combined vocabulary and comprehension section of the Nelson-Denny Reading Test, Form C, which had been administered at the beginning of the semester as a part of the normal testing sequence in the reading/study skills course. This procedure resulted in a grade-equivalent range of 14.0-15.0 for proficient readers, and a grade-equivalent range of 6.0-11.5 for non-proficient readers. The means and standard deviations of the Form C grade-equivalency scores for the two groups are presented in Table I.

The pronunciation test was identical to the one employed and described in detail by Johnson and Venezky (1976).

Procedure

The pronunciation tests were administered over a period of three days by four graduate assistants assigned to teach the reading/study skills course. Approximately one week prior to testing, the investigator had briefed the instructors with respect to the purpose for the testing, and had provided them with a sufficient number of copies of the test complete with directions, and an announcement explaining the volunteer nature of the experiment. Both the announcement and the test directions were read to the examinees by their instructors.

I Reading Test Means and Standard Deviations of Proficient and Non-Proficient Readers

	N	Mean	S.D.
Proficient	27	14.6	.41
Non-Proficient	27	9.4	1.42

Data Analysis

The percentage of actual principal pronunciations and the percentage of principal pronunciations predicted by models 1 and 2 were calculated for each test item on each of the following groups: the original Johnson/Venezky sample, the proficient readers, and the non-proficient readers. The absolute deviation between actual percentage and predicted percentages was then determined for each item. The deviations were summed and divided by the number of items, yielding a mean percent deviation for both prediction models for each group of subjects. The Johnson/Venezky sample was included for two reasons: (1) the data analysis procedure employed in the present study differed from that employed in their study, and (2) its inclusion permitted verification that the subjects in that sample were primarily proficient readers.

Results

The average absolute deviations of the percentage of predicted principal pronunciations from the actual percentage of principal pronunciations across all of the test items are presented in Table II.

The percentages for the Johnson/Venezky and the proficient groups are highly similar, thus providing evidence that the Johnson/Venezky group consisted primarily of proficient readers. For both groups, the actual versus predicted discrepancy associated with model 1 (graphemic environment) was notably smaller

II Mean Percent Deviations of Predicted from Actual Principal Pronunciations for the Three Reader Samples

Sample	Model 1	Model 2
Johnson/Venezky	18.3	26.9
Proficient	19.6	26.8
Non-Proficient	20.3	20.9

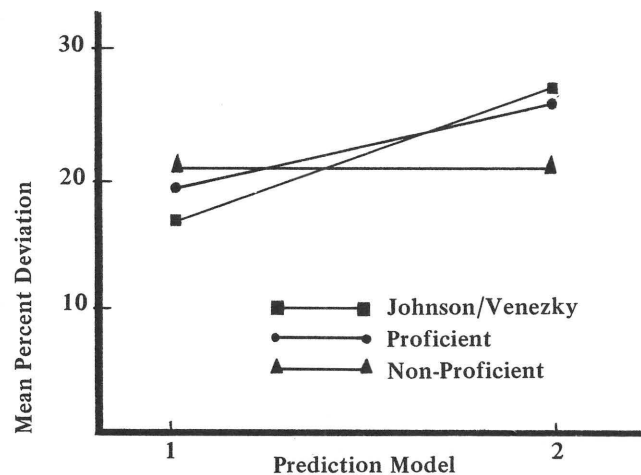
than the actual versus predicted discrepancy associated with model 2 (frequency of occurrence). The pattern of percentages for the non-proficient group, however, deviates from the Johnson/Venezky group and the proficient group pattern; the actual versus predicted discrepancies associated with models 1 and 2 are essentially the same. Figure 1 illustrates the respective patterns graphically.

The means and standard deviations of the proficient and non-proficient readers on the pronunciation test are presented in Table III. There were twenty-three items on the pronunciation test. The difference between the means of the two groups of readers was found to be statistically significant beyond the .001 level ($t=3.45$).

Discussion

The results of this study yielded two major outcomes: (1) a replication of the Johnson/Venezky results with respect to proficient readers, and (2) evidence that the Johnson/Venezky results are not generalizable to non-proficient readers. A virtual match occurred between the Johnson/Venezky and proficient groups in terms of the average percent deviations of predicted from actual principal pronunciations; such a match did not occur in the case of the non-proficient group.

