THE FUTURE OF INFORMATION

Ideas, Connections, and the Gods of Electronic Literature

Theodor Holm Nelson

This special Preview Edition of ***The Future of Information***
has been prepared by ASCII Corporation
for
Members of the World Wide Web Consortium
meeting in Tokyo on June 17, 1997
(the Author's sixtieth birthday).

Later editions will have additional illustrations for greater clarity.

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Information:
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Special thanks to Frank Colson for this arrangement.

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The Future of Information:
Ideas, Connections, and the Gods of Electronic Literature

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This book is dedicated to a great lady
whose radiant spirit and energy
have powered the electronic document world
from the very beginning—
Ballard Engelbart.

Contents

Preface and Thanks

This book is largely based upon my writings in Japan for the last two and a half years. Part of it has appeared in the *Communications of the ACM* and the *EDUCOM Review*, and the proceedings of World-Wide Computing and Its Applications '97, Tsukuba, Japan. Some of it appeared much earlier in *DATAMATION*.

About this different style of writing: my previous writings have been in a style that was for speakers of very sophisticated English, playing with the meanings of unusual words. Unfortunately this is not helpful for getting my ideas understood in today's exciting new international climate. So I have had to adjust my style of writing, a little, for Japanese people to understand the English better.

I am greatly enjoying living in Japan, but I have learned a little about language problems, especially sharing the language problem from both sides. Trying to learn Japanese is like trying to climb a great wall of rock, and I suppose the experience must be the same for people trying to learn English.

So I am trying to use a simpler style of English. It isn't easy, and I do not have much time to keep fixing this book, so I apologize for any unclarity that remains.

My great thanks to the Xanadu guys in the USA too numerous to mention, especially Mark Miller and most especially Roger Gregory; to Yuzuru Tanaka, Toshi Murata and the guys at the Sapporo HyperLab, especially Mr. K. Ookubo; to my present colleagues at Keio University, especially Hajime Ohiwa, Dean Nobuo Saito, and the amazing Vice President Takahashi; to my student associates Kazuko Imai, Kazuhiro Yamada, Yoshihide Chubachi, Yousuke Igarashi, and Kei'ichi Kawai. I want to thank the members of my OSMIC data structure seminar, Kei Kawai, Shu Nakamae, Ken'ichi Unnai, and Yukihiko Yoshida. I would like to acknowledge also the generous support of (in alphabetical order), ASCII Corporation, Fuji Xerox, Fujitsu, Hitachi, Hokkaido University, Keio University, Mallicoat Enterprises, MK Enterprises, NTT, Sapporo Electronic Center, Technova, and Xanadu itself (Project Xanadu®).

My especial thanks to Robert W. Fiddler, Esq., of Great Neck, N.Y. for over twenty-five years of friendship, generous legal tutoring and delightful banter that have helped shape the idea of transcopyright; but any errors, misunderstandings or improprieties are my own.

Special thanks to Frank Colson of the University of Southampton for permission to reprint the Churchill manuscript page, published here for the first time.

Very fond thanks to my supporters in the USA over the last five years, especially David Bunnell and Phil Hood. And to Stan Dale for his magical re-awakenings. And of course to my family back in the States.

For assembling the book at ASCII Corporation, my baffled gratitude to Lauren Colias is limitless. Just ten years ago she (then Lauren Sarno) assembled the 1987 edition of my book *Literary Machines* in San Antonio, Texas; now, through a completely implausible chain of semi-coincidences, she has been assigned to the job of assembling *this* book with me in Tokyo. Synchrodipity! (What is reality?) Thanks also to Shin

Kumada and Noriko Kase for their work in getting this book out so rapidly.

This sojourn in Japan has taken the help of many people. I want to thank Andrew Pam of Xanadu Australia for his great enthusiasm, great help, and great understanding; Samuel Latt Epstein of Sensemedia for hosting the xanadu.net site for two years, Edward Harter for his wisdom and insight, Kay Nishi for his warmth, profound understanding and good will; and most of all my Collaborator, Cargo Angel and Person, Marlene Mallicoat, without whom not even this sentence would have been finished.

Ted Nelson
Keio University SFC Campus
Fujisawa, Japan
June 1997

Chapter One
Where to Begin?

These are my principal computer ideas, the ones that are different from everyone else's, put together for your convenience.

This book is the simplest possible statement of the things I tell my students over, and over, and over. That way they can find it in one convenient place, and I can save time by telling them to read the book.

Usually I try to write for very broad audiences. Not this time, though. Besides my students, this book is aimed specifically at three organizations, and three people in them: the World Wide Web Consortium, especially Tim Berners-Lee; Netscape, especially Marc Andreessen; and Microsoft, especially Bill Gates. These organizations and individuals have the leverage to support these ideas through their products and standards, and so I present this book to their attention in particular.

Many people have not wanted to understand my ideas. This book is for those of you who do. I have endeavored to express them in a friendly way.

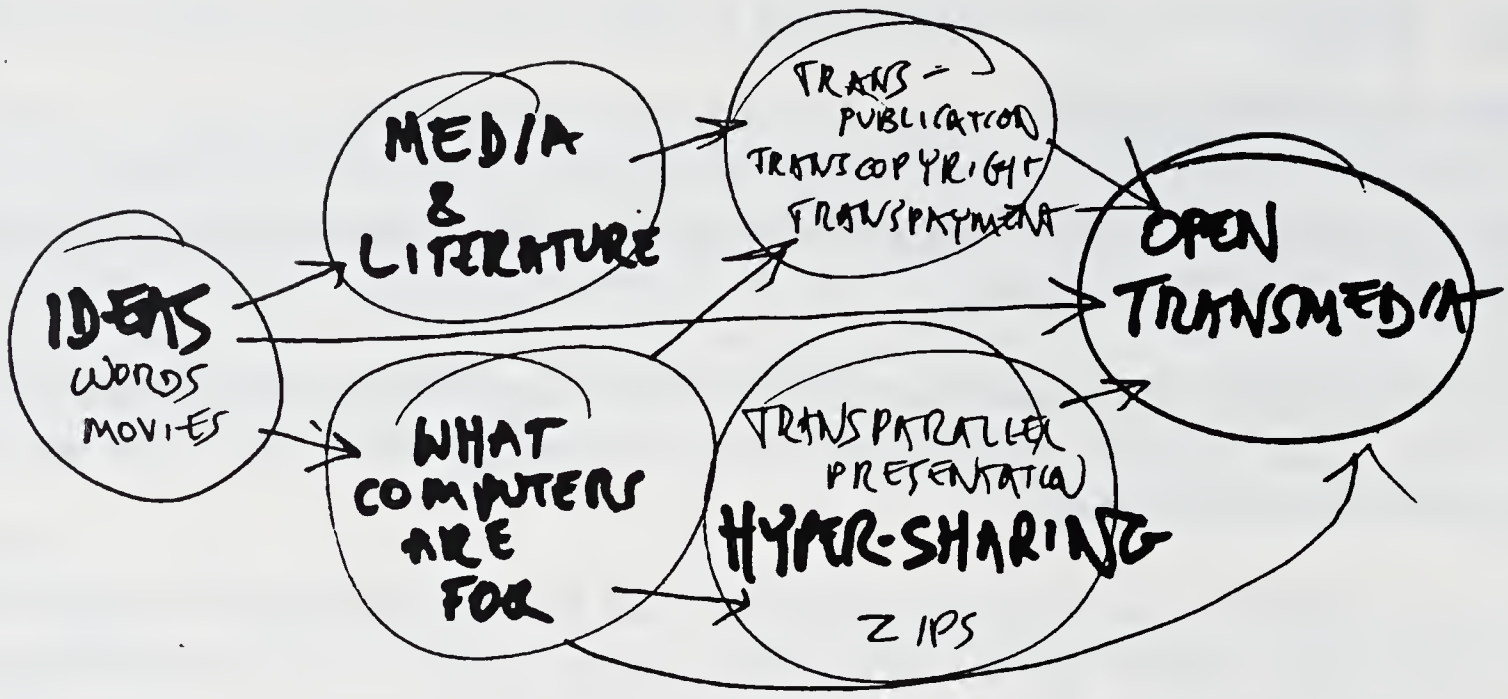
I had these ideas a long time ago. However, I have now taken time to explain them as I had not done before. I have always been in too much of a hurry. I thought it would be easier to build these things, and give them to the world, than try to explain first what I was building.

But there have been many setbacks, so it is time to explain it better.

This book explains my proposed overall design for the media of the future. But first you should understand my general way of thinking. So there are interlocking essays about ideas, words, virtuality, media, and what computers are for.

Then we get to the consequences of this philosophy for how we should use computers: what tomorrow's media should—and I believe will—be like—especially transpublishing and transcopyright, transparallel visualization and hyper-sharing.

The sequence of this book is loose. The ideas tie together, but trying to present them sequentially boggles the mind.



Each blob, or cluster, in this map is a unified set of my ideas. Do not worry about finding an exact sequential structure, just make yourself at home in each cluster.

I call this book *"The Future of Information"* because I sincerely believe that when people understand these ideas, they will become the cornerstone of tomorrow's media.

The Internet

Everybody is excited about the Internet.

The Internet, if it continues to grow and succeed, will bring about some of the greatest changes the human race has ever experienced.

But the Internet is just a transport system. For what? For the new media. What will they be? These are not technical issues, any more than the experience of making a telephone call is "technological." (Technology is not a force to be obeyed, it is the variety of options and opportunities from which we may choose.)

The main issues on the Internet are about human information media and their design—the ways that people present, receive, and seize information.

A Different World of Designs

I have been mistaken for a writer. This gets it wrong. I am a designer, though not the well-dressed and professional-looking sort. For all these years I have lived in a different computer world, a shadow world completely opposite to what we now see, waiting with a system of software designs, always evolving, that I hoped to implement.

My family of designs has always been extremely different from the ones that have become popular—and indeed preceded them. This is because I was concerned, much sooner than most people, with some of the deeper problems of digital media that the

others hadn't thought of yet—especially re-use, intercomparison and copyright.

For all these years I have not been able to get support for my designs, because they seemed so different and so crazy to people. Now, however, people are beginning to understand what I was saying before, and they understand that I was not crazy after all.

Some have said I didn't understand computers because I believe things should be so different. This makes me very angry; if I am right, perhaps I understand computers better than they do.

I think very differently from the way other computer people think, and that's why I design things the way I do. In this book I will try once more to get these ideas across.

I did not get these ideas from any training in science or technology, but from a background in writing, theater and movie-making that goes back to my childhood and my family. When I first understood the inside of a computer, and that you could make a computer do anything at all, I immediately thought about computers for writing and theater and movie-making.

This was in 1960, long before the term "word processing" was invented, and long before any individual owned a personal computer. But it was plain to me that we would all be reading and writing on screens, and that the problem was to design our media of the future for the computer screen. (It is impossible for a young reader to imagine how crazy that seemed to everyone I met, for many years.) But the side-by-side parallel approach of my interactive screen designs began at that time.

I believe everyone is gradually moving toward the truth as I see it, which I have been stating for a long time. But I know now that many people will never admit it.

I will try to say these things without anger, even though I feel that nearly thirty years of my work has been wasted because of people's failure to understand. I believe the world would be a much better place if I had succeeded, even on a small and desktop scale. I believe that today's computer systems have blighted many lives and ruined many projects, and been both a human atrocity and a great loss to civilization. I could have prevented the present situation. So I bear a heavy burden.

This is a book not about science, but about religion. It is about the things I believe in strongly, and what they still imply for the world of the future.

Actually, it is all one simple big idea. It is an idea about ideas and how they should be handled. Because this overall idea was so simple, I thought it would be obvious to everyone. No; it has only been obvious to me. And a few of my friends. And by and large, others did not want to hear.

This shows that a simple idea can be very hard to explain, especially in the face of hostility.

What we have here is a failure to communicate. The rest of the computer world and I seem to be in complete disagreement as to the objectives and nature of electronic media. In order to validate their own system of status, territory and paradigm, some have

found it necessary to attack these ideas and claim that I didn't know anything; whereas I think most people are aiming orders of magnitude short of what we should be designing.

It is rather peculiar that I have hung on and kept going. Partly it was that my small implementations so clearly confirmed my views; partly it was that my predictions kept coming true; and partly it was for religious reasons. My religion holds that these are sacred: human ideas, human understanding, human creativity, human inspiration and human freedom. It is to advance these ideals that I have devoted the last thirty-six years.

Two Cheers for the Web

The reader has by now of course seen the World Wide Web. This is good (you understand what world-wide hypertext publishing means) and bad (you may think this is exactly how it has to be).

In 1990 the Internet was a complicated and technical thing to use. Then came Tim Berners-Lee and World Wide Web, which brought the information medium of networked hypertext to the whole world. But only for text. It was a huge improvement that only Internet outsiders could appreciate—the Internet users of that time, being used to the way things were, saw little use for it. Then came Marc Andreessen's new version of World Wide Web, packaged in the Mosaic browser with pictures and sound. The combined effect of Tim's and Marc's work has been electrifying.

Certainly the World Wide Web has become an enormous looming media presence, astonishing almost everyone. The explosion of this new medium is already having an immense and confusing impact on everything.

The World Wide Web caught on like karaoke: anyone can do it, and that is the appeal and the excitement. It had a very plausible structure to begin with.

But the Web's originally plausible structure is being wildly expanded by Netscape and Microsoft in a special-effects race that most people don't have time for. This careening proliferation of silly new features is creating a backlash, recklessly destandardizing what just became a fragile standard only a few months ago. So that whether the Web will be preeminent in anything like its present form, ten years from now, is quite unclear.

I am of two minds about the Web. One is the incredible disappointment I feel that it was not what I wanted it to be for so many years. (This feeling was shared by many researchers at the 1997 Hypertext conference in England, where the prevailing question was, "Where did we go wrong?")

On the other hand, looking at it with a fresh point of view, the Web sure is great, in its way. But it needs a lot of fixing.

You do not have to consider me an authority. Read this book, if you prefer, to understand the personal myth that keeps a fanatic going. But then consider whether these ideas may have merit after all.

Chapter Two
Ideas vs. Information

Ideas vs. Information 2.0: The Myth of Information

Technical people often have naive ideas about information and its uses. *"Information" is a fiction*, at least in the commodity sense that people talk about it.

It is usually a bad idea to speak of "information." People talk as if information were a substance like water, and that you can just go get "some information" the way you get a glass of water. But glasses of water are very similar, and information is all very different and specific. Information does not come from a faucet, it comes in *packages*, and these packages are based on the ideas of the people who created them—whether the package is a radio program or a magazine article or an adventure movie.

You do not "get information" in some commodity sense, the way you get "a glass of water" or "a box of cornflakes." You try to get *specific* information, information of a certain kind, information about a certain subject, information answering a certain question; but most often you try to get information that will orient, clarify, explain—usually based on some specific point of view that you expect.

And information only comes in packages with points of view. (If you don't think so, it means you don't see the point of view.) There is no way *not* to have a point of view.

It is a myth among technologists—and others too—that you can have "facts" without a point of view. But even when people are very careful to record only the facts they perceive, still they are making a selection of those facts based on their point of view.

This is extremely important, and it is easily forgotten. If you read something that seems to have no point of view, that's because its point of view is like your own—in much the same way that a person who seems to have "no accent" probably speaks just like you.

Ideas vs. Information 2.1: A Philosophy of Ideas

Ideas interconnect every which way. Ideas can be structured and changed every which way. Ideas can be changed, rebuilt and reformed in any number of directions. But our traditions of dealing with ideas have kept us from understanding this, and kept us from dealing with ideas as we should.

