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**LITERARY 1/1 MACHINES**

## AN OBVIOUS VISION

A computer is essentially a trained squirrel: acting on reflex, thoughtlessly running back and forth and storing away nuts until some other stimulus makes it do something else. A perfectly versatile enactor, by rigmaroles and enchantments (called Programs) we make the computer do our bidding.

But then what things should we have it Enact? How can it improve our lives? This is the important issue. That there is a technological imperative, some way it "has to" be done, based on the computer's nature, is a myth and a fabrication. People get cowed, put in their place, when the technoids start enumerating the world as *they* see it.

### TWO HOPES

Here then are two reasonable hopes, which I offer to persons of good will.

HOPE 1. To have our everyday lives made simple and flexible by the computer as a personal information tool.

HOPE 2. To be able to read, on computer screens, from vast libraries easily, the things we choose being clearly and instantly available to us, in a great interconnected web of writings and ideas.

Neither of these is happening.

### TOMORROW'S WORLD OF TEXT ON SCREENS

Computer screens can bring words and pictures right away, at the user's choice. Businesses know it; there are now tens of millions of computer screens active in the country in business environments, and millions more sold every year.

And now that millions of people have personal computers, many of them, too, begin to see what text on interactive screens can be like. But the immensity of the coming revolution is not clear yet.

The personal-computer avalanche is well along, and many are independently imagining how things might and ought to be. (Though the inexpensive computers have been called *microcomputers* so that newcomers will somehow think they're different from the old ones, and subtly inferior. The word "microcomputer" leads people into thinking that the new dinky computers are in some way not as good. Thus the word is like the word *nigger*-- suggesting unspoken inferiorities without having to name any.)

Most, or "all," of our reading and writing can or will, in this century, be at instant-access screens. The question is not *can* we do everything on screens, but *when* will we, *how* will we, and how can we make it *great*?

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To me this is an article of faith; its simple obviousness defies argument. If you don't get it there is no persuading you; if you get it you don't need to be persuaded.

What I don't understand is the apathy about this in the computer field. There is no sense of urgency; there is no unifying vision of uplift for humanity as soon as *every person gets a screen*.

Oh, the woods are abuzz with supposedly great new computer services that will supposedly be offered to the public. Many computer people are "working in these areas." Yet what they give us time and again is complication, complication, because nobody has taught them how to *design simplicity*. No computer school teaches simplicity. Is it beneath them? Or do they simply not imagine it, believing that to teach Complication is their job?

Yet I say simplicity is possible. But simplicity does not come in pieces; you can't buy it in sections or add it in parts, on weekends. A thing is unified and clear and simple because it is designed that way, or it is not unified and clear and simple. Making things clear and simple is *hard*.\*

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\*Biological unity, a tempting analogy, is another matter-- it takes a long time and millions of mistakes, and does not necessarily act in our particular interests.

Pragmatism and the desire to get along in the world lead people to put up with what should not be put up with. But nothing really stops anyone from creating the good and the elegant except habit, inertia and desuetude-- and the fact that doing right is much harder than not doing right.

The starting point in designing a computer system must be the creation of the conceptual and psychological environment, the seeming of the system-- what I and my associates call the *virtuality*. You begin by designing a conceptual structure and how it should feel, then work back into the mechanics. You decide how it *ought* to be, and then make that vision happen; you don't just patch and splice and add and adapt.

As soon as you understand computers, all this should become obvious. Yet most people have not understood computers-- partly because some computer people didn't want them to-- and so the benefits to our lives have been put off and put off.

And what of the two hopes of which I spoke earlier?

#### HOPE 1. SIMPLIFYING OUR LIVES

Unfortunately, to the best of my knowledge, no one's personal life has yet been simplified by a computer, and that is the next major threshold in software design. The two words that characterize today's tense life at computer screens are BINGO and OOPS-- Bingo because things come the instant you

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call them, and Oops when you did what you didn't intend-- which in bad computer systems, *most* computer systems, is hard to undo. Oops is the watchword.