The data collected in this study, then, were interpreted as suggesting that the vowel cluster pronunciation preferences of proficient adult readers are more affected by graphemic environment features than by frequency of



1 Mean percent deviations under both prediction models for the three reader samples.

III Pronunciation Test Means and Standard Deviations of Proficient and Non-Proficient Readers

	N	Mean	S.D.
Proficient	27	18.0	2.04
Non-Proficient	27	14.9	4.39

occurrence features, which is what Johnson and Venezky concluded with respect to adult readers in general. However, these data also indicate that in the case of non-proficient adult readers, graphemic environment and frequency of occurrence features exert an approximately equal influence on vowel cluster pronunciation preferences.

The fact that the vowel cluster pronunciation preferences of non-proficient adult readers appear to be equally influenced by graphemic environment and frequency of occurrence features is not surprising. Generally speaking, non-proficient readers do less independent reading than proficient readers, and are therefore less likely to internalize pronunciation patterns associated with certain contextual constraints. Also, non-proficient readers tend to receive more intense doses of isolated phonetic analysis instruction over vowels and vowel combinations than proficient readers, and are therefore more likely to utilize decoding strategies which do not take into account neighboring graphemes.

Johnson, D. D. *Factors related to the pronunciation of vowel clusters*. Technical Report No. 149. Madison: Wisconsin Research and Development Center for Cognitive Learning, 1970.

Johnson, D. D. and Venezky, R. L. Models for predicting how adults pronounce vowel digraph spellings in unfamiliar words. *Visible Language*, 1976, 10, 257-268.

A review of legibility research published between 1972 and 1976 yielded 285 references. The journals which most frequently contain reports on legibility research are indicated. A list of those journals likely to be most useful to the designer wishing to keep abreast of the literature is provided.

Visible Language, XII 2, Spring 1978, pp. 201-205
Author's address: Faculty of Community Studies, Manchester Polytechnic,
Manchester 15, England
0022-2224/78/0400-0201 \$02.00/0 ©1978 Visible Language, Box 1972
CMA, Cleveland, OH 44106.

Locating **Legibility** Research: A Guide for the Graphic Designer

Jeremy J. Foster

There is a considerable output of research reports describing the effects of visual display format upon the ability to identify or comprehend the display. Part of this research effort is devoted to problems which are pertinent to designers, but until recently there has been little use of this material by designers. A number of authorities have suggested reasons for this state of affairs, but one which has not received much comment is inaccessibility. Frequently it is published in the technical journals of psychology,

education, and ergonomics in a form which the designer may find difficult to locate and comprehend.

In a review of the literature published in this area between 1972 and 1976, I included 285 references. All but a handful were journal papers, and in all 61 different journal sources figured in the eventual list of references used in the review. It may be helpful for those interested in legibility research to know which journals were most frequently the source of papers for the review, and hence are the ones likely to repay regular scanning.

List I (below) indicates the number of references from each journal which provided more than one paper cited in the literature review. It will be seen that 23 journals are listed, so that 38 others provided a single reference.

There are a number of considerations to bear in mind when examining List I. First, it applies only to the references which I selected for inclusion in the review paper. To some extent this was necessarily a personal choice, restricted by my access to bibliographic sources and guided by my estimate of what was worth including. The literature review contained sections on problems of measuring legibility, the study of eye movements, digit and letter identification, reading, typography, graphic displays (signs), visual instruction, engineering drawing, cartography, quantitative data, algorithms and the reading of projected material. Some of these topics are of less direct concern to the designer than to the research-worker; many of the papers from the *Journal of Education Psychology* or the *Journal of Experimental*

List I. Number of papers on legibility research appearing in each journal 1972-1976.

Journal of Educational Psychology (18)

Cartographic Journal (16)

Applied Ergonomics (14)

Ergonomics (14)

Journal of Applied Psychology (14)

Human Factors (13)

Journal of Experimental Psychology (13)

Perceptual and Motor Skills (12)

AV Communications Review (11)

Visible Language (11)

Perception and Psychophysics (10)

Reading Research Quarterly (8)

Programmed Learning and Educational Technology (7)

Dissertation Abstracts International (6)

Journal of Verbal Learning and Verbal Behavior (5)

Review of Educational Research (5)

Bulletin of Psychonomic Society (4)

Psychology are concerned with theoretical issues which are relevant to instructional design but do not involve direct investigation of graphic features of the display. Examples are the extensive literature on “mathemagenic behavior,” much of which examines the value of inserting questions into instructional text. Slightly more remote from the designer is the controversy over models of word recognition; papers on this topic are likely to appear in journals such as the *Journal of Verbal Learning and Behavior* or *Cognitive Psychology*.