Ideas vs. Information 2.2: The Illusion of Order

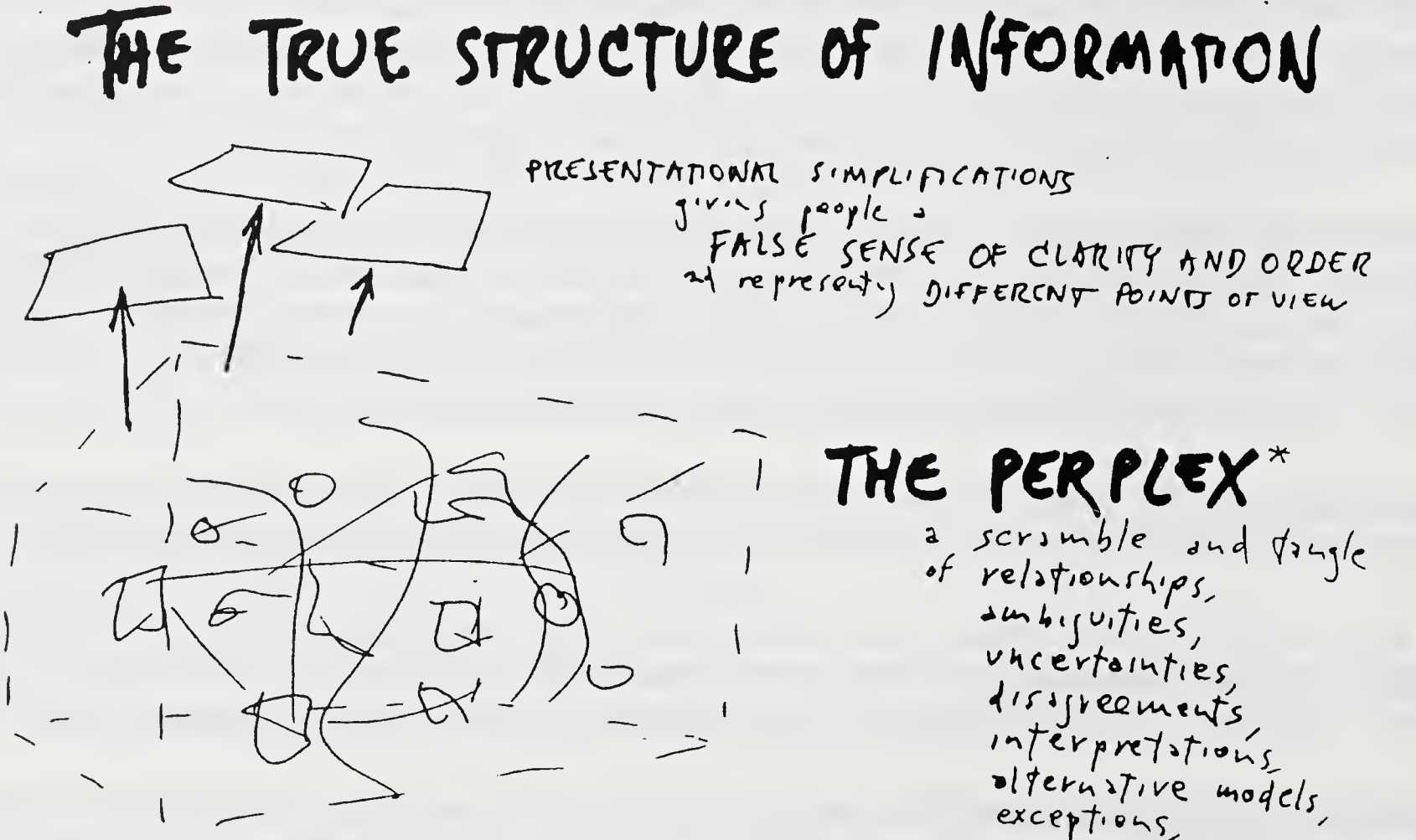
People look at the World Wide Web and say, "It's so disorganized!"

Welcome to the real world of information.

People have been deluded into thinking that information is intrinsically organized, while in fact that organization has been a fiction: they have been looking through someone else's glasses.

The real form of most information is what I like to call a *perplex* [1] —a tangle of items and relations; of facts, partial facts, beliefs, statements and views which can contradict each other in many different ways.

The way that we simplify a perplex and make it look orderly is to present it from a point of view.



[1] Term from Frederick C. Crews, *The Pooh Perplex*.

Any subject is a perplex, unless it is presented from a particular point of view.

"The news" is a perplex, unless someone edits it for you, in which case it has a point of view.

There are big perplexes and little perplexes and great big perplexes. The world's religion is a great big perplex.

The world's information is a great, great, great big perplex. But libraries, and library category systems, make it appear orderly. (This is rather amusing when you consider how much disagreement there is in the world.)

Systems of Order

Order in information is not guaranteed; it cannot even be expected. Order in information is sometimes abstracted (in other words, it was really there to some extent), and often imposed (declared to be there when it isn't)—except it can be hard to tell which. It is hard to tell whether order is imposed or really there. The safest assumption is that most order is imaginary.

We tend to see order, though, because it is our nature; insistence on order is wired into the mind.

And everyone somehow does have a sense of order, except we tend to disagree a great deal about what order exists. Or should.

A system of order is a window through which we see a perplex, screening out or dimming the parts that don't fit that system of order. It is a presentational simplification that makes the perplex easier to see and understand—because it blocks the parts that don't fit.

A large-scale system of order, a superidea dominating other ideas, is called a *paradigm*.[1] A paradigm is an idea that makes a number of other ideas orderly, fitting them together somehow.

Ideas come in all sizes, from paradigms down to little insights and hypotheses and facts. But any idea can be magnified into a paradigm and put on top. If we imagine ideas as competing—Dawkins' "meme" hypothesis[2] —we could say that every idea *wants* to be on top.

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[1] The term "paradigm," made popular by the late Thomas Kuhn, deserves much more attention than there is room for here. See his book *The Structure of Scientific Revolutions*, which got many people thinking more deeply about superideas.

[2] Richard Dawkins, *The Selfish Gene*. Oxford University Press.

Every idea contains the seeds of a huge point of view that might rule all the others. For instance, members of almost every academic discipline believe that their discipline is the most important; and that their theories, or the ones they accept, are the most important.

Not Forcing Structure

Information is not simple, and it is a mistake to try to structure or simplify it arbitrarily. Unfortunately, there are various traditions that force conceptual structures where they do not belong.

It is vital not to express information any more specifically than you intend, not to force people to say things in a way they do not mean; and not to insist on descriptive structures that are inappropriate just because they are easier to express. To borrow a humorous word used by social scientists, it is all too easy to "reify" these idea structures—that is, mistakenly think they are more real, important, sharp and significant than they are. (I believe this was the main substance of the much-maligned philosopher Albert Korzybski.)

Hierarchies and Categories

Hierarchy is a very bad idea that comes from a naive view of ideas.

Because some things are hierarchical, there are traditions of making and insisting on hierarchies at all times. There is a starkness and simplicity about hierarchies that some people find all too compelling.

Categories, too, can be highly misleading—if we think they divide the world sharply, when they don't. Categories can easily lead us astray. It is not that categories are wrong, they are just rarely as accurate as we think. Once we divide things into categories, we are led to imagine that they are sharp and distinct, when often they are not; often keeping us from seeing things as they are because of this oversimplification. And then we use these artificially sharp categories for administrative divisions and other forms of action, which can have results we would not have intended.

Most of the things that people describe and model with hierarchies and categories are overlapping and cross-connected, and the hierarchical and categorical descriptions usually miss this. Everything is much more likely to be interconnected, overlapping, cross-connected, intertwined and intermingled (I like to say "intertwingled").

Hierarchies of categories can be interesting, but they're usually artificial—although occasionally they represent real structure (e.g., Mendelejeff, Linnaeus[1])—but these are lucky cases.

Some people really believe in the rightness of hierarchical and categorical thinking, and insist on dividing, forcing and hard-structuring whatever they see. They try to force others to be more specific than the thoughts they are trying to express, and to divide things into much simpler categories than they want to.

For example: the divisions between educational "subjects" are artificial. They are arbitrary map-lines on a sea of interconnection. And the hierarchies of curriculum and teaching—the order in which things are supposed to be taught—are largely artificial and unnecessary.

(We will get back to what hierarchies and categories—the artificial structures of files—have done to the computer world.)

Documents

Documents are media objects with points of view. (I am broadening the use of the term "document" to refer to movies, symphonies, restaurant menus, diaries, photographs, magazines; any media package that someone creates, which therefore has a point of view.) A document often presents a point of view on some perplex.

There is no way *not* to have a point of view, whether you know it or not.

I stress this because some people think there are objective and factual documents, documents that only keep a record. I must disagree.

Many authors are unaware of the point of view that they are expressing, because they think they are being honest and objective. This is not necessarily obvious as you read what is written today, because you share the author's point of view to a great extent. It is much easier to recognize strange points of view from the past, such as writings of five hundred years ago, from points of view that now sound strange.

We can always hope and believe that we have found the truth, but on a practical level we must allow each new point of view to be expressed, and considered. While it is nice to hope your document expresses some sort of final truth that we may actually know, the only reasonable assumption is that later documents will change people's views, over and over, forever. The attitude of librarians has to be "Keep it coming, we'll deal with it all."

The scary alternative is a dictatorial state, perhaps one run by religious extremists, that enforces one point of view and suppresses all others.

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[1] In case you've forgotten, Mendelejeff found that all the chemical elements fit into a hierarchy of categories; Linnaeus found that all the plants and animals fit into a hierarchy of categories. But these discoveries caused great hierarchy fads, goading people to look for hierarchical categories in a lot of places that they did not turn out to exist.

But there is a more subtle alternative, which we are used to and don't really notice. This is to hide disagreement and make the different viewpoints appear compatible by forcing them artificially into an overall viewpoint.

This is what libraries do.

Libraries create the illusion of order by putting the books in rows and dividing them into categories, even though the categories may not match the thinking of any of the authors.

So a library is *also* a point of view on a perplex, but a broader one—that puts each author in a place the author might not like. Libraries stay useful in large part because of the cleverness and dedication of its practitioners in the face of the complete and categorical impossibility of what they are attempting.

Ideas vs. Information 2.3: A Philosophy of Words

Words are wonderful tools and playthings, but you can cut yourself on them. It is important to understand their difficulties and their edges.

Words, on a smaller scale than documents, are encapsulations of points of view.

It is important to make up new words often.

The reason is simple: existing words create a conceptual lockup. It is very hard to think new thoughts if you use old words, since those words have been well worn and fit together familiarly.

Existing words channel thought, warp perception and hypnotize people. Problems are always formulated in the old words, and people go around and around trying to think of the solution in terms of the same set of old words.

But the solution to a well-worn problem is not found by thinking in the old ways. It lies in finding new ways to think, and thinking new thoughts.

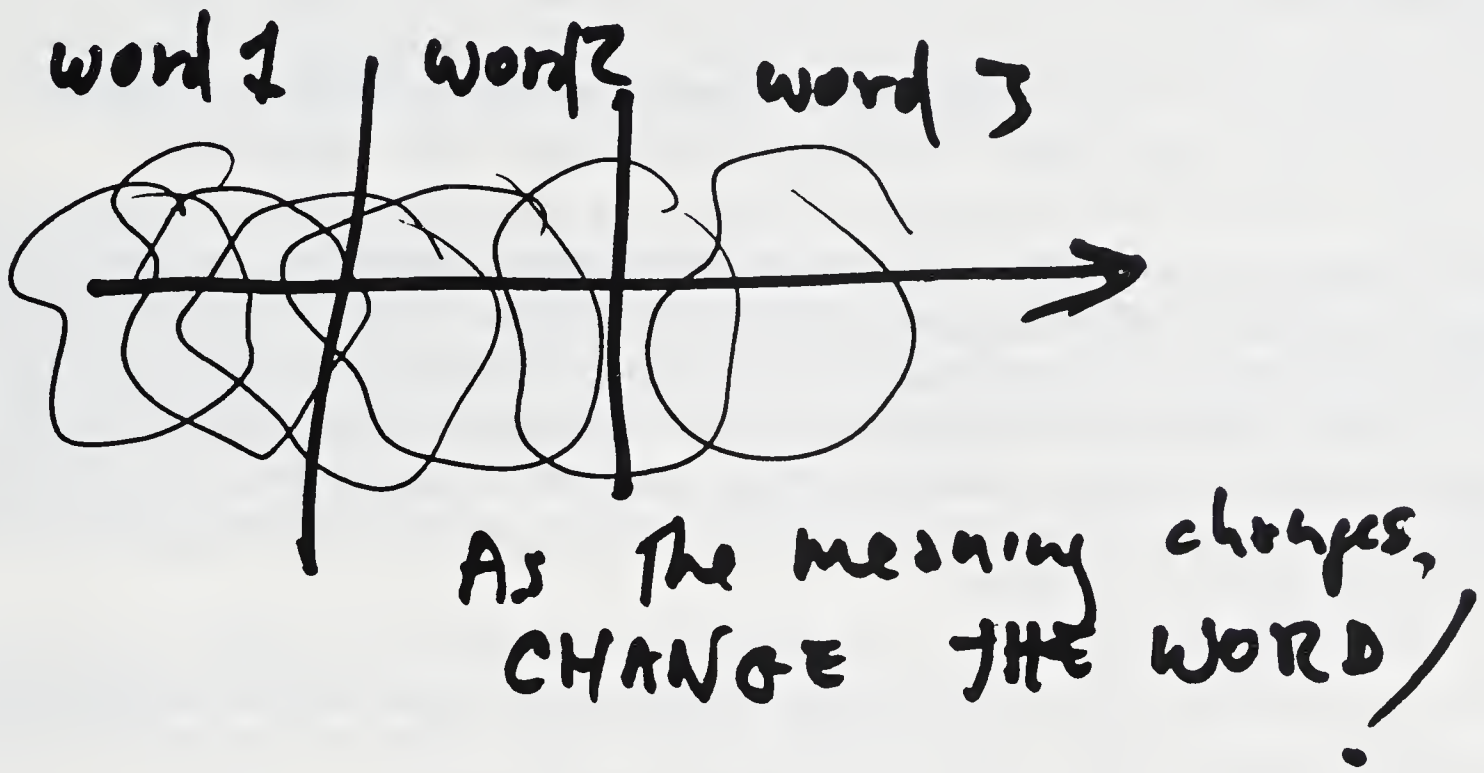
The ideas will gradually change as you think.

And you must try to express these thoughts *exactly*, instead of forcing the new idea into the old words. (This is a problem I will return to repeatedly.)

Your concept in June may be different from the way it was in October, and the notes you write in October can seem strange in the light of June's new meaning.

Recognize this.

The best rule: if you change the idea, change the word.



A very good strategy is to make up a word that has not been used before.

That means that people are not going to argue with you about what the word means, because you are *telling* them what the word means, since you made it up. That is your privilege if you make up a word. To quote Lewis Carroll's Humpty Dumpty, "A word means what I say it means—nothing more, nothing less." Thus the rule I recommend, make up a new word for every new meaning, may be called the Humpty Dumpty rule of new words (neologisms).

Of course, a big problem with new words is that people resent them. This is quite understandable: people see new words as threats to their points of view—which they are.

And getting words right is *hard*. As Mark Twain said, "The difference between the right word and the almost-right word is the difference between the lightning and the lightning bug." This is true whether you're choosing familiar words as you write, or trying to invent a new one that's appropriate for a certain idea.

Inventing words is difficult: you want the right connotations; you don't want them to ring wrong. You want to hit the center of what you mean.

These were some of my concerns when I coined the term "hypertext" in the sixties. I think I chose that one right. The word "transclusion," which I have been using since 1987 or earlier, pleases me less; so in this book I am using the term "hyper-sharing" instead. Its connotations seem better, and it allows me to clarify some of the ideas further.

Computer people have mis-chosen a number of words. "Computer," for example, was a very bad choice and confuses people even today. (Von Neumann more appropriately called it the All-Purpose Machine.) "Word processing" (you don't *process* words, you put them in, move them around, take them out). "Desktop publishing" is a romantic but inaccurate word for what is still called in the publishing business *layout*. ("Publishing" is an important term for something entirely different, the important thing that publishers do: *make things public*.)

But the most evil choice of words in the whole computer field, I believe, was the choice of the words "cut" and "paste" for that evil structure, the "clipboard."[1]

"Cut and paste" has been a term used by writers for decades, possibly centuries, for the process of separating pieces of a manuscript and rearranging them. This is a parallel process, in which you look at a lot of pieces on floor or desktop. To name the nasty serial functions of the "clipboard" with these holy words representing all that is finest in human thought is a desecration of the language, and perfectly shows the technoid mentality. Those two clipboard functions would be better called *hide* and *plug*. I would advocate even more unpleasant terms.

Most people are not careful with words, so words get very loose, and the meanings of words slide around considerably. With words we try to say what we mean, but what we mean keeps changing and the words keep changing as well.

Ideas and words and categories are in constant change: with scientific development, with social change, with arbitrary and random changes in language, with changes in fad and style, with changes in ways of thinking. To expect ideas and words and categories to hold still, or imagine that "vocabulary control" can hold ideas in place, is naive. Stable vocabulary means a frozen point of view.