Computers should bring simplification, rather than complication, to our lives: they should handle the minutiae, the snibbety details of day-to-day existence. Computer screens should bring us the everyday data of our lives-- whatever memoranda we use-- effortlessly so we no longer have to deal with myriad scribbles on paper. What you write down for your own use should be *always available from a screen*, not randomly lost and buried. Birthdays; appointments; possibilities to be kept track of; the blizzard of everyday natter; the scheduling of our lives (which is very complicated in principle, and which we blunder through, sometimes with great difficulty); the trivia of bookkeeping (which most people make into a yearly chore in relation to the IRS); the cross-indexing and storage management of the things we keep (conventional wisdom says we should keep less-- actually a reflection, I believe, of the fact that our systems are lousy and therefore very inconvenient).

So we need *unified* personal systems for a variety of purposes, tying these objectives together. Now, most computer people are under the impression that this implies a vast amount of *programming*. I say no: what it requires is a lot of *good design*, and the creation of some very simple building blocks. There are a few clean and simple

designs we can point to that give a faint hint as to what interactive simplicity is. Two I will point to are the electronic spreadsheet (especially Bricklin and Frankston's original VisiCalc), and Mark Cutter's MacDraw, a graphics and text program for the Macintosh which is an adaptation of Ivan Sutherland's original, great Sketchpad program.

## HOPE 2. ACCESS TO IDEAS

The second hope I mentioned earlier was that we could read from and write on screens with new freedom. Remember those ideals that made our country great, such as liberty and pluralism and the accessibility of ideas? Some of us still do.

Imagine a new accessibility and excitement that can unseat the video narcosis that now sits on our land like a fog. Imagine a new libertarian literature with alternative explanations so anyone can choose the pathway or approach that best suits him or her; with ideas accessible and interesting to everyone, so that a new richness and freedom can come to the human experience; imagine a rebirth of literacy. All that is what this book is about.

Yet dammit, what's worst is everybody lacking a sense of urgency. This is the eleventh hour of the human race, and there is a deadly urgency about everything we do.

These two hopes-- the simplification of our lives, the cornucopia of ideas and writings and pictures-- are the focus of my

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own work. Twenty-six years ago, in graduate school, the two hopes I have mentioned came to me, as I hope they have come to you one way or another. I have put a lot of time into trying to make these things happen in ways I consider right, which I used to think were obvious to anyone but apparently aren't.

In future writings I will deal further with the design of simplicity. (Meanwhile my two-part piece, "Interactive Systems and the Design of Virtuality," in the November and December 1980 issues of *Creative Computing*, represents only a part.)

In this book, however, I will deal simply with reading and writing from screens, and the universe that I think is out there to create-- and then explore and live in. Vannevar Bush told us about it in 1945 and called it the memex ("As We May Think," *Atlantic Monthly*, July 1945, 101-8), but the idea has been dropped by most people. Too blue-sky. Too simple, perhaps.

The memex was a publishing system that would hold everything that is written, and allow each new user to add connections-- Bush called them *trails*-- to connect and clarify the material that's already stored.

I say Bush was right, and so this book describes a new electronic form of the memex, and offers it to the world.

Bush wrote in 1945. A dozen years later, a young electrical engineer had a similar vision: of computers helping the human

mind-- or, as he called it, the augmentation of human intellect. His name was Douglas Engelbart. Working tirelessly at Stanford Research Institute, he built a powerful and intricate system to embody his ideals (now marketed by Tym-Share, Inc. under the name AUGMENT). Inventor of word processing (and incidentally of the mouse, now the pointing tool of the Macintosh), Engelbart is a saintly and inspiring individual. He continues today at Tym-Share, and because of his gentle and retiring qualities has not gotten nearly the recognition he deserves as a man who has so greatly changed the world.

Engelbart is now credited with the invention of "word processing" and "outline processing." But these terms are the most trivial way of describing his work and do not do justice to his vision. He foresaw a world of instant text access on screens, interconnections we can make and share, a new style of shared work among colleagues, and the enhancement of everyone's working imagination.

The system described in this book builds on and fuses these two great visions. It is very close to Bush's original memex, but now computerized; and its purpose is the augmentation of human intellect, as Doug Engelbart foresaw; it is intended to be especially simple for beginning users but easily extended to applications of great complexity; and it is constructed for orderly and sweeping growth as a universal archive and publishing system.

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## THE SENSE OF WONDERFUL DEVELOPMENTS

No alert person, drubbed by popular magazines and TV news, can fail to have heard that we are on the threshold of some sort of new era in the use of information. Soon, we hear, we will be able to get at the Library of Congress stored on a disk, or movies in a pinky ring, and information that we want only vaguely may come at us without our even having to ask.