An important factor influencing the interpretation of the list concerns the number of journals publishing research on a particular topic. The *Cartographic Journal* occupies the number two position in the list because the large majority of research reports on map-reading appeared in that one journal. Experimental studies of the effect of text format on reading performance, on the other hand, appear in a much wider range of journals, so that the total for one specific journal is lower. A further qualification is the occurrence of “one-off” events which distorts the picture. *Programmed Learning and Education Technology*, for instance, had a special issue on typographic research in 1975. But for this, it would have been much lower down the table.

List II is the result of my attempt to show the journals most frequently containing reports on legibility research likely to interest the graphic designer. Again I made allowance for the various factors discussed above. The journals in

Cognitive Psychology (4)
Journal of Psychology (4)
Journal of Research in Science Teaching (3)
Memory and Cognition (3)
British Journal of Psychology (2)
Communication of Scientific and Technical Information (2)
Journal of Experimental Child Psychology (2)
Journal of General Psychology (2)
Journal of Reading Behaviour (2)

List II are not in any order of merit. The designer who wishes to keep abreast of the research literature but can scan only a limited number of journals will probably find that List II contains the ones most likely to achieve his or her aim.

An alternative procedure is to rely on secondary sources. Of these, the regularly-published printed (as opposed to computer-based) ones which I have found most useful are given in List III. *Dissertation Abstracts International* consists of summaries of higher-degree theses, categorized according to discipline. In some cases, the research is published subsequently in a conventional journal. The size of DAI has its drawbacks, and I have been directed to particular entries via an initial scanning of *Psychological Abstracts*. The scope of *Ergonomics Abstracts* is indicated in the title. The coverage is wide, and the categorization system helpful in locating items of interest. *Psychological Abstracts* summarises all types of psychological research. Since "legibility" no longer occurs in the index, finding relevant material is sometimes difficult. The *Psychological Readers' Guide* simply reproduces the contents pages of journals. No indexing system is provided, so that it is likely to be rather frustrating for the non-psychologist to use. *Reading Research Quarterly* is included in List III because it publishes annually a summary of reading from the previous year. The summary is constructed around a category system which helps one to locate particular topics. Unfortunately, however, much of the legibility research does not get included.

List II. Sources of first-hand reports on legibility research.

Applied Ergonomics. IPC Science and Technology Press, IPC House, 32 High Street, Guildford. More technical than most of the other journals.

4V Communications Review. Association for Educational Communication and Technology, 1126 16th Street North West, Washington, DC 20036. Mainly for studies of picture format and content.

Cartographic Journal. British Cartographic Journal, Department of Land Surveying, North East London Polytechnic, Forest Road, London, E17 4JB. For studies of maps.

Ergonomics. Taylor and Francis Limited, 10-14 Macklin Street, London, WC2B 5NF.

Human Factors. Johns Hopkins University Press, Baltimore, MD 21218.

Journal of Applied Psychology. American Psychological Association, 1200 17th Street North West, Washington, DC 20036.

Visible Language. P.O. Box 1972 CMA, Cleveland, OH 44106.

A most valuable secondary source, not included in List III because it does not appear on a regular basis, has been provided by the Open University. In 1974 M. Macdonald-Ross and E. Smith published "Graphics in Text: A Bibliography" (Open University Institute of Educational Technology Monograph No. 3). A revised version appeared in 1977 under the title "Graphics in Text: A Bibliography" (Open University IET Monograph No. 6). This includes a series of introductory essays by Macdonald-Ross, but the main content is a bibliographic list which does not include a summary of each reference. Nevertheless it is a most valuable source of material.

Finally, mention should be made of occasional review papers which authorities in the area provide. The problem here is that they may appear in journals which do not frequently publish reports of legibility research, and consequently are likely to be missed. Two recent reviews are J. Hartley and P. Burnhill's "Fifty guide-lines for improving instructional text," *Programmed Learning and Educational Technology*, XIV (1977), 65-73; and P. Wright's "Presenting technical information: a survey of research findings", *Instructional Science*, VI (1977), 93-134.

List III. Secondary sources for locating legibility research.

Dissertation Abstracts International. Xerox University Microfilm, 300 North Zeeb Road, Ann Arbor, MI 48106.

Ergonomics Abstracts. Ergonomics Information Analysis Centre, Department of Engineering Production, University of Birmingham, England

Psychological Abstracts. American Psychological Association, 1200 17th Street North West, Washington, DC 20036.

Psychological Reader's Guide. Elsevier Sequoia - SA, P.O. Box 851, CH - 1001, Lausanne 1, Switzerland.

