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Electronic Publishing and Electronic Literature

Theodor H. Nelson

No alert person, drubbed by popular magazine 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 vaguely may come at us without our even having to ask.

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 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 has no simple comprehension of the varieties of possibilities, the vast range of options. They will believe anything they are told except the whole picture, which nobody tells them.

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. Those outsiders then spread the gospel 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 the elephant, then lead the other blind men in their several directions.

I am referring to the overblown public expectations for "video records" (which are at this writing still a fiction), for the supposed wonders of cable TV and frame-grabbing, and for such brittle concepts as "computer-assisted instruction," "information retrieval," and "artificial intelligence." By brittle I mean that under pressure they shatter into many separate pieces, individual concepts lacking the collective magic of the overall name.

My objective here is not to criticize these approaches; many of them have their virtues and uses. But I want to stress the problem we face: a variety of people are

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proposing different arrangements by which *other* people, meaning we the public, should handle information in the future; and accordingly the public ought not submit with docility to just whatever may result spottily by chance.

On the other hand, wonders are indeed upon us, particularly in the area of cheap computers. The dramatic fall of equipment prices – best symbolized by the introduction in January, 1975 of the Altair, a full-fledged computer for about five hundred dollars – negates most of the previous economic assumptions about computers. Comparably cheap graphic computer displays are now available, although screens capable of fast and detailed presentations will continue to cost considerably more. The computer on every desk is within sight; the era of Computers for People has come, if only we decide what we want.

With this question in mind – what do we want? – let us consider a few basic capabilities of today's equipment and systems.

First of all, high-performance display scopes are now generally available. These are visual display terminals capable of rapidly bringing text and pictures from computer storage to the screen. By "high performance" I mean capable of holding over a thousand alphabetical characters in upper and lower case, in *more than one font*, and capable of *moving the text smoothly on the screen* – a feature many do not realize to be necessary. Such scopes also make possible animated graphical displays, with computer-generated diagrams and cartoons in motion.*

Second, instant accesses are possible. That is, the reader at such a high-power screen, making a request, may be rewarded within seconds by whatever he wants to see or read. While this level of performance is presently available only with larger computers, the problem is basically one of software – the master control programs – and rapid strides may be expected here.

Obviously, for the larger and larger amounts of material to be offered, some sort of network of storage and supply must send materials on demand, as the nearest computer cannot possibly hold everything you want to read. Here, too, developments are proceeding rapidly, with people increasingly aware that such a network can be built of small computers rather than big ones, as long as the hookup includes a lot of storage space.

Third, rapid arbitrary jumps are possible. That is, material stored in one place may offer a link, much like a footnote, to material stored in another place; a reader may choose to take such a jump between one thing and whatever has been put for him at the other end of the link. The new material arrives on the screen at once. (The NLS system of Douglas Engelbart, at Stanford, is the most well-known to offer this capability, but there are now numerous others.)

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* This presupposes a "calligraphic" type of display equipment, not video. An exemplary unit of this type, the Model VT11 from Digital Equipment Corporation, now costs $6500 and offers all these features; it requires, in addition, a PDP-11 computer, currently costing about $5000. (It may be possible at some time in the near future to get the same effects with the "bit map" type of display, the prices of which are dropping rapidly. Such equipment has the advantage of using video signals of the normal type, rather than the more expensive electronics of the other.)

Fourth, such links may provide for automatic "windowing" between one thing and another; that is, a document on the screen may have a window into another document, or a picture on the screen may have a window into another picture. (For text, such windowing has been developed on Engelbart's and other systems. Graphical windowing usually requires special hardware but is largely the same problem.)

These are the elemental capabilities. The power and breadth of the possibilities thus opened do not seem to be widely understood, although much of CAI – the tell-and-test, multiple-choice approach – appears to be a restricted exploitation of the "jump" concept. It has long seemed to me that such linkage concepts offered much wider opportunities for education, research, and literatures of the future than have yet been put to use.

Computer storage and screen presentation can now change our relation to information fundamentally and completely. The paper world we have lived in for so long – a forest of documents (books, magazines, certificates, and whatnot, each having a certain type of paper housing) – may and perhaps should be supplanted by an electronic counterpart. But in this transformation we have a chance to improve the world – a one-time chance.

It seems to me that the way to proceed now is to look at our paper world, consider its best features, and study how to preserve, extend and improve them. Then we ought to be able to design a world of electronic documents, techniques for rapidly calling them, and techniques for working on them. This could keep everything we want of the old ways while eliminating the "paperwork." Such a general framework means basically that our reading, writing, and record-keeping may be simplified, clarified, and etherealized – the papers will be everywhere and nowhere, will need no filing, and cannot be mislaid.

According to this point of view, then, what matters is what we want on our screens, and the computer technicalities must be worked out accordingly. Such a view is not considered entirely welcome by some parts of the computer establishment, but it is obviously a legitimate approach. Some ramifications of this viewpoint for "business" programming are taken up elsewhere (Nelson, 1978).

Let us consider the possibilities of "electronic literature," some form of writing and publication that employs electronic transmissions and presentations but serves the functions literature serves now – publication, scholarship, and citation; research, education, and entertainment; and general enlightenment. My belief is that the same things can be done better on screens.

However, this will not come about accidentally. Literature as we know it has developed step-by-step, with its traditions of publication date, citation, footnote, and so forth. Yet these can only be mapped into electronic embodiment by a series of conscious decisions. Mere convention must be replaced by active design – design of the visible forms of jump, windowing, and annotation desired; and design of the hidden forms of interconnection, transmission, and look-ahead that are called for underneath.