A hundred jarring systems are confuting. Many media moguls-- "smart money"-- think they have it all worked out, although in different directions. Corporations are being formed. The hearts of investors are palpitating. Foundations and federal agencies are continuing to put out money for breakthrough showcase projects. Yet, in my estimation, we have not a state of progress but a state of virtually total confusion. Never before have so many accepted the unrefined technical fantasies of so few. Never before has so much been spent for what has been so little understood or thought out.

Unfortunately, the public little comprehends the varieties of possibilities, the vast range of options. They will believe anything they are told except the whole picture, which nobody tells them. Laymen have no longer the slightest idea of what is going on, and the gap widens continually.

This sort of thing happens easily in any field. Technical people create catchphrases, and people from outside, eager to be up-to-date, seize on the catchphrases as received wisdom, ideas that seem to span and comprehend all the possibilities, expanding to blot out the sky. Those outsiders in turn spread the gospel of the catchphrase to their own corners of the world, never quite sensing what an arbitrary selection has been made for them; failing to ask pointed questions, they in turn become opinion leaders for other outsiders who are even more afraid to ask. To mix parables, it is as if the blind men, after evaluating their corners of the elephant, then each lead other blind men in their own respective directions.

A variety of people are proposing arrangements by which *other* people, meaning we the public, should handle information in the future. A phrase often heard is, "anything you want, instantly." On closer investigation, however, it turns out that there is much disagreement as to what you want, as well as considerable disagreement as to what *instantly* means, and *want*, and *you*. Accordingly, the public ought not submit with docility to just whatever may result spottily by chance.

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Here are some things that you might want to know about.

## VIDEOTEXT

In England, France and other countries, so-called "videotex" and "teletext" systems are already in operation, offering a variety of limited searchable information to the home user, with a so-called "adapter" (a disguised computer) handling the interaction and display. Videotext enthusiasts think it could revolutionize the world. Unfortunately this uses a retrograde system of numerical lookup (you have to punch in *numbers* to get anything!) and is locked into low-quality graphics. For this to have originated in the land of Shakespeare was a sorry development.

Fortunately the Canadians fixed it all up. A Canadian system, Telidon, posed as a mere upgrade to these systems, but in fact did an excellent and different thing: it dismissed the Neanderthal retrieval and storage methods and simply offered an improved transmission code for interactive graphics. This solved both evils of videotext at once: by getting rid of the hierarchical numerical controls, it reopened the possibilities to any sort of indexing people might want, and it greatly improved the graphic output. Telidon was really a sort of super ASCII, an upgrade to the way text is already stored and sent between computers; in addition it is a brilliant political maneuver that got rid of the worst imaginable features of continental videotext by an old comic-strip

gag-- "Look over there!"-- and snatching the bad stuff away.

Telidon was then adopted by the Bell network (before it was broken up by antitrust) with a few modifications, under the name of NAPLPS. The current state of this standard is one of largely suspended animation, however. The wide acceptance of NAPLPS awaits broad-based consumer uses of computer feed services, which still seem a way from materializing.

## THE CABLE BABEL

Videocable operators for a time thought the public was ripe for about anything they offered. However, after some well-publicized videotext experiments offering computer services on videocable (notably by the Knight-Ridder newspaper chain), it became clear that they couldn't decree public use. These experiments were a well-publicized failure, and have been interpreted by shallow commentators to mean that the public was not ready for anything so "sophisticated" as what was being offered. What the experiments really showed was that shallow services meant to appeal to the lowest denominator of public interest did not have public appeal. (For people in big offices to decree dumb services *to be offered to others* is the height of stupidity. Let those who really *want* a thing build it, and you may get something worthwhile.)

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## "THE OFFICE OF THE FUTURE"

The phrase "office of the future" has been kicking around for some time now, but nobody agrees as to what it is. Companies that make chairs and filing cabinets think chairs and filing cabinets will be the main part.

Many think the office of the future will consist of souped-up "workstation" computers on one big cable, but with the same kinds of programs and complexities users must deal with now.

The position taken in this book, as you will see, is that the equipment hardly matters at all, but certain kinds of software are absolutely necessary, and that today's complications must vanish like the morning mist.

## SHARED-TEXT SYSTEMS

Computerized text communities are springing up. Offices find they can tie their "word processors" together, speeding information between executives.

Various shared-text utilities are also available to the public, to which you connect via personal computer.