Reading Research Quarterly. International Reading Association, Inc., 800 Barksdale Road, Newark, DE 19711.

Marie M. Clay. *What Did I Write?* Auckland: Heinemann Educational Books, 1975. 7½ x 9 inches. 78 pp.

This little book seems at first sight intended only to charm. At the turn of almost every page there are reproductions of writing by young children – a few shaky lines, a half-dozen curlicues, a stately array of repeated letters, an unpronounceable word, a clear but not-quite-there sentence (“the ship is or the oear”). On many pages the writing accompanies drawings, some of them in delightful color. The type set in 11-point Optima, the arrangement of the text in two comfortable columns, and the relation of the reproductions to the text give it the appearance of a children’s book for adults. The important observations that Marie Clay brings together in the text on how writing abilities emerge in children are therefore well served. She is in the Department of Education at the University of Auckland, New Zealand.

Most of the samples of writings were produced by five-year-old children who were learning how to print in school. They first drew pictures and dictated captions that the teacher wrote down for them. They later traced or copied the captions, remembered whole words on their own, and even constructed word forms independently. Some of the children received specific instruction in letter formation, but others apparently made as much progress without it. Clay examined many such samples for features which the children’s writing still lacked or only grossly approximated, relative to mature norms. Her objective was to trace

This
This

the ship is or the
oear

NO
NO
NO
NO

NO
NO
NO
NO

Yes Yes
Yes Yes
Yes Yes
Yes Yes

her scrutiny with an appreciation for the children's creativity and liveliness.

It is a disappointment, therefore, that Clay's analytic framework for bringing order and new meaning to her observations is weak. She talks about principles in offering her observations and inferences; we have referred above to observations that she groups with respect to the directionality principle, the flexibility principle, the recurring principle, the inventory principle, and the contrastive principle. But she does not satisfactorily explain what they are principles of, nor how they relate to another analytic category that she uses, the concept. Her discussions on the significance of the children's writing to questions of learning to read are stronger, although sketchy. Since her book is addressed to sensitive and enterprising teachers, she offers a rating technique for assessing children's early progress and describes a test of writing vocabulary that has shown itself to be a valuable predictor of reading progress. With respect to questions of psychological development, her remarks are suggestive but do not attempt to be systematic. They are important, however, to her purpose of placing the young learner in focus. It is her conviction, which this book successfully communicates, that a strategy for teaching writing that proceeds from an adult's logical analysis cannot succeed so well as one based on observation of the constructive process that children undertake on their own.

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Abstracts

Français

Résumé des Articles

Traduction: Fernand Baudin

Le volume et la valeur économiques que représente l'alphabétisation
par John R. Bormuth.

L'objet de la recherche était d'évaluer le budget que représente un certain niveau d'instruction et d'en mesurer la croissance au cours d'une génération. La quantité d'informations que les gens échangent par écrit fut considérée comme l'indice de la consommation. Dans la production de l'enseignement on a distingué trois composantes: la première étant la production industrielle des articles; la seconde, leur distribution; et la troisième comprenant les enseignants eux-mêmes. Certains articles ont été retenus pour donner l'indice de production par composante; le temps que les gens passent à lire et à écrire servant d'indice pour la consommation. Ces évaluations ont été examinées séparément par composante et par rapport à une population donnée afin de mesurer un taux de croissance pendant une période déterminée. On a

ensuite exprimé ces évaluations en dollars et un coefficient d'instruction nationale fut fixé, d'abord pour évaluer le budget national de l'instruction et, deuxièmement, pour évaluer en termes de profits et pertes un programme d'éducation donné et les prévisions qu'on peut en tirer. C'est ainsi qu'on est arrivé aux conclusions suivantes: une fraction importante et croissante de la population est parvenue à un niveau élevé et croissant d'instruction qui rapporte plusieurs fois ce qu'elle a coûté; elle est un des facteurs économiques les plus importants à l'échelle nationale; les investissements des particuliers et des groupes sociaux vont croissant en ce domaine; mais nous n'en sommes pas encore au point où nous pouvons nous considérer comme véritablement instruits au niveau national.