Ideas vs. Information 2.4:
A Philosophy of Design (and of Writing)

Design is perhaps the paramount activity of the human mind. Design means putting things together by intent. You can design a house, a government, a table setting, or your plan for the day. In all cases you usually look in parallel at alternative combinations of possibilities—although you may not be aware of the possibilities you select and discard.
The general problem is to *get the ideas right*. And getting ideas right is *hard.*

Writing is a case of design. So is film-making. So are most other creative activities. (However, "writing" is a very important special case of design, since there is so much

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[1] The "Clipboard" on the Macintosh is just like an ordinary clipboard, except you can't see it, it can only hold one object, and putting a second object onto it destroys the first. It is like an ordinary clipboard *in every other respect*, except there aren't any. This is called a "metaphor." Not only is the Clipboard one of the most uncivilized and destructive phenomena in all the software world, but designing software in terms of such shallow resemblances, or metaphors, is one of the *other* most uncivilized and destructive phenomena in all the software world. See Chapter 3.4, "Virtuality."

of it, and since we must all do so much of it, and since there is no end to it.)

Possibilities and Magic

Since childhood I have been a fan of Buckminster Fuller, a unique designer of this century. His central idea, at least as I absorbed it at the age of eleven, was that good design can make things much better by making them very different. He believed that even if you are seeking conventional objectives (like transportation and shelter), you should should consider very unconventional designs.[1]

I have always seen the computer as a chance to break away from the old ways of doing and seeing things. The higher objectives of human communication, and the clarification of human thought, required—I have thought—computer tools which are far different from the paper tools with which we have been familiar. The computer enables us to build new structures of information, new topologies, that will better serve our old needs. (This is very different from the "metaphorical" approach taken by most other software designers, in which paper is actually imitated; see Chapter 3.4, "Virtuality.")

To this I have added a second premise: that there are magic combinations, unique design structures which have unequaled properties.

Many design combinations are unique. Four wheels on a car, horizontal airplane wings—these are design configurations whose properties are uniquely workable; there is seldom a good reason to change them.

But the magical combinations are balances which have even sharper properties of goodness.

Circular wheels, for instance.

Another fascinating example that I read about in high school was the superheterodyne radio. Before the invention of the superheterodyne radio during World War I by Major Edwin Armstrong, it was necessary to tune a radio in two places simultaneously, and they had to be carefully matched. But Armstrong's design managed to use only one tuning method by doubling the use of the same circuitry.

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[1] His three major designs were the Dymaxion Car, a fabulously efficient three-wheeled car built in the 1930s which was a business failure; the Dymaxion House, an extremely efficient factory-built home, also a business failure; and a family of geodesic domes, which finally achieved wide success in the nineteen-sixties.

This was a unique and magical combination; a design used in all radios, even today.

But such magical combinations are not easily found. In order to find magical design combinations you must consider a lot of others; or, as the saying goes, "Before you find your handsome prince, you have to kiss a lot of frogs."

You need to study and understand a lot of design alternatives in considerable detail.

Ideas vs. Information 2.5: A Philosophy of Movies (and Software)

Movies are the art form of the 20th Century. Movies have defined the twentieth century, celebrating our dreams and recording our atrocities. Movies have in many ways replaced the religions of the past, in providing visualizations of the right and the desirable.

Here are some propositions about movies and software I would like to bring to your attention.

Interactive Software is the New Generalized Movie

Movies are systems of events on a screen that affect the heart and mind of the viewer. Software—even office software—is a system of events on the screen that affect the heart and mind of the participant, and interact with the participant—who is no longer a mere viewer.

That means that software is exactly what movies are, and more. Software is not just a branch, but the *generalization* of movies, not metaphorically but literally.

So that the main concerns in software development, as well as movie making, are its effects on the mind and heart of the viewer.

And that what you need to know to create software begins with all the previous objectives and techniques of movies.

Directing: Unifying the Effects

Movies—and software—are structures and events that affect the heart and mind of the user. Movie directing is unifying the variety of film techniques toward this overall result.

The movie director does not have to know how to sew the costumes, hang the lighting, load the camera, or play in an orchestra. He need not even be able to act. But the good director knows how to bring together all these different techniques to coordinate a unified effect for the user's experience.
Though film schools try to teach it, there is no particular training required to be a director. The work takes determination, visualization, planning ability and especially

talent.

Software As Yet Has No Director

The software world currently corresponds to the Pre-Director stage in movie-making (1893-1904). During those years, when short films were already being shown in theaters, the job of making the movie was given to the cameraman—because he knew how to work the equipment.

That is how it is with software today. Today's software designers are those who only understand the technicalities, and not—with rare exceptions—those who understand how to integrate the presentation of ideas to the mind and heart.

That changed in the movie business about 1904, when D.W. Griffith showed that the talent required to make a movie was very different from the technical skill of working the camera: it required a new, unifying ability to weave many parts into a whole.

But the disjointed character of most software today does not weave many parts into a whole. It's usually a clutter of disconnected parts. Usually the different parts of a package have been made by different people, and they generally get to design their own interface for the part they program. No one has the authority to integrate the different parts.

The result is the present software chaos. The political compromises necessary in today's software development environments create a "too many cooks" situation; the results are confusing compromises. (It is entirely possible that some of the individuals involved would be able to design good software if given the job alone.)

Video games, interestingly, are far better integrated and have much better performance than office software. I think this is because people who program video games love them, and care about the ideas, look and feel of the resulting product. I doubt that anyone who programs word processors really loves writing. And that is the main difference.

This all means that the proper training for software design has rather little to do with what is taught under the name "computer science," and everything to do with what is taught in film school. Thus those who want to design software should study movies, and perhaps go to film school rather than study computer science. But this also means that the film schools should prepare for their proper role in the teaching of software design.

Everybody Wants to Direct; It Turns into Politics

It is a commonplace saying in Hollywood that "everybody wants to direct." It is also well understood that very few can; that is, very few can direct well.

Everyone wants to direct, and everybody thinks they have the talent; so who gets to direct? That's what Hollywood is about. It's all about the politics of who gets to direct,

and control, the making of a movie: raising the money, who gets to make the creative decisions, who gets final cut.

That is why the software industry is becoming like Hollywood. Because the issues are the same: raising the money, who gets to decide the story; who gets final decisions. And that's why Hollywood is in some ways merging with the software industry.

The Theory of Virtuality

The theory of virtuality is my proposed generalization of movie theory to explain the proper concerns, and procedures, of software design. (See Chapter 3.4, "Virtuality.")

Chapter Three
Heaven, Hell, and Structure

Heaven, Hell, and Structure 3.1: Computer Religions

There are hundreds of different computer religions: deeply held views of what the computer is and should be in our lives, and what kinds of systems to build around it.

The way to recognize a computer religion is by strong views like these:

"My ideas are the most basic.
"Everything else can be expressed and implemented using my ideas.
"Because my ideas are the most basic, they should be put in at the most basic level, i.e. the operating system.
"In other words, I should make up the rules of the universe."
And so,
"YOU SHOULD IMPLEMENT YOUR SYSTEM ON TOP OF MINE."[1]

Only a very few people get to build computer universes, putting their ideas into the operating system. These are a lucky (and hardworking) few: Ken Thompson and Dennis Ritchie, the creators of Unix. Gary Kildahl, who simplified the Unix concepts into CP/M for the early personal computers. Steve Wozniak, who created the (wonderfully inconspicuous) operating system of the Apple II. Steve Jobs, who led the teams creating the Macintosh and NextStep. Dave Cutler, who created both VMS (the Digital Equipment VAX operating system) and now Windows NT. Richard Stallman, who created the personal operating system Emacs. Jef Raskin, who created the anomalous and interesting "Canon Cat." And of course Bill Gates, who didn't create MS-DOS (he bought it cheap) but himself directed the creation of Windows 95. And a few others.

The rest of us have to be content with creating mere programs that must run under the rules of these universes that others have created. But many of us wish we could structure the universe the way it *should* be.

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[1] Note that this gets into simultaneous issues of status, territory and paradigm, which I wish we had room to discuss here.

Heaven, Hell, and Structure 3.2: What Computers Are For

Computers are not rigid in their operation. You can make a computer do almost anything, if you design its plan—or its program—carefully and cleverly enough (and if it is not impossible because of laws of logic or mathematics).

In that case, the question is how we should design our interactive worlds.

The interactive worlds we are used to, on the screens of our PCs and Macintoshes and Unix systems, are all pretty much the same design. A lot of icons, or little pictures, are on the screen, and may be moved around. If you click on them, they turn on specific programs, or perhaps open up as windows of text.

The people who came up with this basic design said that beginners needed familiar ideas they could relate to. So the icons have been made to look like file folders and garbage cans and sheets of paper. And when a word processor window opens up, it behaves very much like a sheet of paper in a typewriter. It's two-dimensional and rectangular. (The text can behave like a liquid, and be rearranged easily, but otherwise it's very like paper.)

Now, this kind of design—based in the past—is not the only possibility.

I believe there is no reason to make our screens behave or look like anything previous. We can design entire new imaginary worlds. Video games like "Pac-Man" and "Tempest" and "Tetris," are interactive, imaginary worlds quite unlike normal reality—and even beginners manage to deal with them quite well.

Ideas and Computers

As I said earlier, ideas interconnect every which way. Ideas can be structured and changed every which way. And computers can in principle deal with arbitrary constructs of any kind. There would seem to be a natural fit between the two: why can't computers be set up to represent our ideas exactly?

This is not how it has worked out.

Certain ideas are locked into the designs of today's computers. Like "hierarchy."

Other ideas are locked out.

For instance, *connection*. There is no general way to link a comment permanently to a computer file, or to create persistent connections between any two files. You ought to be able to make a connection between files, and presto! —wherever in your system one of them went, the other one would know about it.

No such luck. Files are naked and unconnected. If you want to set up a connection between files, it has to be inside some *other* file, by some method you must choose or create. They will tell you God intended things that way. That's because connection was

left out of the operating system.

The principal function of the computer should be maintaining connections—not just connections between files and hypertext pages, but the connections we want to represent for our minds.

Because paper is not good for representing, or visualizing, complex connections. (If you try to draw them on paper, the lines get very dense and have to be redrawn, and it becomes impossible.)

On a computer screen, though, you can show diagrams with thousands of glowing lines; they can even stay connected as parts of the diagrams move. (I'm assuming a hot 3D system, which I think will soon become the standard.)

With the computer we can design information structures to represent anything we can think of; even human thought in its fullest complexity.

That is what I am advocating. Rich and accurate representations of our mental contents. The fundamental information problem is to keep track of ideas, and represent them, accurately.

The principal function of the computer should be maintaining connections; especially, the rich connections needed by our minds. In vast numbers. And to show them to the human mind in ways that can be understood.

That, to me, was always the point of hypertext—

- We need to intercompare and re-use ideas in detail.
- We need rich systems for tracking ideas, showing them accurately, allowing us to change our documents (our ideas) by degrees, and show the differences.
- Hypermedia and visualization tools should be used to represent, not just simple ideas, but the differences among rich ideas and diverse points of view (the Rasho-Mon principle).
- We need to represent, and show, complex diagrams and texts *and their variations*, so as to show the differences between them. We need rich systems for showing ideas, the equivalent of multilevel portable glass whiteboards.

I said all this in my 1974 book *Computer Lib*. So far I still have not seen any systems of this type.

For some reason we have intentionally built our information systems around categories and hierarchies—file systems chosen for their starkness and simplicity—and we require people to fit all their work and ideas on the computer into these nested boxes.

In other words, most of computer practice—and much of information science—has concentrated on these trivial and misleading cases!

We make users chop and constrain their work to fit in hierarchical directories (though softening the difficulties slightly with extra file pointers, like the Unix "soft link," the Macintosh "alias" and the Windows 95 "shortcut").

But the point is to keep track of, and represent ideas exactly, not force them into structure which does not fit.

But that's not how computers work today.

Heaven, Hell, and Structure 3.3: It's All Wrong: Today's Horrible Computer World

Today's computer world is one of the great miracles of human history. The ever-falling price of electronic circuitry—predicted with astounding accuracy by Gordon Moore of Intel in the nineteen-fifties—gives us faster and cheaper computers every year, with which we can in principle do more and more things better and better, improving our lives.

But we can't really, and we don't.

Everyone has learned to accept horrible conditions imposed on them by software designers, and to believe that is how it has to be.

In the first edition of my book *Computer Lib* (1974), before personal computing, I said that computers were oppressive because of the thinking of the people who made them. In the second edition (1987), after personal computing had become established, I said "Now it is possible to be oppressed by computers in your own living room."

This has only gotten worse.

All the things I tried to prevent in *Computer Lib* have come about.

You do not own your computer. It owns you. You do not control your software. *They* control it, whoever made it, trying to capture your data in "black hole" applications that you'll never convert it back from. You are forced to upgrade software, even if you don't like the new version as much.

Newcomers keep hoping the computer will help them organize and reduce the complication of their lives. Sorry. On the contrary, the computer is likely to bring much greater disorder to your life. Rather than help you keep track of things, it requires you to keep track of more different things than you have ever had to keep track of before.

The personal computer as we know it is a preposterous device. It needs a great deal of attention. Owning a personal computer is like owning an expensive sports car that needs a weekly oil change and a new transmission every three months. Unlike a television set, which just sits there and performs when needed, it must be catered to and worshipped and bowed down to and obeyed. Hundreds of software install disks and registrations must be maintained to back up the system when it crashes, as happens so often.

We take as evidence of progress that people buy huge quantities of software. But the reason people buy so much software is that it's all so lousy and disappointing. Like searching for the right lover, the poor customers haunt the stores, each searching for something they think is simple and clear, and never getting it. (But unlike the perfect lover, the software that people really want could perhaps easily be created.)

This dark side is not mentioned so much.

It is often said that if automobiles had improved as much as computers in the last fifty years, automobiles would now cost a hundred dollars, go at the speed of light and travel a million miles for a dollar's worth of gas.

That's the good side of the analogy.

On the other hand, if you had such a magical car, like today's computer, it would also stop suddenly at unpredictable and very inconvenient times, it would suddenly fall apart once a month so that you would have to put all the parts together again, and you would have to keep original warranties and paperwork on a hundred separate parts. You would also have to replace dozens of these parts a year when new ones became available.

And if you were driving such a car with your family in the back, and it stopped suddenly, your family might simply be gone forever.

It doesn't have to be that way.

A Great System of Lies

The computer field is a great system of lies.

The computer people tell you that software—the plans that make computers do what they do—is "technology," and do their best to make you stupid for not understanding it.

This is both false and wicked.

The design of the things the computer does is called *software design*. Software is a new art form, usually very badly mangled. And it's not really about technicalities in the old sense.

When you learned to fix a car, if you ever did, the parts of the engine had specific functions because they had been engineered and re-engineered over the years to work well. There are technical reasons for every aspect of an engine.

It's not that way with programs.

Computer programs deal with made-up ideas that the programmers figure out in their minds. These imaginary constructs make sense to the designers and so they think they

will make sense to you too.

This means that most of the "technicalities" you deal with on computers are imaginary constructs that came straight out of people's imaginations. And if you "don't understand the technicalities," that is usually because you don't think the same way that the designers did.

Now, these imaginary constructs are neither true nor false. The real question is whether they are convenient or useful, whether they are easy to use or complicated.

But this is not the way they are presented to users. They are presented to users as *real*, *necessary*, and *true*.

And that is false.

It starts at the beginning. So-called "computer basics" are mostly lies.

They tell beginners that the basic types of software are "word processing, spreadsheet and database." In fact, each of those is a system of artificial constructs, constructs which have become popular and seem to make sense, but for which alternatives have scarcely been tried.

Here's a real lie. They tell beginners that computer files are necessarily hierarchical. Wrong. Computers have been very carefully and intentionally set up with hierarchical files *because their guardians haven't come up yet with a better conceptual structure, and believe that is the right way for them to be*. Hierarchical files were a cheap hack of an idea around 1947 that has come to be treated as God's Will. The fact that projects overlap and categories overlap is not reflected, as it should be, in the system of filing.

And the maintenance of computer files is far more difficult than the maintenance of files on paper.

There are many strange and stupid things about the present system of storing and modifying data, but we accept them as if they had been decreed from heaven. You have to name things unnecessarily and with silly restrictions. They must have absurd names and be put in absurd places. You have to back them up and take care of the backups like tender flowers. (No good automatic systems are available.) You have to keep multiple copies of things for safety, but you *cannot easily be certain that they match.* And for every saved file you must have its parent software package, like having to keep the original typewriter in order to read what was typed.

Another example, at a less deep level, is "fonts."

To use a variety of fonts on the Macintosh, you have to deal with and understand: bitmap fonts, Postscript fonts, Truetype fonts; fonts loaded in the operating system as distinct from fonts installed in a particular program; locking of fonts, unlocking of fonts. And Font Suitcases.