Computer Bulletin Boards, "Community Information Systems," teleconferencing systems, all are creating new communities that share text via computers. The armed

forces, too, have complex text systems (where commanders at each level can read all messages of those below them, but not those above.)

So-called "electronic mail" means different things in different places. The U.S. post office jumped into "electronic mail" with both feet, assuming that if it was "mail" they owned it; but its ECOM service, intended to take over the electronic mail business, died ignominiously after a year or so of service.

The term "network" means all sorts of different things. Various large-scale systems now exist. Key examples are ARPANET and USENET. ARPANET connects university and military computers all over the country. Originally created for the remote use of military research computers, its main function has become the storing and sending text messages among its users.

USENET is a system for transmitting messages among companies and individuals who use the Unix system; different Unix computers pass along messages in a great decentralized transmitting net. (It's sometimes startling, when you're in a Unix household, to hear the computer answering the phone in the middle of the night to get your Usenet messages.)

The Source, Compu-Serve and Murray Turoff's EIES all have popular systems for sharing text and sending messages. Even the folks who brought you the Whole Earth Catalog have their own conferencing system, The Well.

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## BALKANIZATION

Unfortunately all of these systems and approaches have their complications, intricacies, shortcomings and incompatibilities. It is possible to publish with royalty on some of them, but only in the clumsiest fashion. The conferencing nets often deliberately throw away the material after a stated period—ignoring its potential archival value. There is little consistency, great complication, and little hope for unity—unless a wider method can be found to which all may be cleanly mapped.

## ELECTRONIC PUBLISHING

For some five hundred years the educated public has been reading from books and magazines of paper. Now all of that may change.

Electronic publishing is coming, this much all agree on. Just what it will be is not so clear.

As screens become more and more available, there is less and less reason for printing on paper. The costs of wood pulp and gasoline (to move the paper to and from the printer), the long lead times of paper editorship and production, the increasing divergence of specialized interests, the lowering cost of computers with screens, of disk storage and digital communications; all suggest this.

Beginning thinkers in this area often suppose that what will be offered to the screen reader will be merely individual stored documents, available on line quickly, but based somehow on conventional documents nestling in conventional computer files.

Our point of view is different.

Many approaches to electronic publishing are very complicated. But that can't work on a broad scale; "publishing" suggests use by the public. Meaning simplicity.

## WHITHER?

All these approaches are different. They *seem* to be converging, but are they? The existing systems do not combine well; hooking them together creates something like the New York subway system.

I say we need unified design. It has to be simple. It has to be powerful. It doesn't have to be complicated; in fact, *can't* be complicated. I believe, indeed, that the design we need will derive simply from what we have known in the past.

The future of the written word can and will be built on an electronic version of its past, losing nothing of its heritage, but totally changing its nature by instantaneous accessibility.

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And this world, this new literature, will be built from the "document" as we have long known it, the "author" as we have long known him or her, and an extended form of "writing" as we have long done it and read it-- rather than what some people, such as McLuhan and the video freaks and the CAI folk, have been telling us would be anonymous, collective, scrambled, psychometric, and/or Boolean.

I believe there exists a clean, complete and thorough solution. And that is what will be described here.

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## TWO CULTURES FACE THE FUTURE

C.P. Snow pointed out long ago that there are two educated cultures, the culture of technology and the culture of the humanities, and they don't talk to each other. That was twenty-five years ago, but it's still true.

Not only is it still true, but the two cultures have united on a *false, agreed-upon definition of what computers are*. In this polite conspiracy the members of the two cultures, technical and literary-- who rarely talk to each other-- have it all figured out, quite wrongly.

Their shared false notion of computers is that they are Inhuman, Oppressive, Cold, Relentless; and that they somehow Reduce Everything to Mathematics.

One camp says "yessir, and I run 'em," and the other camp says, "I want no part of it."

This view, in its two variations, is a strange fact of our culture and psychology. But it has virtually nothing to do with computers. What computers *really* are is irrelevant to this curious compact.

To throw things in a sharper light, let me refer to the technical types as the *Technoids* (or Noids for short), and I will refer to those with a humanistic background, in literature, history, the arts, etc., as the *Fluffies*.

### THE NOIDS

The Technoids have an exaggerated and caricatured notion of what constitutes clear-minded thinking, and never miss a chance to denounce other cognitive styles as "illogical." (For some reason a rigid and punitive notion of "logic" is important to such people.)