L'organisation d'un texte et son expression graphologique
par Rudolf Arnheim

L'organisation spatiale d'un texte à écrire ou à lire peut être perçue de deux façons. L'écriture ou la lecture établissent une relation à la fois corporelle et mentale entre un scripteur ou lecteur et la surface sur laquelle l'écriture est tracée. Cette relation implique deux attitudes différentes. La première, commandée par la vision, est orthogonale et évoque l'idée de conquête, de domination, ou, au contraire, de stabilité. La seconde, commandée par l'action, est horizontale et évoque l'idée de rapprochement ou d'éloignement, de spontanéité ou de réserve, d'agressivité ou de passivité. Au moment où l'on écrit ou lit, ces attitudes se confondent au point qu'il est possible d'allier un détachement réel avec un engagement total.

Boniface (c. 675-754), archevêque, légat et maître des postes
par Frédérick J. Cowie

Boniface était la cheville ouvrière de l'église transalpine dans la première moitié du 8^e siècle. Il avait organisé une *communio* de croyants anglo-saxons, francs, germaniques et italiens. Elle était composée de moines, de nonnes, de comtes, de rois et de papes. Pour animer et entretenir cette *spiritalis communio* il avait organisé à travers toute la Chrétienté un vaste système de communications, un véritable service postal essentiellement composé de prêtres très instruits qui faisaient fonction de postiers, de

facteur et d'ambassadeurs itinérants. Ce réseau d'émissaires était en somme la réplique "barbare" du *cursus publicus* romain et servirait bientôt de base aux *missi dominici* de l'empire carolingien.

La longueur des lignes, les marques d'alinéas et leurs effets sur la consultation d'un texte en prose
par James Hartley, Peter Burnhill et Lindsey Davis

On a donné à lire à des écoliers du secondaire un texte sur deux colonnes de 20 cic. chacune et un texte justifié sur 42 cic. Les alinéas étaient marqués de quatre façons différentes. On a vérifié leur commodité relative à la consultation en recherchant les mots qui avaient été sautés. Conclusion: la mise en page sur deux colonnes avec les rentrées d'alinéas classiques est, économiquement, la plus efficace; toutefois il semble que les lignes de longueur exceptionnelle ne donnent aucune difficulté particulière au lecteur.

La prononciation des groupes de voyelles par des lecteurs adultes, bons et mauvais
par Frederick A. Duffelmeyer

Il s'agissait d'établir si les résultats d'une recherche conduite par Johnson et Venezky (1976) sont généralisables aux lecteurs adultes mais peu exercés. Cent et huit étudiants qui avaient été testés et dont les résultats étaient connus pour un test de lecture

standard ont eu à lire le test de prononciation Johnson-Venezky. On a comparé ensuite les résultats des 25 étudiants de la tranche supérieure (celle des bons lecteurs) avec ceux de la tranche inférieure (les mauvais). Les bons lecteurs coïncidaient avec les résultats de Johnson-Venezky; mais pas les mauvais. Ce qui fut interprété comme indiquant que la prononciation des groupes de voyelles par des lecteurs adultes varie selon la qualité des lecteurs.

Un guide concernant la lisibilité *par J. J. Foster*

Il s'agit d'un compte-rendu des recherches poursuivies pendant la période 1972-1976. Il contient 285 références et renseigne les périodiques qui publient couramment des rapports sur les recherches en cours concernant la lisibilité. Tout cela peut être très utile aux graphistes qui veulent être tenus au courant.

Deutsch

Kurzfassung der Beiträge
Übersetzung: Dirk Wendt

Wert and Umfang der Verbreitung von Lesekenntnissen
von *John R. Bormuth*

Diese Untersuchung wurde angestellt, um den Umfang and finanziellen Wert der Verbreitung von Lesekenntnissen während der letzten Generation zu verfolgen. Als Ausnutzung der Lesefähigkeit wurde die Information betrachtet, die Leute durch geschriebene Worte austauschen. In der Produktion der Industrie zur Erzeugung von Lesestoff wurden drei Komponenten gesehen: eine, die das Material produziert, eine, die es verteilt, und eine dritte, die den Leuten das Lesen und Schreiben beibringt. Verschiedene Zählungen von Produkten wurden benutzt, um Meßwerte für die Ausstoßmengen jeder Produktionskomponente zu finden. Die Zeit, die Leute mit Lesen und Schreiben verbrachten, diente als Maß der ausgenutzten Lesefähigkeit. Diese Zählungen wurden individuell innerhalb jeder Komponente untersucht und mit der Bevölkerungszahl verglichen, um ihr Anwachsen während der untersuchten Periode zu bestimmen. Dann wurden diesen Maßen Dollar-Werte zugeteilt und eine Leserzählung je Volk durchgeführt, um erstens den Gesamtgeldwert der Lesekennt-

