THEODOR HOLM NELSON

LITERARY

THE REPORT ON, AND OF, PROJECT XANADU
CONCERNING
WORD PROCESSING, ELECTRONIC PUBLISHING,
HYPERTEXT, THINKERTOYS,
TOMORROW'S INTELLECTUAL REVOLUTION,
AND CERTAIN OTHER TOPICS
INCLUDING
KNOWLEDGE, EDUCATION AND FREEDOM.

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.)

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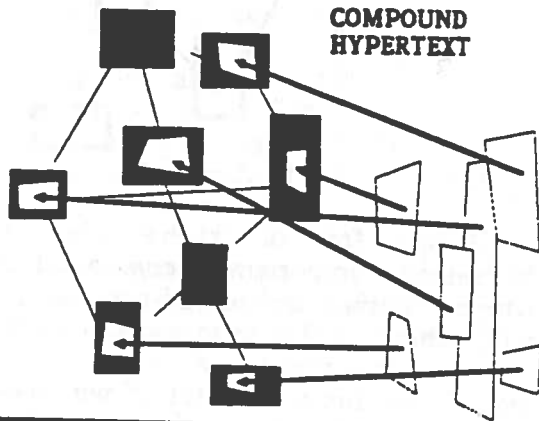
CHUNK STYLE HYPERTEXT
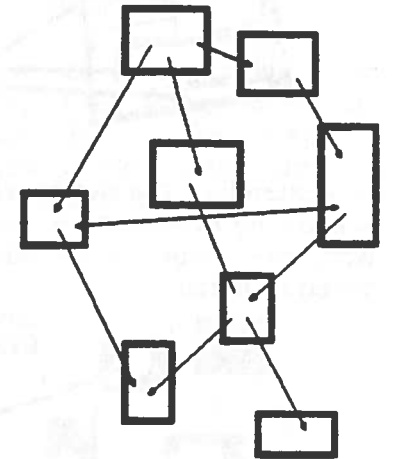
Another form of text that is becoming increasingly important is *compound text*, where materials are viewed and combined with others. (This term too has recently become common.) A good way of visualizing this is as a set of windows to original materials from the compound texts themselves. Thus I prefer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

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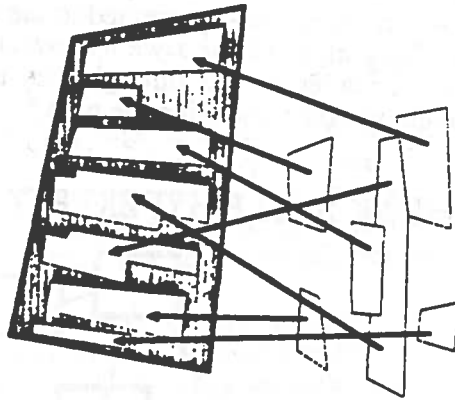
Extending the notion slightly, we get *windowing hypertext*-- where nonsequential writings-- hypertexts-- window to other stored materials.

COMPOUND
HYPERTEXT

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.)

*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 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.

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.
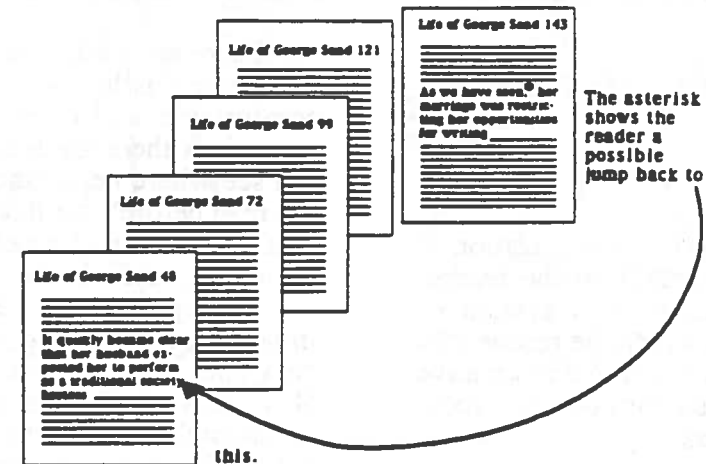
The asterisk shows the reader a possible jump back to this.

WHAT'S HARD ABOUT WRITING

There are basically two difficulties in writing sequential text: deciding on sequence-- there are so many possible connections!-- and deciding what's in and out. Both of these problems go away with hypertext. You no longer have to decide on sequence, but on *interconnective structure*, which provides much greater flexibility. You no longer have to decide what's in or out, but simply where to put things in the searchable maze.

WHAT'S TRICKY ABOUT READING

In reading works of non-fiction, the active reader often skips ahead, jumps around, ponders about background material. These initiatives are useful and important; if we provide pathways to help active reading, it will be possible to enhance initiative and speed comprehension.

TWO STYLES OF HYPERTEXT ORGANIZATION

1. *Presentation and Effect*

One style of hypertext organization is based on its possible effect on the reader. The connective structure is a system of *planned presentations* which the reader may traverse. Variant sequences and alternative jumps will be contrived for how they look, feel and get ideas across.

2. *Lines of Sructure*

The other style of hypertext organization is based on simply representing the structure of the subject, with possible directions of travel mapping the relations in the network of ideas being presented. The internal relations of the subject are thus represented in the connective relations of the hypertext. This is simpler than calculating the effect on the reader, since the author is only concerned with analyzing and representing what the structure really *is*, and the reader is exploring the structure as he or she explores the text.