My favorite example is the typical Technoid insistence that you can't type a number into a computer using the letter Oh, you have to use the numeral Zero, because otherwise it isn't Logical. This despite the fact that a computer can easily be programmed to recognize that when you type Oh in the middle of a number you mean Zero, just the way a program can distinguish between a decimal point and a period, or a hyphen and a minus-- contextually.

But that overlooks what the Technoids' notion of Logic is about: rigidity and the chance to be boss.

Despite the way they oversimplify logic, the Technoids are also Lords of Complication: they enjoy keeping track of intricacies and memorizing numerous buttons. And they shower contempt on people who have difficulty learning the complicated systems that they, the Technoids, dream up.

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## NOIDS' OUTLOOK

The Technoids are usually hired guns, interested in the next complex problem they can get into. They generally have an obsession with favorite methods, and a negligible concern for history, art, literature or human freedom. Indeed, some of them really *like* to oppress other people (and some of this type get to head computer centers eventually).

In a famous experiment, psychologist Stanley Milgram, wearing a white coat, instructed unsuspecting subjects, who thought they were merely paid assistants, to push buttons that they were told would inflict terrible pain on others. To Milgram's chagrin, nearly everyone followed instructions without a qualm.

This in a way characterizes the Technoid mentality. If the government solicits bids on a Deterrent Weapons System that will selectively barbecue only the small children of an Aggressor Nation, the Technoid will probably say Yes Sir, Can Do, What Color Do You Want the Corpses? While the Fluffy who has read Sophocles and/or Tocqueville may be *slightly* more likely to say, Wait a Minute...

## THE FLUFFIES

The Fluffy cognitive style leans toward vagueness and the reduction of issues to vague idealistic terms (they being unused to specifics except for Metaphors and Objective

Correlatives). Their disposition is always to get away from specifics as being mundane and/or Sociological.

And they do not like computers or the idea of screens. "I love books," "I hate computers," "It sounds so cold," "I can't see cuddling up with a CRT in bed," "I can't take it on the train (in a hammock, into the woods)," etc. They have no conception of the importance and immediacy of creating an electronic literature that embodies what they believe in.

(I have experienced many levels of Fluffy negativism to computer ideas, which we may call Fluffy-Indifferent, Fluffy-Resistive, Fluffy-Hostile and Fluffy-Aggressive. You will encounter them all in the publishing industry and in Library Science.)

## LITTLE CORNERS

About the only thing the groups have in common is their shared view of computers. Their views of each other are mutually derogatory, roughly on the level of "You're the one who eats strange food, not me!"

But one interesting aspect of the two cultures is their view of each other in the world. Each sees the other group as "those people in their little corner, unaware of the big wide world."

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To the Fluffies this real world is history, art, literature, and the little corner is "technical things." To the Technoids the real world is that of Technical Questions and Ideas, and the little corner is the artsy-craftsy nook of bygone concerns.

### SYSTEMS HUMANISTS

As you may have suspected, I see another point of view. As far as I am concerned both the Technoids and the Fluffies are in their own little corners. In the broader view, the goals of tomorrow's text systems will be the long ones of civilization—education, understanding, human happiness, the preservation of humane traditions-- but we must use today's and tomorrow's technologies. We who believe this are *systems humanists*, striving to further the ideals of the humanist perspective by the best available means. This means finding the ways that human literature, art and thought-- including science, of course-- may best be facilitated, preserved, and disseminated.

Consider the analogy of water. Civilization as we now know it is based in part on running water-- supplying it, distributing it, and turning it off and on where you need it. That overall system had to be thought out. Similarly, someone now must design waterworks for the mind.

The literature we envision, described in this book, is meant to be a utility, a commodity, a waterworks for the mind; your computer screen will be the spigot-- or

shower nozzle-- that dispenses what you need when you turn the handle. But that system must be based on the fluidity of thought-- not just its crystallized and static form, which, like water's, is hard and cold and goes nowhere.

## LITERARY 1/13 MACHINES

## HYPertext

Spoken language is a series of words, and so is conventional writing. We are used to sequential writing, and so we come easily to suppose that writing is intrinsically sequential. It need not be and should not be.

There are two outstanding arguments for breaking away from sequential presentation. One is that *it spoils the unity and structure of interconnection*. The other is that *it forces a single sequence for all readers which may be appropriate for none*.