All of these are imaginary constructs. They were made up for reasons of commerce and convenience. But they are presented to users as if they are *real*, rather than a bunch of

incompatible ideas that we've accidentally gotten stuck with for marketing reasons, that nobody has had time or authority to make better.

Each of these things made sense at the time it was created, because it was being added to the situation at the time. But there has been no way to start over, clean and fresh.

Today's interfaces, too, are imaginary constructs that were made up because people thought they made sense and were easy to use—not because they are technically required. They tell the beginners that the necessary design of software uses a so-called GUI, or Graphical User Interface. This is completely misleading.

The term "graphical user interface" sounds nice and general. But only one style of graphical interface has even been tried! Graphical user interfaces are possible that could be completely different, and (I believe) much better.

A lot of these imaginary constructs make sense on a small scale, but become more difficult as the scale grows. Spreadsheet is one of these. Little spreadsheets are very useful, but big ones are nearly impossible to work with.

Word processing is another idea which makes sense on a small scale but gets much worse as it grows. Authors and editors need complex organizing tools which simply do not exist. And the World Wide Web, which has grown to a vast scale, is based on a hypertext coding system that is manageable only on a small scale—and is now a total mess to work with for multiple pages.

These are *all issues of the artificial ideas and constructs that computers have been set up with,* the ramifications of imaginary ideas and the tangle of their unforeseen consequences. In other words, the construct logic of made-up ideas. But users and citizens are not encouraged to think of them that way. We might complain.

The problem is that most software design is dreadful, almost no one is doing clean design, and most software designers haven't the faintest idea what clean design would *mean*, let alone what people need.

Heaven, Hell, and Structure 3.4: Virtuality (and Designing It)

Software design is not generally well understood. I believe that inspired software design is art and not technology.

I believe it can be much better understood in terms of movies and the philosophy of ideas—what I call the Theory of Virtuality—than in terms of computer technicalities.

Software design is really the design and presentation of worlds of imaginary ideas, in the same way that a movie is the design and presentation of an imaginary story world. To make a movie, or to design software, is to design virtuality.

But most movies take place in a world of human beings, or something very like it. Software design is more concerned with imaginary structures and their imaginary rules of order. It is an art form concerned with the design of abstractions. But in both cases the imaginary world must be presented to somebody's mind and heart, and this is much more like making a movie than it is like teaching algebra.

The Theory of Virtuality

What I call the Theory of Virtuality is the generalization of movie theory: what it means to unify ideas and effects.

"Virtuality" has always meant the opposite of reality: what something *seems* to be—its ideas, apparent character or illusory qualities.[1]

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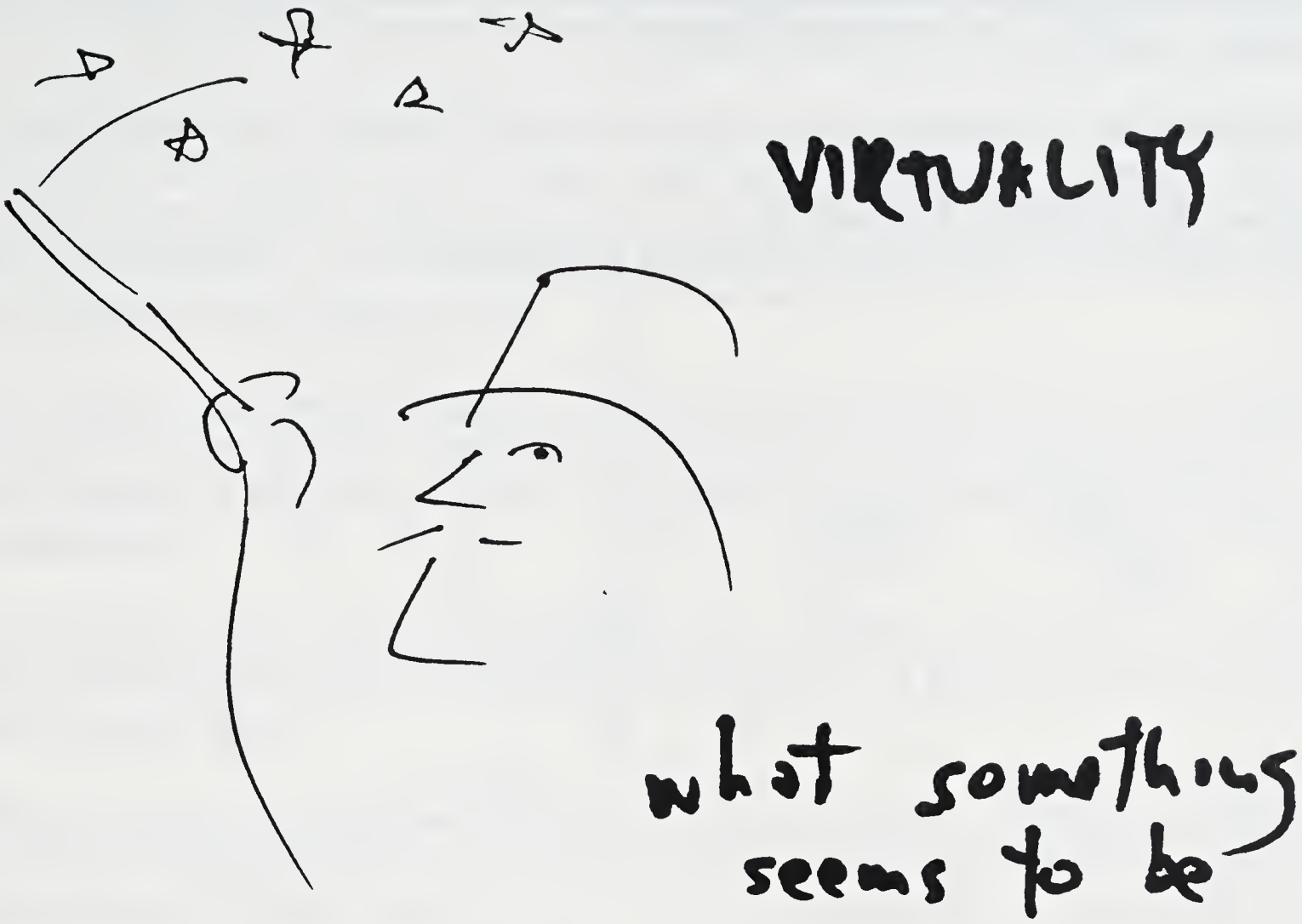
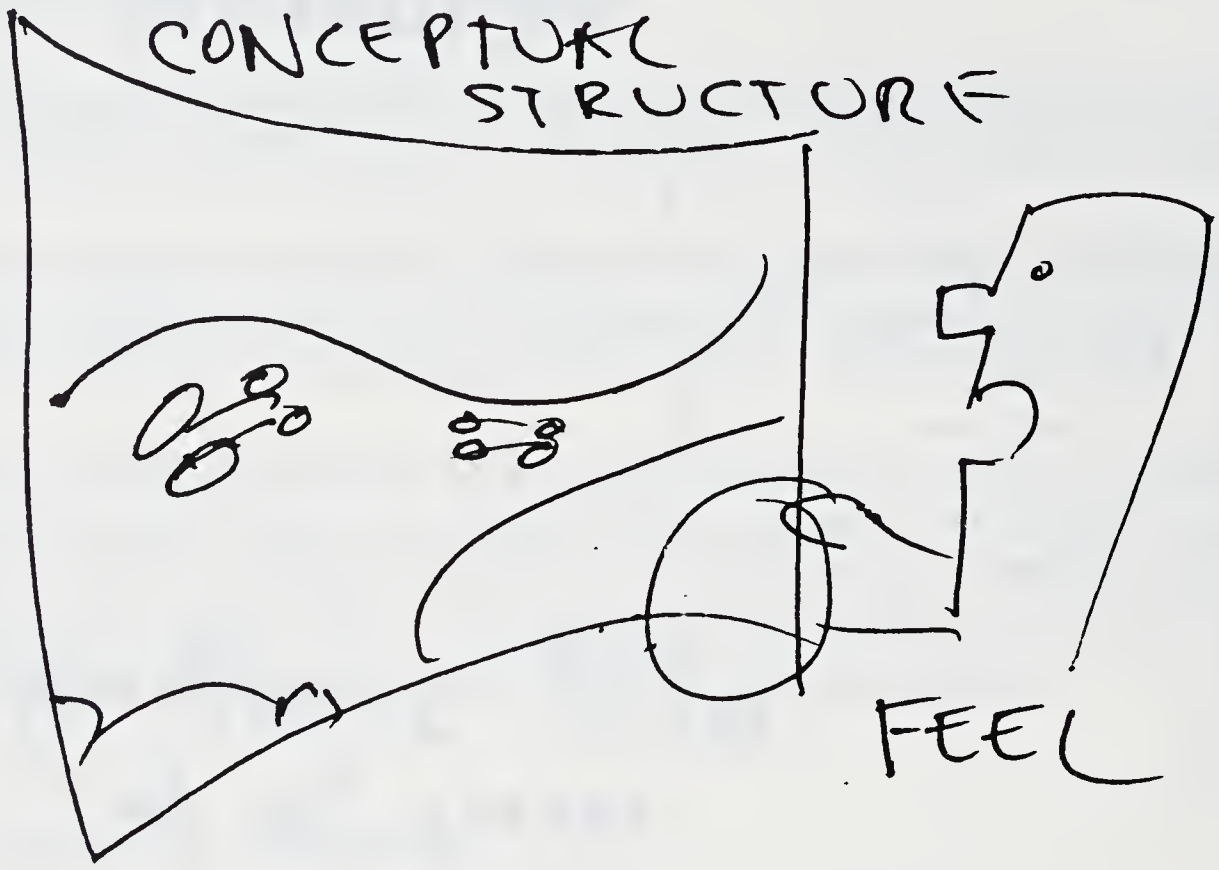
[1] I received a letter from some lawyers in England stating that "Virtuality" was a trademark of their client, and would I please stop using the term in my lectures. My reply (which I have not gotten around to sending) is as follows: I have been using the word "virtuality" for this theory since 1976, and thus I have established a usage which the more recent trademark cannot dislodge. However, on the advice of legal counsel I must also mention that "virtuality" is defined in my 1919 Webster's *New International Dictionary* as "Quality or state of being virtual, or existing in essence or effect, but not in fact." However good these lawyers, their new trademark cannot obliterate a fine old word.



Everything has a reality (its technical nature, exactly statable) and a virtuality (what it seems to be). A building has a reality (concrete, glass, steel and whatnot) and a virtuality (such as “jagged modernistic”).

Virtuality has two parts: conceptual structure and feel. By conceptual structure I mean what a person thinks about while using it. By feel I mean its subtler nuances, qualities to the senses, variations from similar objects.



For instance, all cars have the same conceptual structure (forward and back, left and right, start and stop) but the feel of different cars is very different. The handling, smell, polish, acceleration and door slam of different cars have very different feels.

Some things are *all* virtuality, like a movie or a video game. A movie has a *conceptual structure* (the plot of the movie) and a *feel* (the moods and pacing of the film, its humor and suspense and mise-en-scene). A video game has a *conceptual structure* (the world of the game) and a *feel* (the smoothness and play qualities of the video game).

What software design really is about, then, is ideas: the creation of an imaginary world and its rules of order. (A kind of movie.) Software is about the presentation and manipulation of these ideas—presenting this imaginary world and its rules of order to the user, and making them as clear as possible. (Some of those ideas have consequences in the real world, such as the state of the user's files, so the user's understanding may be important in ways that in a video game it is not.)

In a movie, the conceptual structure (originally the script) is mostly created by writers, but *detailed* by the director in the course of implementation. In this implementation, the conceptual structure and intended feel are gradually translated into specific pieces of film and audio. There is a constant negotiation of possibilities: what the director and producers want, and the particulars they have to settle for.

Though the intended feel of the movie may have been clear from the start, it only gets that feel through the complex execution of the movie-making process. The feel is a complex and rich outcome of the many details which have been chosen. (Constant reconsideration is involved as details are chosen and their effects are better understood. The plot often has to be adjusted during this process.)

In software design, the conceptual structure of the software also acquires its detailing in a long process of translation, execution and reconsideration.

The conceptual structure is detailed in the process of programming it, as the original ideas are mapped into specific mechanisms. Similarly, the feel is a complex and rich outcome of the many details which are chosen. As with movies, there is a constant negotiation of possibilities, and the intended concepts and qualities must continually be adjusted according to the results so far.

A software world can be designed from scratch, and the detailing of its conceptual structure may take a lot of work. I call this work *construct logic*—designing the conceptual structure of imaginary worlds, imaginary constructs and their imaginary rules of consistency.

(Winning constructs will no longer be imaginary in quite the same way, of course, because they will become part of the fabric of our lives—as word processors and spreadsheets already have.)

Most software designers have been trained in computer science, which (according to this analysis) is an inappropriate and irrelevant form of training. What counts is not the mechanisms of the computer, but rather *the structure, usefulness, comprehensibility and aesthetics of the ideas of the imaginary world*. It is the imaginary world that is the concern, and not the technicalities that bring it about; just as in a movie, the story is what the director is trying to create, and the mere mechanisms that create the effects of buildings and dinosaurs and rocketships shown in the picture are irrelevant to the story being told and the atmosphere being created.

Of course, if you don't know something about programming, your designs won't work, just as in movie-making you must know something about the film-making process. But this level of knowledge only needs to be rudimentary. The world of the software designer is the world of the imagination.

Old Information Forms

In this new world of new constructs, we do no have to accept the information forms that we have inherited: the sheet of paper, the file card, the file folder, the book. Maintaining these structures is like driving an airplane on the highway: holding back the highest potential of the system by using it in a simpleminded fashion, abandoning its great potential (and additional dimensionality) in order to maintain an old conceptual structure that only holds us back.

Right now there are only a few families of software, and they are all extremely similar, most having been designed around the Xerox PARC school of interface. The interfaces in current use ought to be called not GUIs but PUIs, or PARC User Interfaces, since they are all imitations of the interfaces designed at Xerox Palo Alto Research Center in the 1970s. They were a wonderful innovation twenty-five years ago, but they have gotten stale. I believe they have reached the limit of their usefulness, and that we need new and entirely different screen constructs.

Highlights of the current environment include:

- the simulation of familiar office objects, such as sheets of paper, file folders, paper clips, envelopes—to "make the user feel at home;"
- a type of simple window not showing connection to other windows, and variously decorated with standard widgets such as elevator, go-away box, expansion box;
- icons, little pictures on the screen representing various things;
- "folders" as representing conventional hierarchical file structures;
- "metaphors," or comparisons with familiar things (such as file folder icon, desktop metaphor, garbage can metaphor).[1]

But software could and should be entirely different.

The computer, and its interactive potential, make it possible to have entirely new structures, leaving the restrictions of paper behind (2-dimensionality, overlap, size restriction, page structure).

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[1] The "metaphor" issue is important. Right now people are using "metaphor" for any possible description of software—"spreadsheet metaphor," "museum metaphor," even "hierarchical metaphor"—but I believe this is an extremely damaging and unproductive word.

The conceptual structure of software needs to be examined and understood in considerable detail to make any sense of it. Several different operating systems using the "desktop metaphor"—the Macintosh, Windows 3.1 and X under Unix—are entirely different in detailing and feel, even though they all superficially share the same "metaphor." The extreme differences in controls and handling smoothness among these three make them entirely different to the user.