nisse des Volkes zu schätzen, und zweitens den Netto-Wert der Lesekenntnisse und das Kosten-Nutzen-Verhältnis der Leseunterrichtsprogramme und ihre Tendenzen abzuschätzen. Aus diesen Daten konnte man ersehen, daß ein großer und wachsender Teil der Bevölkerung ein hohes und steigendes Niveau von Lesefertigkeit erreicht hat, und daß die Lesefertigkeit ein Vielfaches dessen wert ist, was es gekostet hat, sie zu erzeugen, und daß die Pflege der Lesefähigkeit eine der bedeutsamsten volkswirtschaftlichen Aktivitäten der Nation ist, daß persönliche und soziale Investitionen in die Lesefertigkeit der Nation gestiegen sind, aber daß die Nation erst noch den Punkt erreichen muß, wo sie sich als lesefertig betrachten würde.

Räumliche Aspekte des graphologischen Ausdrucks
von Rudolf Arnheim

Die räumliche Eigenart eines Schrift- oder Lesestückes hat wahrnehmungsmäßig zweierlei Bedeutung. Schreiben und Lesen schaffen eine enge körperliche und geistige Beziehung zwischen einem Schreiber oder Leser und der Oberfläche, auf der die Buchstaben geformt werden. Diese Beziehung umfaßt zwei verschiedene Einstellungen: Einstellung I, eine orthogonale Beziehung zu den Buchstaben, wird vom Sehen beherrscht und erweckt eine Art Erhebung und Eroberung oder ihr Gegenteil, Stabilität. Einstellung II, eine horizontale Beziehung, wird von der Handlung beherrscht und weckt Gefühle für Nähe und Ferne, Aus-sich-herausgehen und Zurückhaltung, Aktivität und Passivität. Beim Vorgang des Lesens und Schreibens mischen sich diese Einstellungen und ermöglichen beide eine Ablösung des Selbst durch ein Selbst, das sich aktiv für die Erreichung eines Zieles einsetzt.

Bonifatius (ca. 675-754): Erzbischof, Gesandter und Generalpostmeister von Frederick J. Cowie

Bonifatius war für die erste Hälfte des achten Jahrhunderts der erste Beweger in der transalpinen Kirche. Um diese außergewöhnliche Leistung zu vollbringen, gebrauchte er ständig eine *communio* von Gläubigen, zu der Angelsachsen, Franken, Deutsche

und Italiener gehörten. Unter den Mitgliedern waren Mönche, Nonnen, Herzöge, Könige und Päpste. Um diese *communio spiritalis* lebendig und gesund zu erhalten, mußte Bonifatius ein Kommunikationssystem einrichten, das die gesamte Römische Christenheit erreichte, Sein Postdienst bestand in erster Linie aus hochgebildeten Priestern, die den Dienst von Briefträgern, Lieferanten und allgemeinen Gesandten versahen. Dieses Netz von Botschaftern stellte ein "barbarisches" Gegenstück zum römischen *cursus publicus* dar und wurde zur Grundlage der *missi dominici* im Reiche Karls des Großen.

Auswirkungen von Zeilenlänge und Absatzkennzeichnung auf die Auffindbarkeit von Informationen in Prosatexten
von James Hartley, Peter Burnhill und Lindsey Davis

Schulkinder lasen entweder zweispaltigen (je Spalte 20 Cicero) oder einspaltigen (42 Cicero) Text in je einer von vier verschiedenen Versionen zur Kennzeichnung neuer Absätze. Um die Lesbarkeit der verschiedenen Systeme zu messen, wurde den Schülern die Aufgabe gestellt, fehlende Wörter zu finden. Das Ergebnis legt den Schluß nahe, daß zweispaltiger Satz mit herkömmlicher Absatzkennzeichnung einem einspaltigen hinsichtlich des Kosten-Nutzen-Verhältnisses vorzuziehen ist. Eine große Zeilenlänge bedeutet aber auch keine unzumutbare Anstrengung für den Leser.