### 1. *Spoiling the Unity and Structure*

The sequentiality of text is based on the sequentiality of language and the sequentiality of printing and binding. These two simple and everyday facts have led us to thinking that text is intrinsically sequential. This has led to the fallacy that presentation *should* be intrinsically sequential. Marshall McLuhan even put this fallacy at the center of European thought, and perhaps he was right, perhaps it is.

But sequentiality is not necessary. A structure of thought is not itself sequential. It is an interwoven system of ideas (what I like to call a *structangle*). None of the ideas necessarily comes first; and breaking up these ideas into a presentational sequence is

an arbitrary and complex process. It is often also a destructive process, since in taking apart the whole system of connection to present it sequentially, we can scarcely avoid breaking-- that is, leaving out-- some of the connections that are a part of the whole.

Of course, we do this kind of simplifying sequential breakdown all the time, but that doesn't mean we *should*, it just means we *have to*.

(Some thinkers, of course, really *do* believe that certain of their ideas are primary and that the rest follow from them, and that's fine. I criticize merely the presumption that all systems of thought have an intrinsic sequence, or should be made to.)

### 2. *Forcing Simple Sequence Inappropriate for All Readers*

People have different backgrounds and styles (as I said of the Noids and Fluffies in Chapter 1.3). Yet sequential text, to which we are funneled by tradition and technology, forces us to write the same sequences for everyone, which may be appropriate for some readers and leave others out in the cold, or which may be appropriate for nobody. (This book, too, is hardly everybody's cup of tea, since there is not very much *choice* among its sequences.)

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Thus it would be greatly preferable if we could easily create different pathways for different readers, based upon background, taste and probably understanding. Now, in normal circumstances this is handled by writing different articles (and books) about the same subject, and publishing them in different places (or ways) for different audiences. This will give readers many choices in approaching the same work.

In the computer world this will change, especially if-- as I foresee-- there will be one great repository, and everything will be equally accessible. This means that "different" articles and books will more likely be *different versions of the same work*, and *different pathways through it for different readers*.

#### THE ALTERNATIVE: NONSEQUENCE

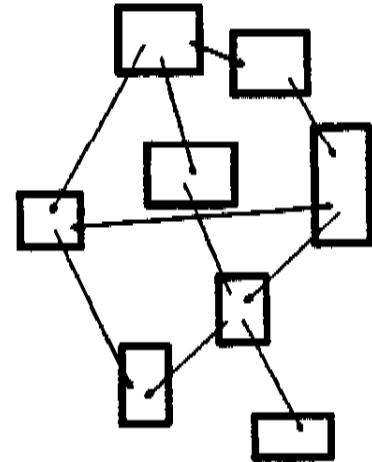
Nonsequential writing on paper can be all sorts of things-- magazine layouts, funny arrangements of poetry, pieces of writing connected by lines, or many other things.

As we go in this century from paper to the computer screen-- and tomorrow's computer screens will have the richness and resolution of paper-- all these nonsequential forms, and more, are possible. And we must discover and invent them.

Some are obvious. The most obvious is

that which simply connects chunks of text by alternative choices-- we may call these *links*, of which more later-- presented to the user. I call this simply *chunk style hypertext*. The user, or reader, moves through it by reading one chunk, then choosing the next.\*

#### CHUNK STYLE HYPERTEXT



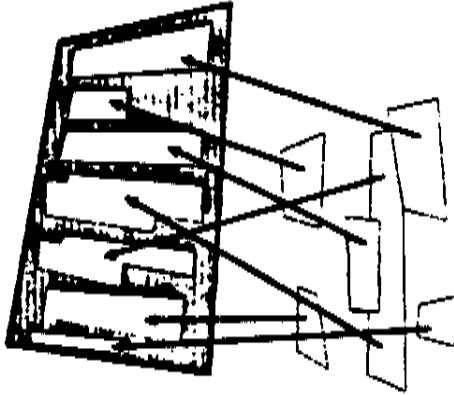
Another form of text that is becoming increasingly important is *compound text*, where materials are viewed and combined with others. (This term too has recently become common.) A good way of visualizing this is as a set of windows to original materials from the compound texts themselves. Thus I prefer to call this *windowing text*.