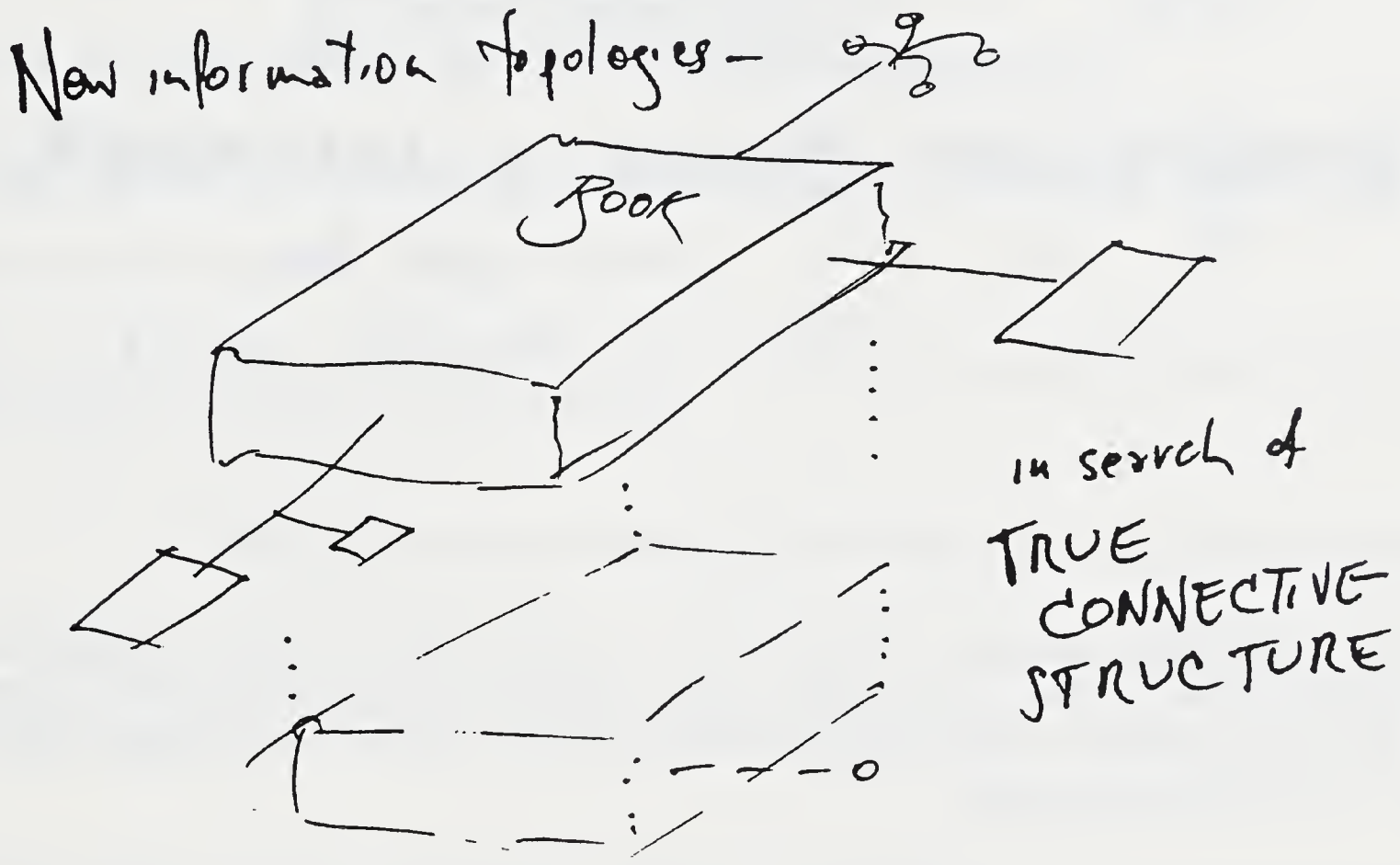
Why it is called a "desktop metaphor" is in no way clear. Very few desktops are vertically mounted, or have overlapping sheets of paper which leap to the front when you touch their corners. Nevertheless these are features of the "desktop metaphor."

I would like to restrict the term "metaphor" to its everyday use, "implicit analogy." Thus we have a garbage-can metaphor and a desktop metaphor, but hierarchy and spreadsheet are not metaphors; they are *structures*.

I believe we must seek some *truer* structure, without being shackled to, or misled by, the accidental vessels that have been used before. The notion of representing paper, and file folders with their hierarchical structure, seems to me insane: at last the computer allows us to *escape* from 2-dimensionality and hierarchy; why should we walk back into that prison?

We can and should be free to design software with any imaginary constructs whatever, without limitation, just as we design games.

The issue then becomes: what things are humanly useful? And what is their truest structure?



Comparison metaphors push the design in certain directions, and greatly reduce the design possibilities. I believe that deeper and powerful designs will look like nothing we have seen before. It is these designs I want you to imagine.

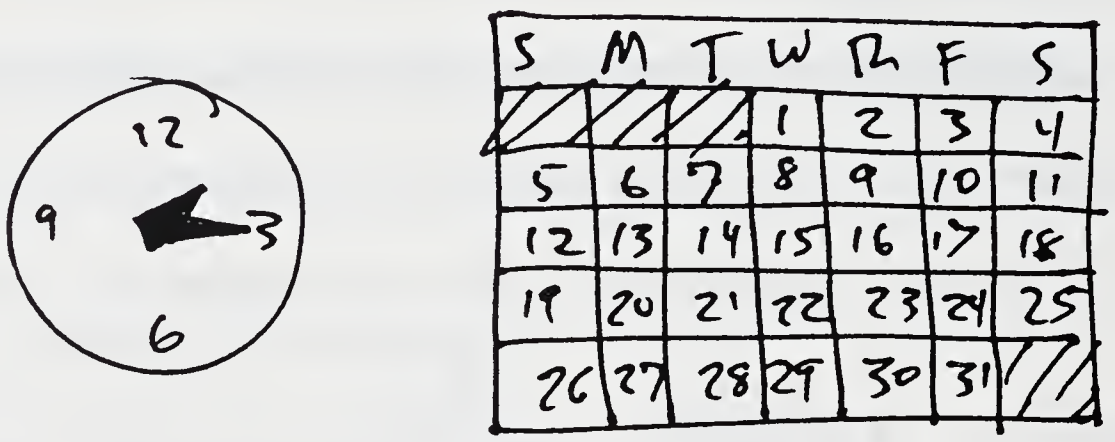
Clocks and Calendars

Let us consider clocks and calendars. Clocks and calendars are ways of visualizing cyclical phenomena. A clock helps us visualize the time of day, and its relation to the time past and remaining of the day, time till sunrise, lunch and so on. Somehow it helps us visualize the whole twenty-four hours, even though by convention it shows only half of the day at once.

A calendar is another device for visualizing cyclical relations. Among cycles that we

have to keep track of are the *week* and the *month*. The calendar tells us how long it will be till payday, till a birthday, till the weekend.

Today's "metaphorical" software will show you a 7x5 calendar and a circular 12-hour clock, because that is what you are used to.



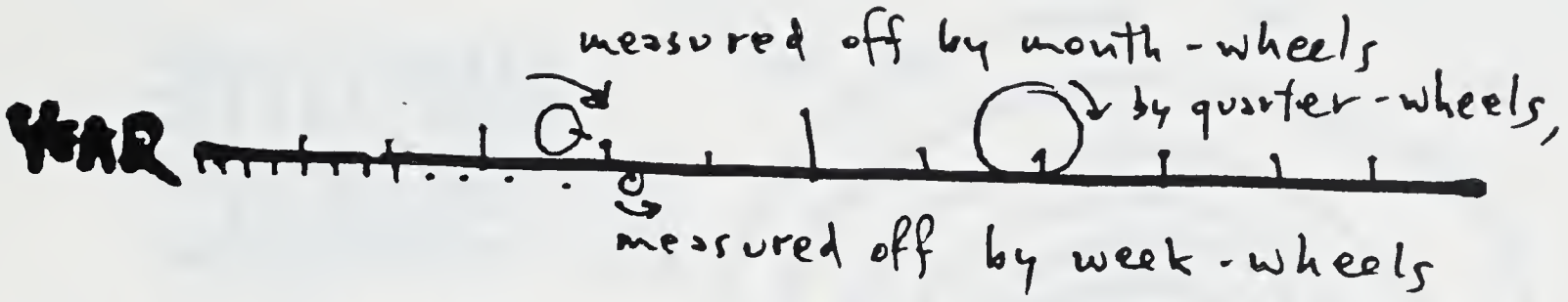
But these show far too little of the true structure we are dealing with.

Both these visualizing systems, the clock and calendar, show only one particular cycle. The calendar shows us the cycle of the week, and how weeks fit into the current month. The clock shows us the cycle of twelve hours, and lets us estimate times until (or since) important moments.

But these are not the only cycles that we need to keep track of. The cycle of night and day is crucial to our life, and maps to the clock according to a much longer cycle. The cycles of the lunar month are significant, particularly if you are a fisherman or live in a houseboat. The quarter-year is significant for a number of aspects of business. And so on.

I believe we can create a form of visualization which can show us various different cycles at once.

Think of a year as a line. We can measure it off in weeks, we can measure it off in months, we can measure it off in lunar months, we can measure it off in quarters.



Now, is there some way we can see all these different cycles all at once?

There is. We can wind this line into various cyclical visualizations.

I would like to propose an *interactive spiral* for visualizing and planning time.[1]

First let us consider a spiral calendar.

(I apologize for my very rough sketches here, but without an implementation it is better to show it roughly than try to get into detail.)

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[1] Please note that this Spiraltime™ design of mine is under license to aMaze, Ltd. in England. While I believe the following is my original design, millions of other people are thinking about these problems, so others may have thought of this also. I would appreciate any information about other similar designs.

INFINITE SPIRAL CALENDAR (zoomable)

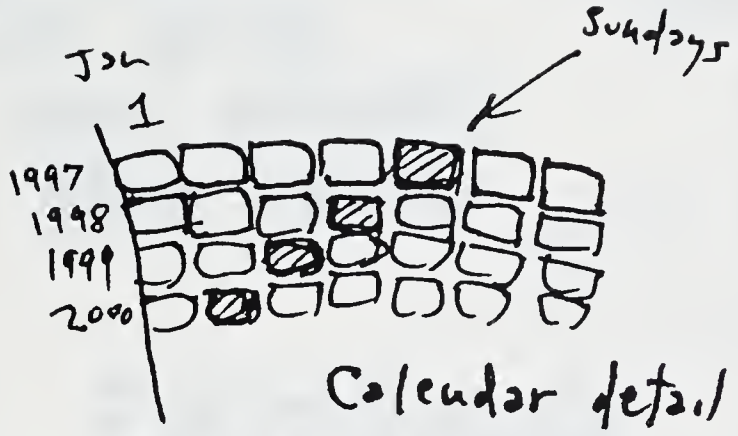
Make the current month and day the endpoint at the outside of the spiral, so that the future is toward the center of the spiral. Think of it as tightening toward the center.

One revolution is one year; and so several years may be seen at once. (In principle we can see an infinite number of years ahead.)

This visualization can be a considerable help in planning. It lets you see successive dates over a long period of time.

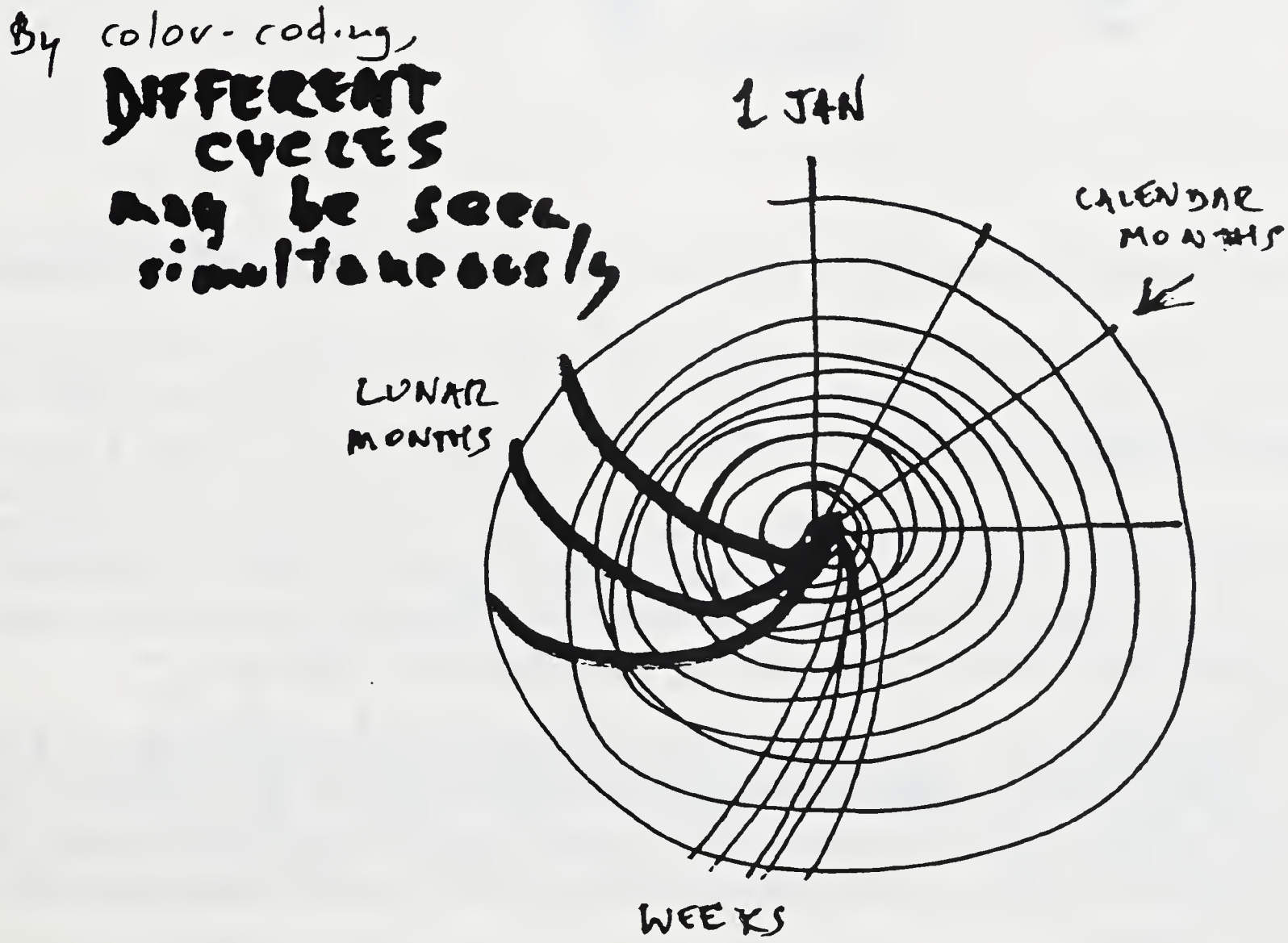
We line up January first of each year as a vertical line leading to the center. (What about years having different lengths? The leap years, with one extra day, have to be coiled a little tighter to fit in the 360 degrees of the circle.)

If we color the first of each month, we see that the beginnings of the months line up as almost-straight lines heading toward the center.

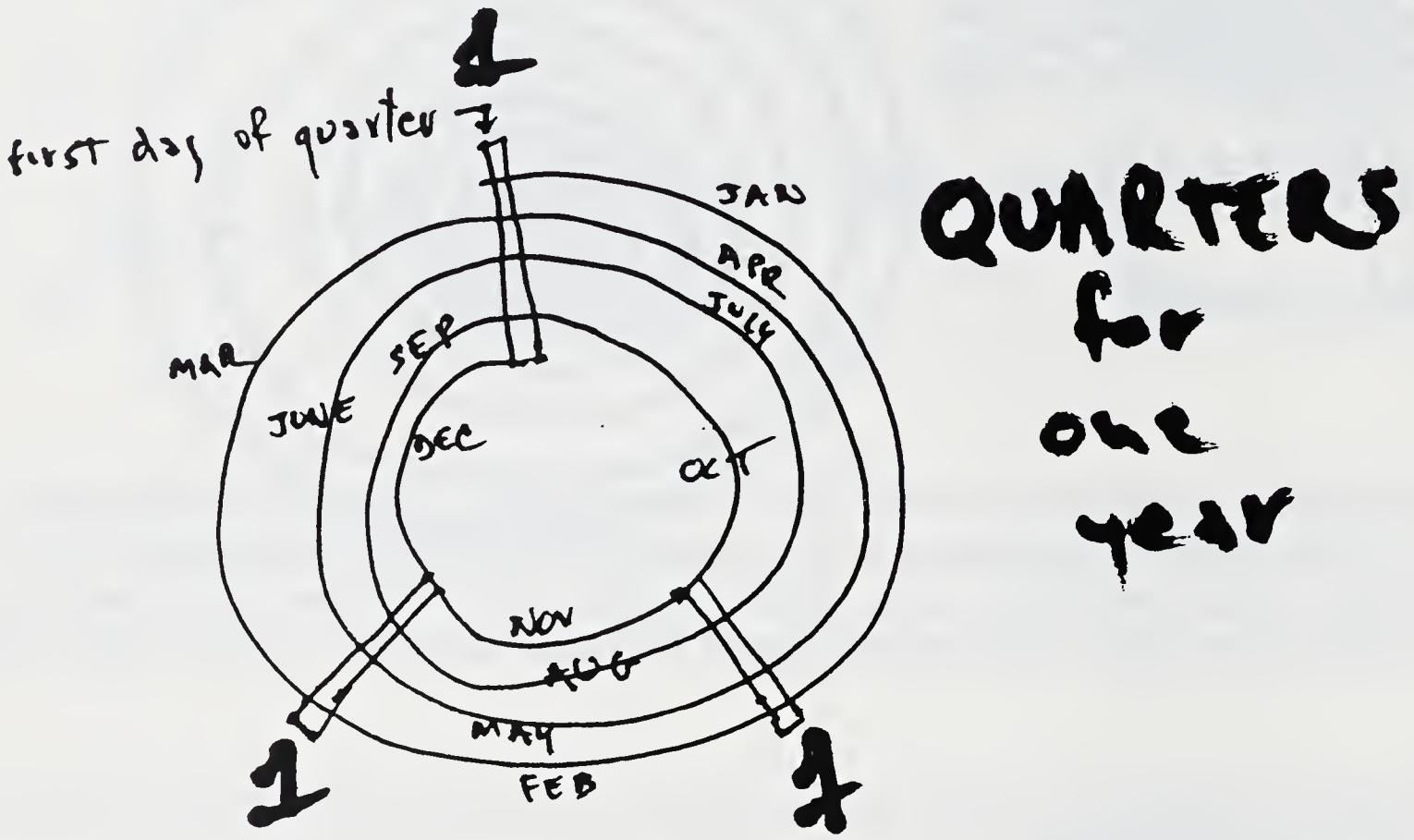


Calendar detail: days look like kernels of corn

Now observe that we can see the other cycles as well. Let's color them so that they stand out. We saw that the beginning of the months line up as almost-straight lines. The beginnings of the weeks line up as slight spirals, since fifty-two times seven is 364, one or two days short. The beginnings of the lunar months, too, are slight spirals.