Die Aussprache von Doppelvokalen bei guten und schlechten Lesern von *Frederick A. Duffelmeyer*

Ziel dieser Untersuchung war es, festzustellen, ob die Ergebnisse einer Studie von Johnson & Venezky (1976) auf weniger erfolgreiche Leser verallgemeinert werden können. Einhundert-undacht College-Studenten, deren benotete Leistungen in einem standardisierten Lesetest bekannt waren, erhielten den gleichen Aussprachetest, den Johnson & Venezky verwendeten. Die Ergebnisse der Aussprachetests von denjenigen Lesern wurden analysiert, die entweder in die Gruppe der guten Leser (oberstes Viertel der Gesamtgruppe nach dem Lesetest) oder in die Gruppe der schlechten Leser (unterstes Viertel) gehörten. Das Ergebnis für die guten Leser stimmte mit dem von Johnson & Venezky überein, nicht aber das für die schlechten Leser. Dieses Resultat wird so interpretiert, daß es nahelegt, daß die Ausspracheentscheidungen bei Doppelvokalen als Funktion der Lesefähigkeit variieren.

Fundorte für Lesbarkeitsforschung: Ein Führer von *J. J. Foster*

Eine Durchsicht der Lesbarkeitsforschung, die zwischen 1972 und 1976 veröffentlicht wurde, ergab 285 Literaturangaben. Diejenigen Zeitschriften, die am häufigsten Berichte über Lesbarkeitsforschung enthalten, werden genannt, außerdem wird eine Liste der Zeitschriften aufgestellt, die wahrscheinlich die brauchbarsten sind für den Designer, der über die Literatur orientiert bleiben möchte.

Español

Resumen de los Artículos

Traducción: Ana Fisch

Valor y volumen del alfabetismo *por John R. Bormuth*

Se emprendió este estudio para determinar el volumen y el valor monetario del alfabetismo y para desubrir su crecimiento en la última generación. Se consideró al alfabetismo consumido como la información que intercambia la gente por intermedio de la palabra escrita y se observó que la industria productora del alfabetismo contiene tres componentes principales — uno que produce materiales, otro que los distribuye y el tercero que enseña a la gente a leer y escribir. Se utilizaron varios cálculos de productos para hacer un índice del volumen del rendimiento para cada componente de producción. El tiempo que la gente emplea leyendo y escribiendo fue usado para hacer el índice del volumen del alfabetismo consumido. Estos cálculos de unidades fueron examinados individualmente dentro de cada componente comparándolos con el tamaño de la población para determinar su crecimiento durante el período estudiado. Luego se asignaron a estas medidas de unidades valores de dólar y se realizó un cálculo de un alfabetismo nacional, en primer lugar para estimar el valor monetario total del alfabetismo de la Nación y en segundo lugar para estimar el valor neto del alfa-

betismo y de la proporción beneficio-costos del programa de alfabetismo y para examinar sus tendencias. Fue posible deducir de estos datos que una fracción grande y creciente de la población ha llegado a un grado de alfabetismo alto y en aumento, que el alfabetismo ha valido ampliamente lo que costó en producir, que el alfabetismo es una de las más importantes actividades económicas de la Nación, que inversiones en el nivel social y personal en alfabetismo han ido aumentando pero que la Nación aun tiene que llegar al punto en el cual se podría considerar alfabetizada.

Aspectos espaciales de la expresión grafológica
por Rudolf Arnheim

El carácter espacial de un escrito o de un trozo de lectura es perceptualmente doble. La escritura y la lectura establecen una estrecha relación física y mental entre el escritor o el lector y la superficie sobre la que se forman las letras. Esta relación encierra dos actitudes diferentes. La actitud primera es una relación ortogónica hacia las letras que es dominada por la visión y evoca un sentido de elevación y conquista o lo opuesto, estabilidad. La actitud segunda, una relación horizontal que está dominada por la acción y evoca los sentidos de proximidad y lejanía, de salida y retención, de activo y pasivo. En el proceso de escritura y lectura, las actitudes se funden permitiendo el desprendimiento del yo con un yo que se ocupa activamente en llegar a la meta.

Bonifacio (c.675-754): arzobispo, legado y director general de correos *por Frederick J. Cowie*

Bonifacio fue el móvil principal de la iglesia transalpina durante la primera mitad del siglo octavo. Para lograr semejante hecho utilizó constantemente un *communio* de creyentes que incluía anglo-sajones, francos, alemanes e italianos. Entre los participantes figuraban monjes, monjas, condes, reyes y papas. Para lograr mantener sana y despierta esta *spiritalis communio* Bonifacio tuvo que idear un sistema de comunicación que cubría toda la cristiandad romana. Su servicio postal consistió en primer lugar de sacerdotes muy cultos que desarrollaban tareas de carteros, distribuidores y embajadores en el sentido amplio de la palabra. Esta red de enviados formaba una respuesta “barbara” al *cursum publicum* romano al mismo tiempo que preparaba el terreno para los *missi dominici* del imperio de Carlomagno.