Actually, both styles of organization will probably blend, since the ideal presentation will follow lines of structure, and the mere representation of structure will presumably need enhancement by showmanship.

THE PROBLEM OF ORIENTATION

There are tricky problems here. One of the greatest is how to make the reader feel comfortable and oriented. In books and magazines there are lots of ways the reader can see where he is (and recognize what he has read before): the thickness of a book, the recalled position of a paragraph on the left or right page, and whether it was at the bottom or the top. These incidental cues are important to knowing what you are doing. New ones must be created to take their place. How these will relate to the visuals of tomorrow's hot screens is anybody's guess, but it is imperative to create now a system on which they may be built.

THE IMPROVED REPRESENTATION OF THOUGHT

It is my belief that this new ability to represent ideas in the fullness of their interconnections will lead to easier and better writing, easier and better learning, and a far greater ability to share and communicate the interconnections among tomorrow's ideas and problems. Hypertext can represent *all* the interconnections an author can think of; and compound hypertext can represent all the interconnections *many* authors can think of, as we shall see.

THINKERTOYS

This work began in 1960 with the problem of intercomparing complex alternatives-- of looking at two alternative structures, paragraphs or arrangements on the screen side by side, and noting in detail their differences and advantages.

Such intercomparison systems, I still believe, will become a vital aspect of our working lives-- once they are easy to use. I do not know of anything on the market yet that does this.
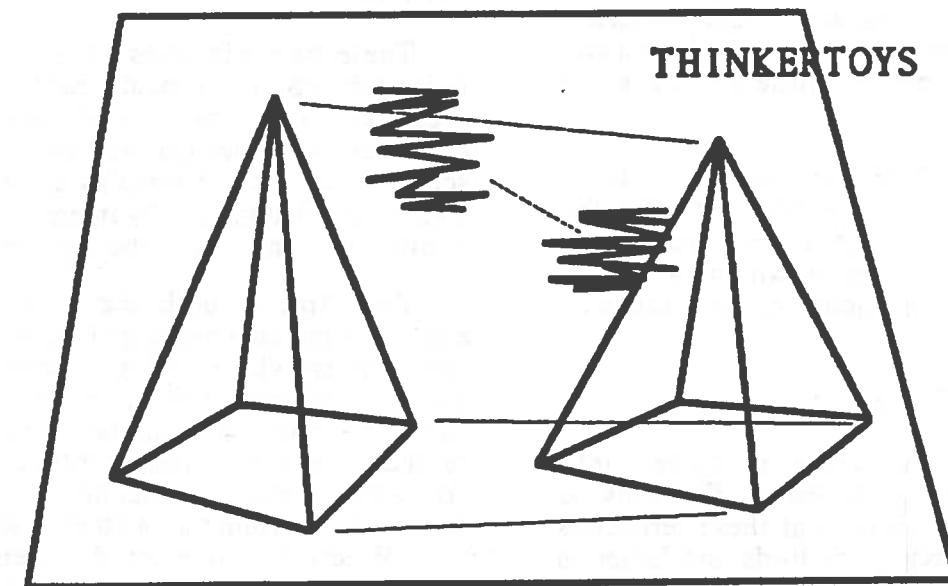
THINKERTOYS

THE SCHOOL PROBLEM

Most people consider school to be a grim necessity to be accepted, endured and survived. School, as nearly everyone freely admits, is dull, unpleasant, and designed to build mediocrity. It is a mapping of the world of ideas into a sequential bureaucratic presentational system, with generally awful results.

1. The Curriculum

The very system of curriculum, where the world's subjects are hacked to fit a schedule of time-slots, at once transforms the world of ideas into a *schedule*. ("Curriculum" means "little racetrack" in Latin.)

A curriculum promotes a false simplification of any subject, cutting the subject's many interconnections and leaving a skeleton of sequence which is only a caricature of its richness and intrinsic fascination.

2. Teacher as Feudal Lord

The world of ideas is carved into territories, and assigned as fiefdoms to individuals who represent these territories (called Subjects); these lords and ladies in turn impose their own style and personality on them. The pupil must pay homage to the Duchess of History, the Count of Mathematics; and if you and these individuals do not like each other, you will almost surely dislike the subjects they control, which take on their stamp and personality. Each feudal lord has absolute power to bore, offend, and sever access.

The teacher controls access to the subject under his or her own viewpoint. If you find this viewpoint unfriendly, unpleasant or confusing, that subject becomes closed to you forever.

These two principles-- the crushing of living subjects into curricular caricatures, and their bestowal to feudal overlords-- effectively guarantee that whatever is taken in school becomes and remains uninteresting. Everything is intrinsically interesting, but is drained of its interest by these processes.

Thus follow both the dreariness of education and the crippling of the mind as we see it everywhere today. Education is typically the process of successively ruining subjects for you, and the last subject to be ruined determines your profession. An educated person is someone who says, "I don't know anything about that, I never took it." Whereas a free-minded person can become excited about a new idea, in any subject, whether or not he or she ever heard about the idea or the subject before.

What is perhaps even worse, this system imbues in everyone the attitude that the world is divided into "subjects;" that these subjects are well-defined and well-understood; and that there are "basics," that is, a hierarchy of understandings which must necessarily underpin a further hierarchy of "advanced ideas," which are to be learned *afterward*.

This outlook could not have been better designed to crush people's mental spirits, to keep them from becoming involved with ideas, from thinking, exploring, conjecturing, taking interest.