But what if we want to emphasize the lunar month? Why, we tighten the spiral, so that the full moons line up radially, and let the calendar months become the spirals. And if we want to visualize quarters, we can tighten the spiral so that the beginnings and ends of the quarters line up.



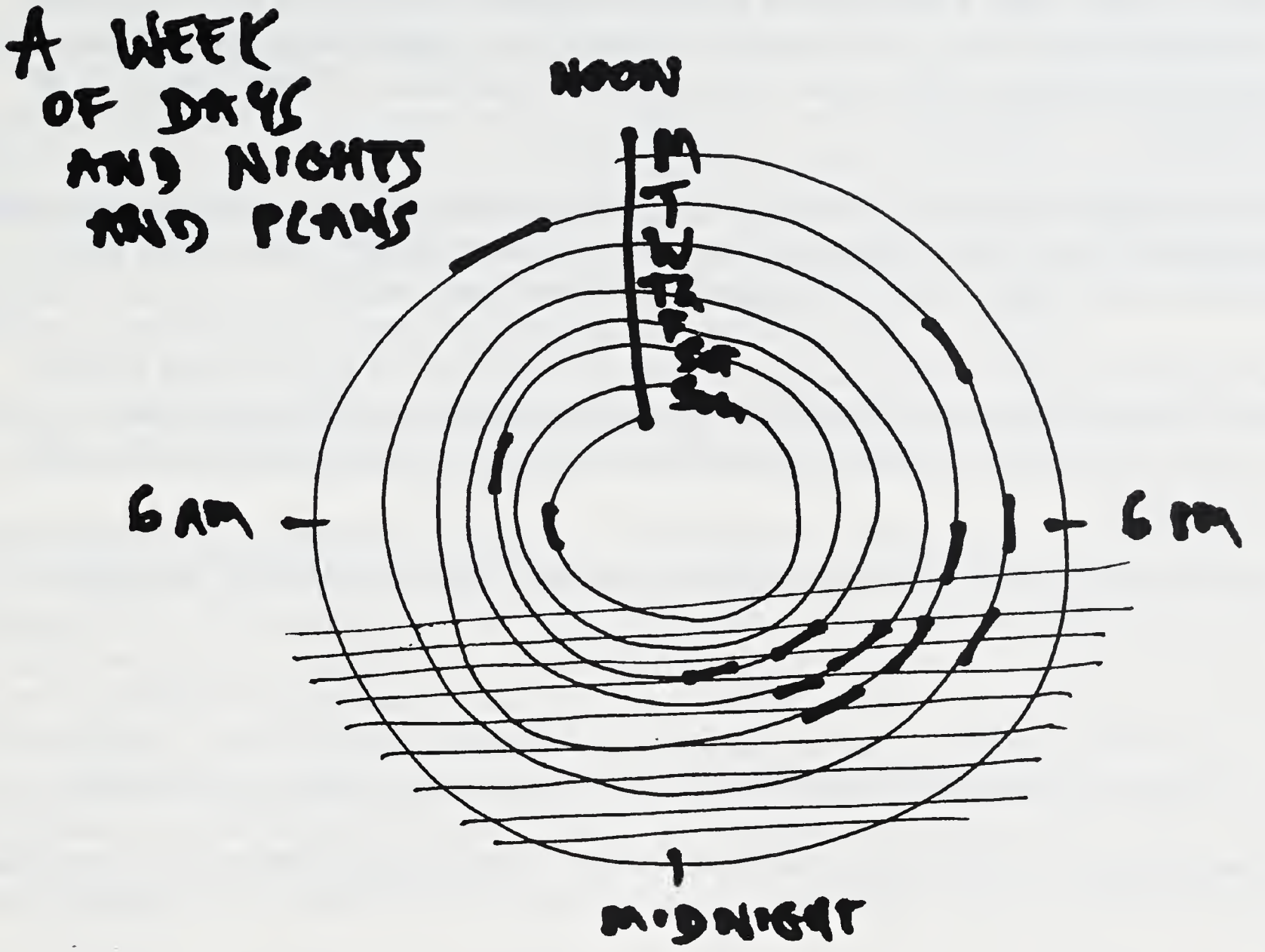
If you want to emphasize some other cycle, you can make that the periodicity of the spiral.

The Spiral Clock

The same spiral idea—in fact, the same display program—can be applied to planning the day and the week. If you are familiar with printed "planning diaries," you will be aware that a lot of space is provided each day for conventional business hours, much less for evenings and none for night, and not much space for weekends.

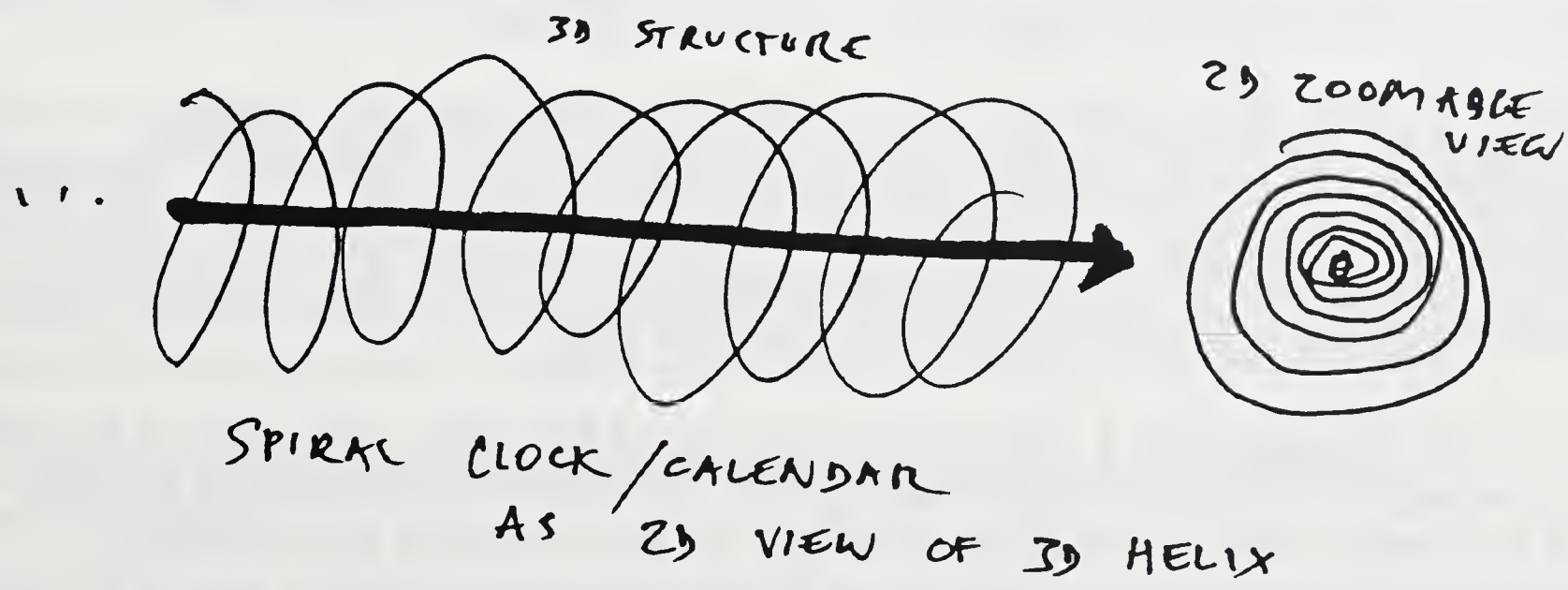
This may be right for some users, but not for everybody. Note that many people have to work at night, or on schedules that fluctuate between night and day schedules. These are very hard to plan. Those of us who work at night, and have meetings at night, need to see the relations of night and day, and how a succession of related meetings and events will be spaced.

But a day-night diurnal spiral lets us see all these things at once. A number of days can be shown, and the relations of day to night. (Note that in the calendar the days are granular, whereas on the clock the spiral is better smooth.)



Perspective

But let's put this in perspective. What I have shown you is a spiral, which is a plane figure. But it could also be a helix, which is a three-dimensional figure. In fact, what you see as a spiral on your screen can best be implemented as a projection to two dimensions of a 3-dimensional helix.



Clock Windup

This makes clearer what I mean about new information designs and new structures. This visualization for time is an example of what I have been talking about: new information presentations that break away from the limitations of paper and give us extra benefits.

So this is the kind of design I do: trying to figure out powerful new generalizations that extend what we can do on our screens, and yet still stay simple—with clarity and consistency, and without a lot of strange little things to memorize.

We see that this is a generalized design, meaning that it can be used for any kind of time-based phenomena, to help visualize patterns and help plan. But note that interactivity plays a crucial part in this design; it could not be physically built in any very useful way.

(In a way it is also a new topology, since it presents visual connectivity along the cycles.)

The point is to look for the "true virtuality" or "true conceptual structure" of a domain—meaning, actually, "Let us ignore past traditions, conventions, containers and visualizations, and expand and complete the idea in the most useful possible way."

If this design is not useful, it is not a good design. For a design to be merely interesting or humorous is not enough. Will this design be useful? We'll find out, won't we.

The Virtuality Design Process

Virtuality, as I've said, has two components: conceptual structure and feel. In virtuality design, we start with a wish list for something. Then we consider first the conceptual structure, and endeavor to get the cleanest possible set of concepts. (This is like writing a movie script.) In the same way that we build plot structure, we build conceptual structure; but instead of plot we are looking for, designing and weaving together threads of generalization.)

Then we consider the possible feel—that is, production values and touches—and see if this gives us ideas that might change the conceptual structure.

In the case of the Spiraltime design, the wish list included not just scheduling individual items, but seeing continuities among cycles and scheduled items. The spiral was one possible mapping. The idea of *tightening and loosening* the spiral was a conceptual generalization in the visualization and construct logic. Structuring it as a helix was a unifying transformation of the construct logic.

Another interesting example I often use is the game of Pac-Man. The game of Pac-Man might have begun with the idea of a maze game, but evolved progressively into the concept of "eating dots" as a unifying principle for both covering the maze and stopping the monsters that are chasing you. Eating dots, not originally part of the idea, probably evolved as a unifying concept. It also contributed to the feel of the game, with its fast rhythmic sound and oral-aggressive character.

Advanced Construct Logic

Construct logic can involve any concepts whatever, and constructions can be of any form. You need not be bound by conventional constraints that have to do with the real world, since this is not "metaphor" thinking. Consistency is in the mind and comfort and control of the user. What "makes sense" may not match conventional ideas at all. (*Paradoxical spaces*, which do not correspond to the dimensionalities we are familiar with, are a particularly interesting branch of virtuality construct logic.)

Substruction is the process of designing conceptual details backward to fit an overall idea. Since there are hardly any restrictions, the possibilities are endless.

A very interesting example is the game of "Ballblazer" from Lucas Arts, programmed by Dave Levine. In this game, each player controls a sort of robotic cart on a shared playing field. A ball appears on the field; either player can grab the ball magnetically by moving toward it in a certain way. The objective is to run the ball across the other player's goal line.

From a substruction point of view, the interesting thing is that Levine worked backward from the intended mode of play. He decided that pushing the stick forward should be a successful null strategy, so that if the other player did nothing, these moves would occur:

Active player's cart approaches ball. Ball is grabbed, or seized from other player. Cart realigns to board and heads toward correct goal.

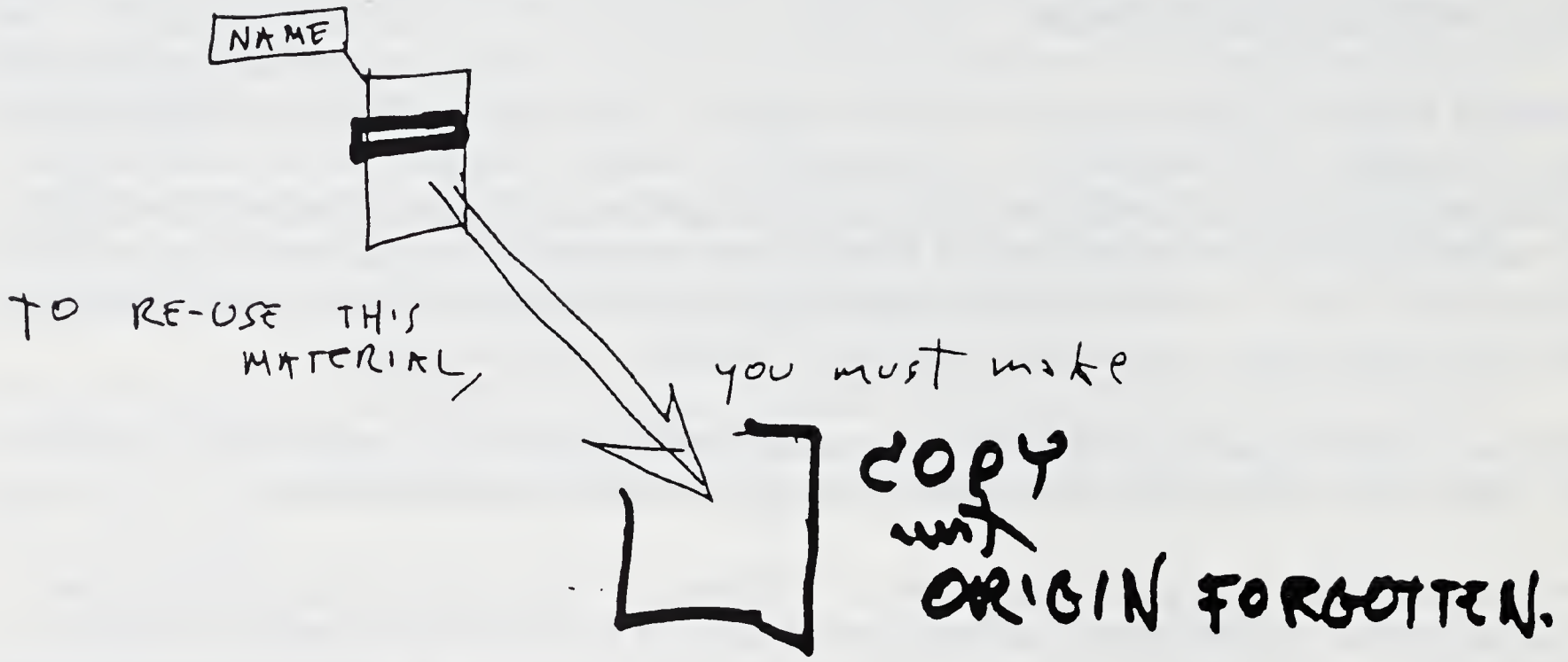
The interesting thing is that Levine was able to create a coherent set of controller rules working back from that strategy, i.e., creating a construct logic in which the simple push-stick-forward strategy did all those things. This is a prime example of substruction in construct logic.

Heaven, Hell, and Structure 3.5: What Do We Need for Text?