Los efectos de la longitud del renglón y la indicación del párrafo para recobrar información de un texto de prosa *por James Hartley, Peter Burnhill, and Lindsey Davis*

Niños en los primeros grados de escuela leen ya sea dos columnas (cada columna de 20 ciceros) o una columna sola (42 ciceros) de texto en una de las cuatro maneras que indican nuevos párrafos. Se asignó a los estudiantes encontrar palabras faltantes para medir

la legibilidad de los distintos sistemas. Los resultados sugieren que la disposición en dos columnas con la indicación tradicional de división de párrafos es preferible a la disposición en una columna en lo que se refiere a la eficacia de costoc; sin embargo, una longitud extrema de renglón no presenta un esfuerzo excesivo al lector.

Preferencias en la pronunciación de grupos de vocales en lectores adultos proficientes y no proficientes
por Frederick A. Duffelmeyer

El propósito de esta investigación fue de determinar si los resultados del estudio conducido por Johnson Y Venezky (1976) son generalizables para lectores adultos no proficientes. Se administró a ciento ochenta estudiantes de colegio mayor, en un examen de lectura corriente para quienes se disponía de notas equivalentes a grados el mismo examen de pronunciación usado por Johnson Y Venezky. A continuación se analizaron los datos del examen de pronunciación de los sujetos cuyas notas equivalentes a grados los colocaban ya sea en las divisiones superiores (lectores proficientes) o inferiores (lectores no proficientes). Los resultados del lector proficiente coincidieron con los resultados de Johnson y Venezky pero no así los del lector no proficiente. Estos datos fueron interpretados como si sugirieran que las preferencias en la pronunciación de grupos de vocales en lectores adultos varía como una función de competencia de lectura.

Investigación sobre localización de legibilidad: una guía *por J. J. Foster*

Una reseña de investigación sobre legibilidad produjo 285 menciones. Se mencionan las revistas que con mayor frecuencia contienen información sobre investigación de legibilidad. Se provee una lista de aquellas revistas que probablemente son de mayor utilidad para el diseñador que desea estar al día con la literatura.

Authors

John R. Bormuth is associate professor in the Department of Education and of Behavioral Sciences, Methodology, at the University of Chicago (60637). He is a Fellow of the Center for Advanced Study in the Behavioral Sciences, having spent the year 1974-75 at the Center. His research deals with literacy and literacy policy. Initially, it concentrated on the theory and techniques of measuring the comprehensibility of prose and later on developing the readability formula, a device that enables its users to coordinate the skills of writers and the comprehensibilities of their writing with the skills of readers. Recently Dr. Bormuth's work is dealing with reformulating the formula to employ it at the core of an economic model that can be used to formulate, analyze, and evaluate alternative literacy policies.

Rudolf Arnheim is at present a visiting professor at the University of Michigan (Ann Arbor, MI 48109). He is professor emeritus of the psychology of art, Harvard University. Trained as a psychologist at the University of Berlin, Germany, Dr. Arnheim has published several books on the psychology of art, among them *Art and Visual Perception* and *Visual Thinking*. His most recent book, published like the others by the University of California Press is *The Dynamics of Architectural Form*.

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Frederick J. Cowie is assistant professor in the Department of History at Carroll College (Helena, Montana, 59601). He did his doctoral studies at St. Louis University where he did research on St. Boniface's idea of *communio*. His association with the Vatican Film Library at St. Louis sparked his interest in manuscripts, which led to the delivery of this paper at the 1976 St. Louis Conference on Manuscript Studies. Dr. Cowie's most recent paper, *Communio and Extra-Communio: Boniface—Friends and Enemies*, was given at the Medieval Institute in May 1978.

Frederick A. Duffelmeyer is reading editor for the Houghton Mifflin Test Department (Iowa City, IA 52240). He worked three years as a reading specialist at the Harry S. Truman Neurological Center in Kansas City prior to completing his Ph.D. in Reading Education at the University of Missouri-Kansas City. Before joining the Houghton Mifflin Test Department Dr. Duffelmeyer was Assistant Professor of Education at Drake University, where he taught courses in elementary reading, clinical reading, and classroom measurement.

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J. J. Foster is senior lecturer in psychology at Manchester Polytechnic (Manchester M1 3GH, England). He obtained his M.A. from Manchester University in 1967 with a thesis, "The Legibility of Print," and his doctorate in 1974. He was editor of *Legibility Research Abstracts*, and has published a number of papers on the effects of typographic cuing in printed materials.

Colophon

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