To accompany such an electronic literature, there should somehow be built-in

techniques for the general intercomparison of things in the system (comparable to looking at books side-by-side); a free anthologizing facility, allowing each user to make his own "anthologies" with windows into whatever else he wants to keep around; and the ability to quote and present modified versions, wherein one writer may show his modification of another's material.

To design in this area, we both need to know technically what is possible and to feel intuitively what different literatures have meant to people in the past. Among the questions we must ask are: What forms of organization in a nonsequential written work will be most helpful and clear? What forms of personal annotation will be most useful for making private notes on what we read? What forms of screen publication are most useful and viable? And appealing? And most important, how may we best preserve and extend the facilities – and freedoms – we have had before?

What we need is an orderly and yet truly versatile way by which a user of the screen may get around in an ever-increasing panorama of offerings – on-line documents and facilities and "thinkertoys." These will include writings, user-manipulable graphics, pathways among these things and anthologies that embrace and window them, and layer upon layer of public and private annotation and commentary by a parade of authors and users.* The problem is to find some orderly, overall meta-design that will preserve clarity while facilitating easy movement by the user (Nelson, 1965). Anybody can design a system that is complicated and confusing. The problem is how to design a system that is *general, simple,* and *clear.* Contrary to a widespread myth, generality and simplicity not only can coexist but belong together.

I have for some time promoted the term "hypertext" for nonsequential writing using such facilities. The general idea of hypertext is that, by creating pathways for readers with different interests, we can both simplify writing and make reading more appropriate to the reader's interest and level of knowledge.

However, it must be admitted that general hypertext is in itself a somewhat disorderly notion. The possibilities go in too many directions. My present concern, then, is to bring some sense of order and generality to these areas.

The approach I am presently investigating I call "structured literature," by analogy with Dijkstra's well-known concept of "structured programming". Just as programming can get you into tangles, arbitrary jumping around on screens can get you into tangles, and the same remedies used in programming may prove helpful.

The structured-literature approach is based on the idea of finding a few powerful and clear organizing techniques and employing these exclusively, with the idea of avoiding idiosyncratic and exceptional forms of connection. If properly done, this need not limit the versatility of performance of the system or its contents but may

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* Note that blind excursions – events that the user cannot fully control, such as animated cartoons and most CAI – confuse these offerings slightly, as the user may not be able to find out precisely what he is in for.

provide an ordering, which increases the flexibility and power available to the user.

A structured literature, then, is one having defined data structures of certain generalized types – especially text and animated graphics – and allowing certain types of link structures among them. Many types of viewing and jumps may, in turn, be devised around these link types.

In my present formulation, there are several link types. These include the plain jump, the window that can open from one file to another (the quote window), and the intercomparison multilink (collateration). With the use of such a set of linkage types, documents and screen views may be nested to any degree without obscuring the fundamental simplicity of interconnection. The interesting thing is that these link structures appear to have enough generality for all desirable tasks yet confer a certain clarity upon the resulting system.

This structured-literature approach also supposes a hypothetical network of fairly definite properties. Such a network will service individual consoles that are not mere "terminals" but that will each be capable of individual, private operation. Both network and individual consoles will be set up to handle big files with arbitrary structure. The network will have techniques permitting storage of both private and public materials, including private annotations and modifications of public documents. (Thus, a "publication" method must be defined within the network. Since publishing can be instantaneous and unrestricted, merely a "publish" button on the console could do it – but the dangers of rash publication to an individual's reputation would be great. Some formalized technique would therefore be required for "committing to publish" – probably a ceremony and signature.)

One interesting scheme for copyrighting would appear to bind such a system well. Copyrighting is normally a matter of status and litigation, but such a network could establish a copyright convention *internal to the network* and agreed upon by all participants. Under one possible arrangement, each author would consent to a certain royalty – say, a few cents per screen hour – and each reader would contribute those few cents automatically as he reads along. The windowing approaches already mentioned could then automatically furnish a general solution to the "copyright problem" with regard to quotation and citation, simply by this means: authors who are windowed automatically get royalties as well.

Actually these formulations are intended simply to facilitate the extension of literature as we have previously known it into the era of cross-linked screen access. What these specific linking ideas really do is stress the singularity of each document, its external and internal borders. Thus, we focus on the integrity of the "document" as we have long known it, the "author" as we have long known him, 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.

And it should go without saying, but it must be said, that none of our freedoms should be sacrificed for any new advantages. Our files must be free from snooping, tampering, and censorship (the restricting of accessibility). Naturally, no absolute

guarantees can be put in at the computer level; but it may be that steps can be taken to make incursions – whether by government or other source of mischief – plain and flagrant. It is our common paramount interest to do so.

References

For additional material on the topics discussed here, the reader is referred to my book *Computer Lib* (1974) available from The Distributors, 702 S. Michigan, South Bend, In. Of particular relevance in that volume are "Apparatuses of Apparition" and "Babel's in Toyland," p. 125; "The Mind's Eye," pp. 109 ff.; "No More Teachers' Dirty Looks," pp. 113 ff.; "Hypertext," pp. 84–85; "Doug Engelbart and 'The Augmentation of Intellect,'" pp. 82–83. On collateration, "Thinkertoys," p. 77 and "The Parallel Textface," pp. 75–76. On the network, see "Xanadu," pp. 72–73.

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