I believe that today's text software is based on a total misunderstanding of the nature and uses of information, ideas, text and documents. The needs of text organizers (writers and editors) have been completely misaddressed, and today's systems of "word processing" and "outline processing" are a technoid's solution to the wrong problem. But the technoids have managed to convince the world that this solution is correct. Thus a great deal of human work has been deeply blighted, I believe.

The function of the computer is to represent and maintain a vast number of interconnections.

"Word processing" is the opposite: it embeds each piece of text in a closed object which has to be given a name. And so it is impossible to maintain all the connections, or to represent the true interconnection of information.



What kinds of system do we really need for handling text?

Writing is the job of of trying to represent ideas in exactly their true form by words. But since most writing is sequential, one sequence for the text must usually be chosen, losing the alternative benefits of possible other sequences.

In technical writing, and some other areas, it is usual to follow outlines, and so the myth has grown that this is "how you write." But in actual practice, there can be many possible organizations of the same material, and the writing process is detailed interweaving of the pieces, continually moving them around.

See, for example, the nice sample of Winston Churchill's original hand-rewritten manuscript, here in print for the first time with the kind permission of the Churchill Charitable Trust and the University of Southampton.

This page is from the manuscript for Churchill's great speech in the House of Commons in March 1938—"arguably the speech of his life," according to historian Frank Colson—in which he sought support for his position that England could not appease Hitler any longer.

should things come to a pinch, he is going to ally with Hitler?
I sent nothing from him except that he should break with
Hitler. But I suppose that it is in his power to do so. The
fact that the Germans are on the Brenner may mean he is more
frightened of the Germans, but it does not mean that he is more
friendly to us; it could just as well mean that he is either willing
or capable of breaking from his powerful and successful brother-
Dictator at a moment when all the world can see how dictatorships
pear. The Germans going to the Brenner have gripped him, and
they will occupy it in their interests. It may well be that
for the sake of gaining help and advantage from Britain, he
will dissemble. We have been told how good Italian diplomacy
is in dissembling. But if you think yourself that by any small
advantages and inducements you can offer Mussolini, he is going
to break with Hitler and be on the Anglo-French side should
trouble come, it is to be the height of delusion. Even if in a
week or two you produce a shop-window scheme pretending that
Mussolini has joined our system, that will make no difference
at the essential realities and position. There is time yet
yet he will have to go with Hitler, and whatever he has said,
the crisis comes with Hitler he will go.

Surely you will not be misled by Italian finesse? If
I am right it is already seen what a pity it was to [illegible]
the late Foreign Secretary; what a pity it was to give this

This was not an idle or artistic effort. Churchill felt that England's life was at stake, and the success of the speech was literally a matter of life and death.

We clearly see the care that Churchill took as he combined, separated, and moved the separate points and items, knitting and re-knitting them together.

Such rearrangement and re-knitting is the process of rewriting, and always has been. The rearrangement ranges from fine-grained (as shown in the Churchill page) to large-scale (whole sections and chapters moved about).

This method is the same whether you are writing a novel or writing history. There are numerous points to make, numerous interconnections to show, and the main problem is where to say what. A given item might go in seven or eight different places, or get left out entirely because there is no space.

So the process of "writing" is for most authors mainly the process of rewriting, moving things around to try to find the best overall arrangement, and knitting phrases and thoughts together locally to support the chosen arrangement as it looks at the current moment.

This technique has not changed in the nearly sixty years since Churchill's speech. It is called cut-and-paste. (REAL cut and paste, not the nasty hide-and-plug methods that the technoids falsely call "cut" and "paste.") It cannot be properly done by computer; there are no software tools which are of the slightest use for this. This is because software designers have not known, understood or accepted the structure of this process.

This snapshot (taken as I write this, 12 June 1997, and rewrite it and rewrite it) shows the modus operandi of cut and paste. Sections are moved back and forth, all over the tabletops. This is how Tolstoy did it (he called the separated pieces his "noodles"). This is how I have done it for forty-five years:

When you get the pieces in order, you attach them to a base sheet. This working stage is quite similar to the Churchill page (here is a sample).

HYPERGODS
THE GODS GO ELECTRONIC

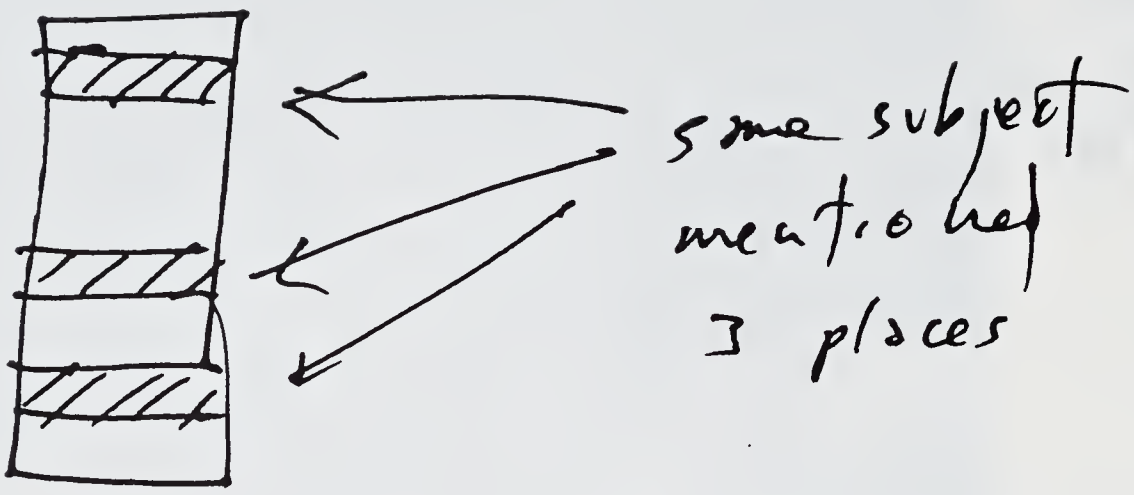
THE LINKS OF THE GODS

Extending literary freedom to our electronic literature of tomorrow, this two-god system becomes two freedoms: free user movement (turning the electronic page in any direction) and freedom to publish,

that it is the necessary next step of civilization.

And God the Reader can choose which way to go.

Though the pieces get cut up, and divided into pieces which are put into several places, they often retain an unseen connection that you have to stay aware of as you rewrite—because you may want to go back and redivide these sections, putting more in the front or more in the back or more in the middle. So you need to keep track of these internal connections of the parts.



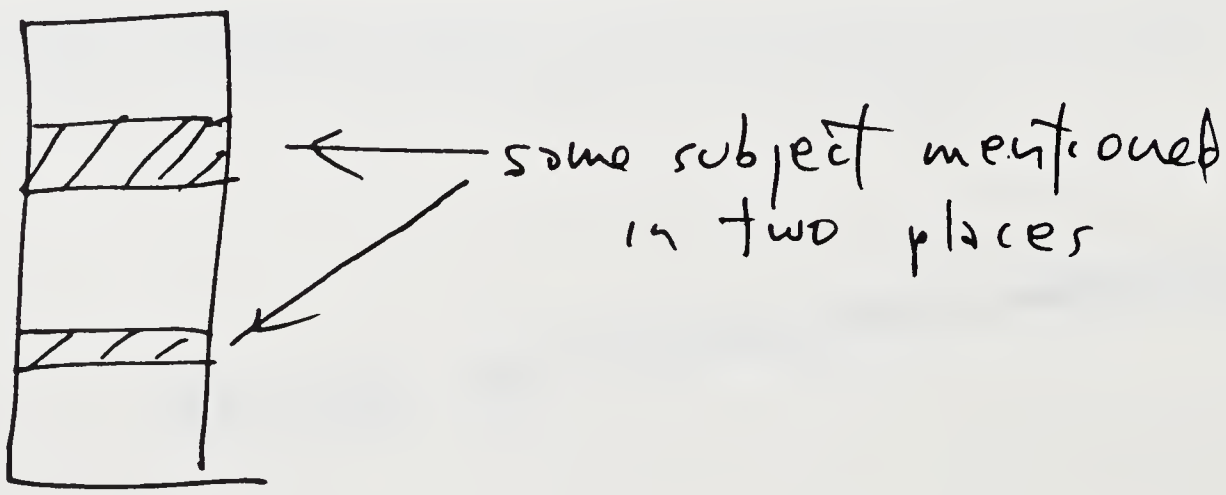
These are things which authors do quite a lot, and it is easy to get confused and disorganized in doing these things with paper. It is even easier to get confused and disorganized in doing this with a word processor, because word processors, in imitating the sheet of paper, provide no such internal connections.

Ending the Charade

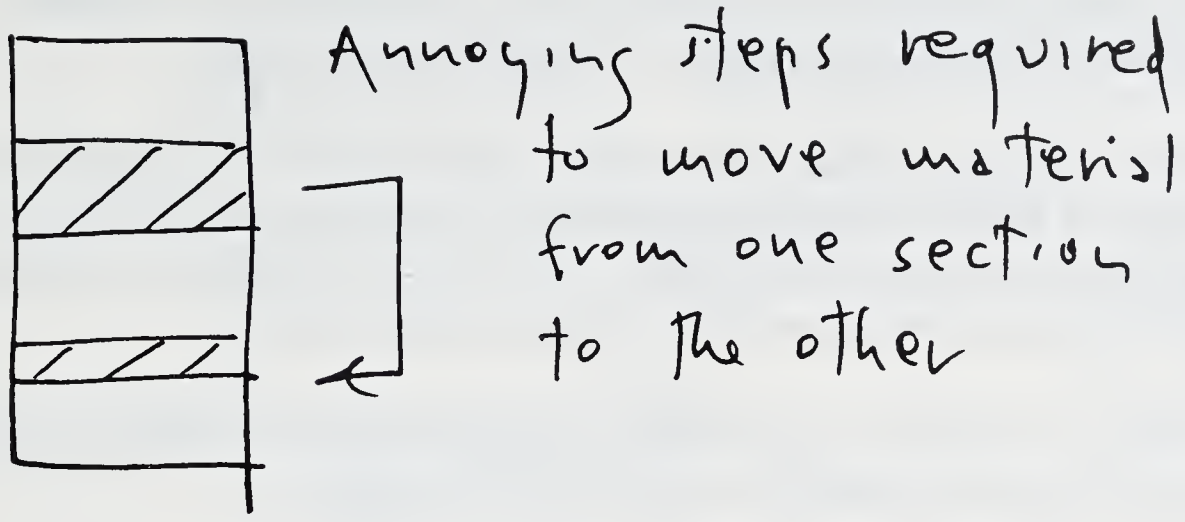
But if we break away from the conventional structure of word processing, and no longer imitate paper, what are the possibilities?

If we break away from conventional structure, the possibilities are endless. For instance, here's a notion from some of my earliest text systems.

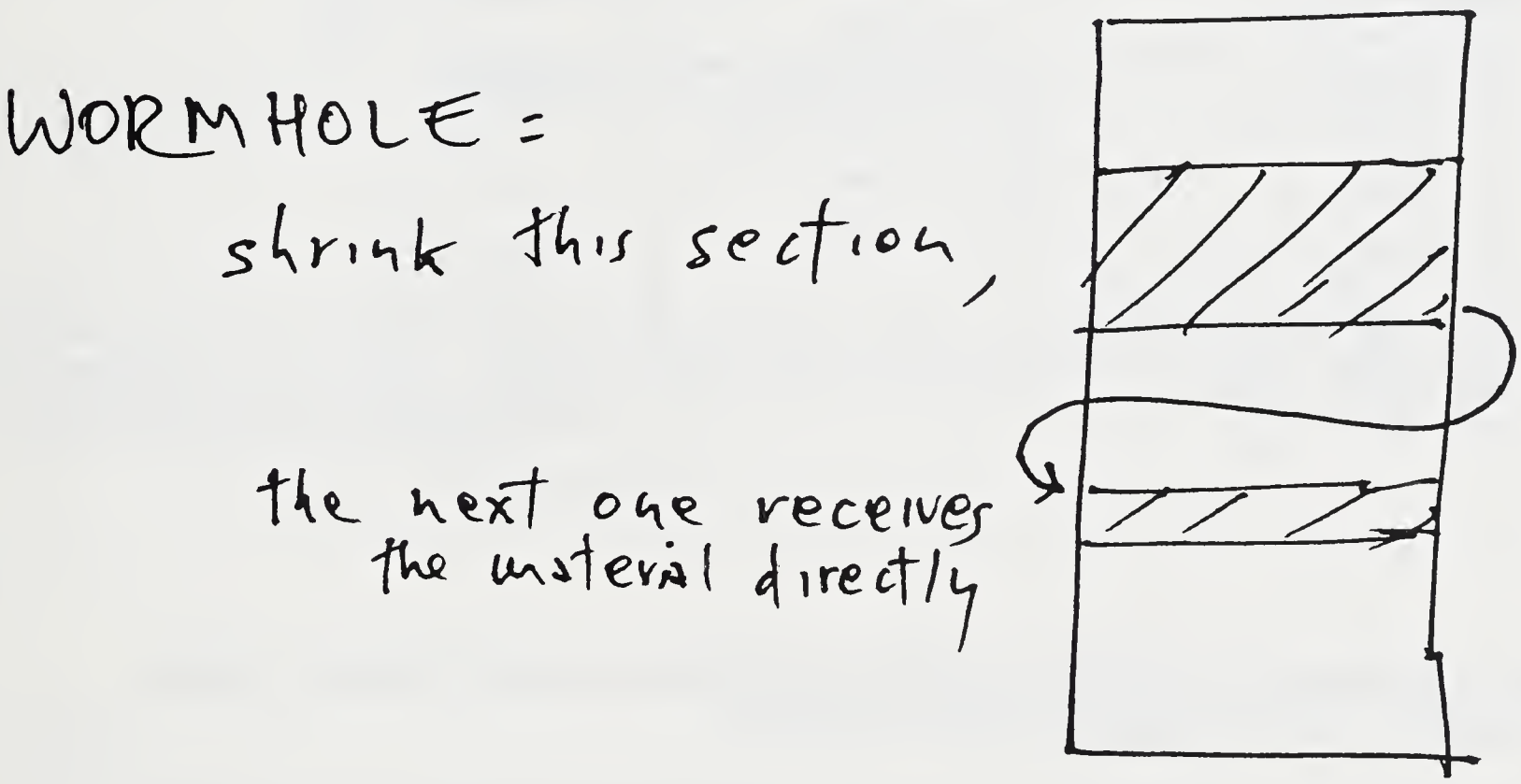
Suppose you are planning to mention a certain topic two different places in a book.



It's irritating to have to carry things back and forth between the two places across which the topic is spread. In the course of rewriting, material may have to be moved back and forth between these two related locations. This is a pain.



But it might be nice to have a special connection that would allow you to move things fluidly between these two sections. Imagine a special marker in the text that acts like a secret door. They come in pairs. You could push text into one and it would come out the other.



I called this a *wormhole* (in honor of a similar concept in physics). The different sections would be like balloons connected so that air can go from one to the other. If you squeeze one balloon, the other gets bigger.