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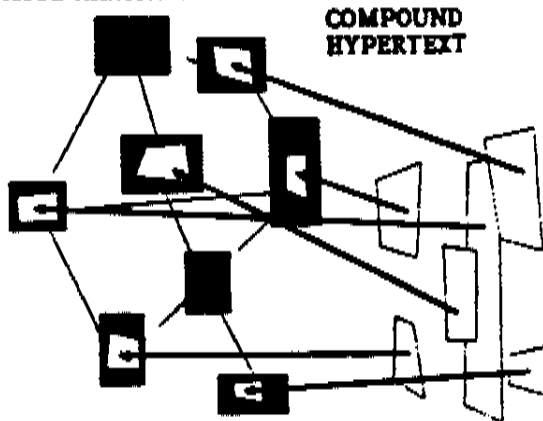
\*Note that if the connections to be followed are given different types, we may call these *colored links*.

(This is the mathematical usage, where connections are called "colored" if they are of different types.)

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**WINDOWING OR  
COMPOUND TEXT**

Extending the notion slightly, we get *windowing hypertext*-- where nonsequential writings-- hypertexts-- window to other stored materials.



\*Except for the Talmud. This is an extraordinary hypertext, a body of accumulated comment and controversy, mostly on the Torah (the Hebrew Old Testament) and on life in general, by Jewish scholars of old. It has been accreted over centuries

It is this notion, then, of windowing or compound hypertext-- which we foresee as the vital and basic new information system of the future-- that has charged and inspired the present work.

Unfortunately, for thousands of years the idea of sequence has been too much with us,\* because nothing else has been practical; and indeed, creating a system subtle and profound enough to meet our real needs has proven to be an extensive task indeed.

*The structure of ideas* is never sequential; and indeed, our thought processes are not very sequential either. True, only a few thoughts at a time pass across the central screen of the mind; but as you consider a thing, your thoughts crisscross it constantly, reviewing first one connection, then another. Each new idea is compared with many parts of the whole picture, or with some mental visualization of the whole picture itself.

It is the representation of whole structures of ideas, and placing them on the page for others to understand, that we call *writing*. Writing is the representation and the presentation of thought.

(So are pictures and diagrams; but they are intrinsically nonsequential, and so not relevant to the present argument.)

with commentaries on commentaries. This hypertext is a fundamental document of Jewish religion and culture, and the Talmudic scholar is one who knows many of its pathways.

## LITERARY 1/16 MACHINES



## HYPertext DEFINED

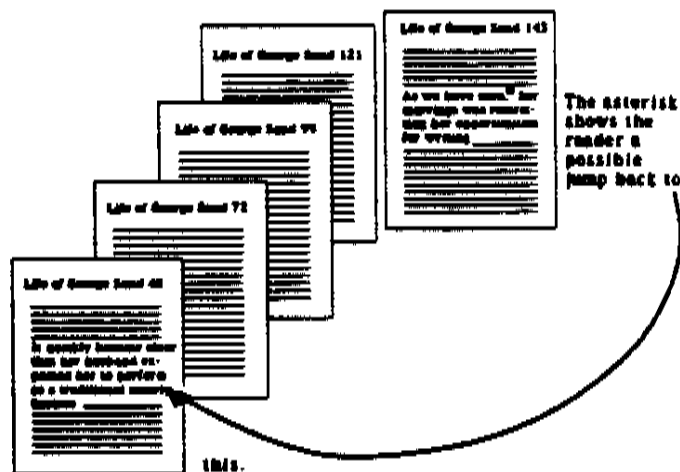
By hypertext I simply mean non-sequential writing. A magazine layout, with sequential text and inset illustrations and boxes, is thus hypertext. So is the front page of a newspaper, and so are various programmed books now seen on the drugstore stands (where you make a choice at the end of a page, and are directed to other specific pages).

Computers are not intrinsically involved with the hypertext concept. But computers *will* be involved with hypertext in every way, and in systems of every style. (Ideally, you the reader shall be free to choose the next thing to look at-- though repressive forms of hypertext do turn up.)

Many people consider these forms of writing to be new and drastic and threatening. However, I would like to take the position that hypertext is fundamentally traditional and in the mainstream of literature.

Customary writing chooses one expository sequence from among the possible myriad; hypertext allows many, all available to the reader.

In fact, however, we constantly depart from sequence, citing things ahead and behind in the text. Phrases like "as we have already said" and "as we will see" are really implicit pointers to contents elsewhere in the sequence.



# LITERARY 1/17 MACHINES