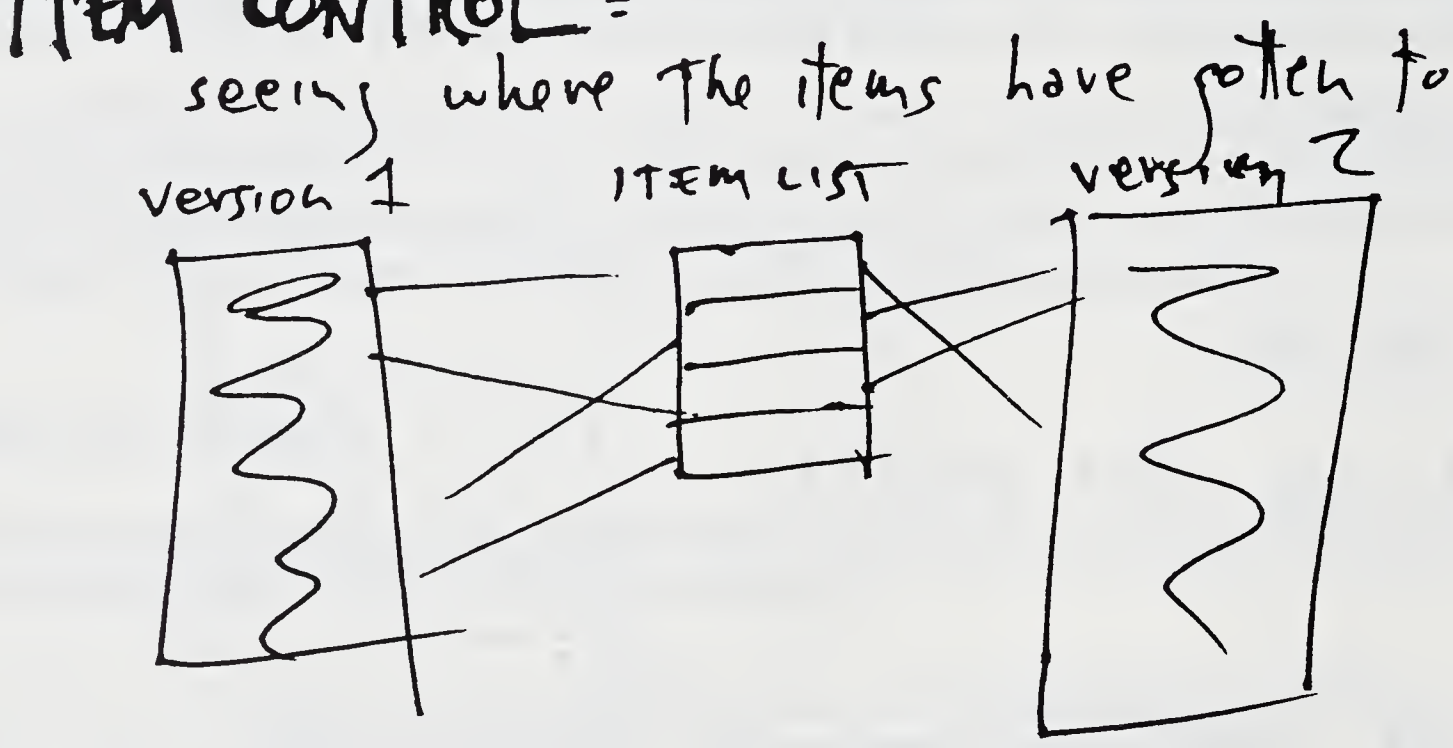
This might be quite useful for authors. If you had a number of these for different topics in your document, it would make it much easier to redistribute materials back and forth.

Let's not dwell on this item, but it's an example of how we can benefit from leaving behind older structures and concepts. This is like my example of the Spiraltime clock: it provides more flexibility and power by showing connections that could not not be shown before.
But our objective should not be just to be clever. Our objective should be to have as few structures as possible, and make them as powerful and as clear as possible.

The issue is how to build vivid, clean and general tools for the management of ideas. Text, as a principal form in which we work with ideas, is an important case.

Whereas today's "word processors" assume that text consists of Scrabble™ tiles with no connections, merely to be moved about. "Outline processors" assume that the way to create a document is to begin with a sequential outline, then keep changing it, always keeping this outline sequential. I believe these are very naive assumptions.

I believe that the principal problems of writers and editors are two. One is what we may call item control—deciding and re-deciding where to put specific items.

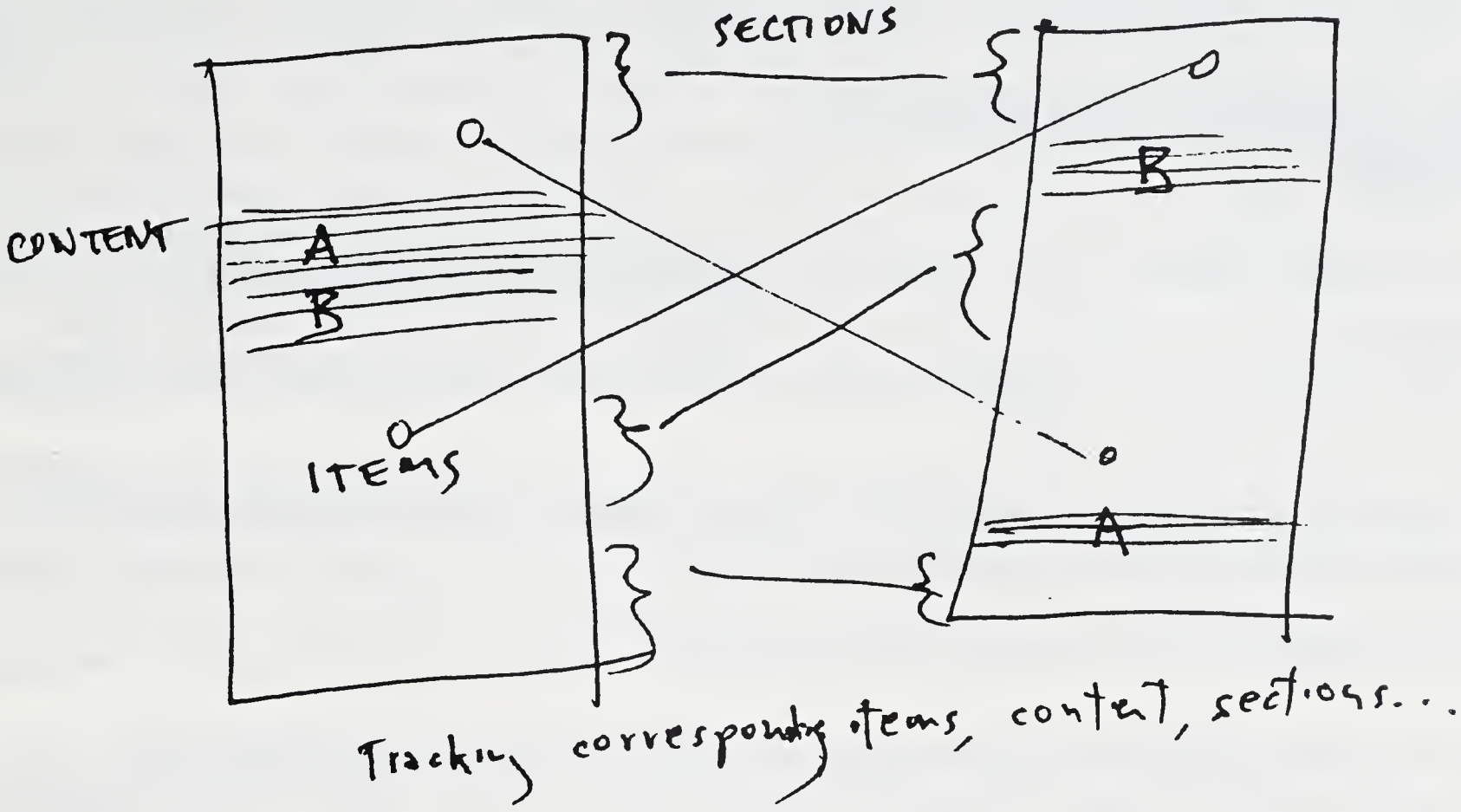


This problem is common to contracts, treaties, legislation, press releases, reports, novels, screenplays, research papers and proposals.

More generally, the real problem of text management is keeping track of versions, alternatives, and the movement of items among versions, alternatives and projects, and *to show detailed intercomparisons among them.*

In other words, general version management means ways to consider all the different connections and resemblances among versions that are being worked with and considered.

VERSION MANAGEMENT



These are not trivial problems; but because of the backgrounds and interests and hierarchical viewpoints of those who have designed text systems, they have been overlooked and misunderstood.

Chapter Four
Media, Literature, and Gods

Media, Literature, and Gods 4.1: Old Media

The term "media" refers to our structures, packages, forms and channels of communication. (It is a fairly recent word in English; I believe it was coined in the advertising industry, and introduced to the public by the Canadian intellectual Marshall McLuhan in the nineteen-fifties.)

Media are basic to humanity. Media have always been the vital center of human life, beginning with speech, cave paintings and music.

And human history has been the history of media.

Media are what human life has always been about. Writing, the printing press, phonograph, motion picture, radio and television have each revolutionized the human world.

In our earliest tribal days, the media were song and story, dance and chant and ritual, painting and ceramic and decoration.

All these expressed our lives and thinking, long before we could write or read.

Today our life and thinking are expressed, alas, by television, in its sleaze, shallowness and pomposity.

Media define us. We lead media lives.

There are two kinds of media: *temporary* media, like speech and gestures and telephone calls; and *persistent* media, media that we keep.

As each medium becomes digital, it is easier to keep it automatically. For example, e-mail is not just a temporary channel, it is a medium of keepable objects, even though many people use it simply as a temporary channel.

When I say "media" I will refer to the kind that we keep, or might keep. I'll say "temporary media" or "channels" if I refer to the other kind, because I will be concentrating on the kind we keep, at least momentarily.

We keep more and more media objects. Each time it becomes possible to save some new kind of media—for example, photographs and phonograph records—people do. We keep media for a lot of reasons—public reasons, private reasons, sentimental reasons, scholarly reasons, historical purposes.

Persistent media objects are the center of our lives in ways we know and ways we

don't know. For instance, in the way that writing changed the nature of religion, by creating the *holy book.*

Holy books have defined the major religions: creating a holy book was a way that a religious leader, possibly with some holy help, could express the truth as he or she saw it. This was also a way of fixing traditions, or passing on the leader's way of thinking. Extreme importance has been attached to every word of these books by some people. The fact that great mystery and beauty was attributed to written words associated with the gods gave these books additional power, and the belief in their perfection and hidden truths have given people a lot to do.

Twentieth-century religion has been explicitly about media.

Celebrities and media talent have to a large extent replaced the saints and deities of the past. We have literally worshipped movie stars. The death of a pop idol, whether Rudolf Valentino, Marilyn Monroe or John Lennon, brings sainthood. The markets for the celebrity-stars of media are just as highly developed as the markets for the media themselves—the books and magazines and shows that feature these celebrity-stars.

In some ways media are all alike. Media are packages, and packaging systems, for presenting points of view. And all media objects contain the point of view of the creator: sometimes in a very mild or obscure form, sometimes in an intense or combative way. Sometimes we can know what the creator intended, sometimes we can't.

Every media object has a point of view: the outlook or idea that is preserved in it.

Media industries and markets are highly developed. The media themselves are created and poured into the marketplace at a vast rate. As are the new faces always replacing the older ones.

And in these industries, each author or artist has the same problems, regardless of what medium is used: getting resources to create the object; getting resources to distribute the object; and maintaining creative control and some degree of ownership, in conflict with backers and distributors. And the problem of trying to get paid for the creations, even after they have been distributed. These problems are the same whether you wish to write novels, compose symphonies, make movies or make ceramic ashtrays. (Artists and authors who have some other form of support, like a teaching job, may only create for their own enjoyment.)

And businesspeople in media have their own family of problems. Media production houses (which offer facilities) need to find clients. Media creation companies (magazines, movie studios, record companies) have to turn out media products on schedule, and have to make a profit with them, and are always looking for authors and artists who will increase sales.

The Media Life We Need

In the great onrush of more and more media content, we need a way to mark our

position, understand and retain insights.

We are not fish and we are not cattle. We need to understand and keep track of what we see, read and hear. We need to be able to save and intercompare tomorrow's media.

Media Define Us

We define ourselves by our personal media collections, although ownership of media by other than princes is a phenomenon of the last five hundred years. (Erasmus, the Renaissance scholar, would buy books *first*, and only buy food if he had money left over. This kind of intellectual enthusiasm was also new with the Renaissance.) A hundred years ago, many people defined themselves in terms of their Family Tree on the wall and their Family Bible.

Modern individuals define themselves, in part, in terms of the media they keep. Your collection (whether books, recordings, videos) is your virtual self, your individual point of view.

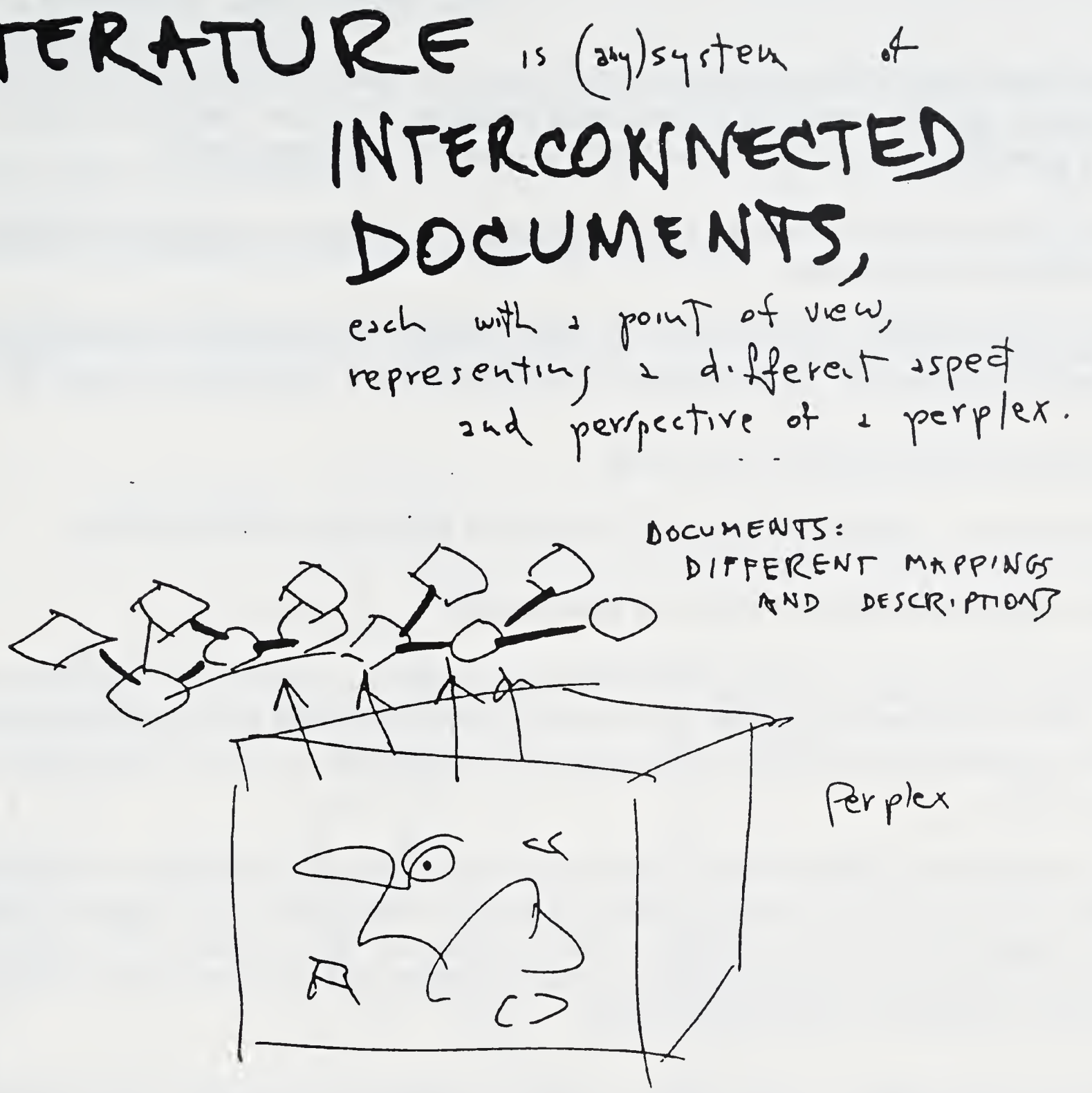
Media, Literature, and Gods 4.2: Literature's Hidden Secrets

I think the term "literature" in its broader sense has always meant something which we can only now see clearly.

We have been misled by books and libraries into thinking we understood literature; but now, in the age of electronic media, it is becoming clear that there is a larger sense of literature that we did not understand.

The term "literature" is often taken as meaning something Poetic and Cultural: perhaps having to do with coffeehouses, garrets, salons, and the lives of artists. But the word "literature" simply refers to "what is written," including the writings at the bases of statues, the fine print on a ticket, the Rosetta Stone. "Literature" is also used to refer to the works about any particular subject: the literature of science, the literature of biology. And, in a general sense, literature means all writing.

Literature is the system of *interconnected* documents. The connections are as much a part of the literature as the objects themselves.



The study of literature has *always* been the study of documents and their interconnections.

Sometimes these connections are visible, sometimes they are not. But they are always there. The new interactive hypermedia make it possible to show and follow these connections electronically.

The inner structure of literature has been that of documents, each with an owner/creator, which quote and refer to one another in an ever-growing snowball. And when I say "documents," I mean not just written objects, but movies, symphonies, lab reports—any human production of text or pictures or audio or other media, any package of information.

The connections among documents may not be apparent. But every book refers to others, explicitly and implicitly; every movie has connections to what came before. Sometimes these connections are visible, sometimes they are not. But they are always

there.

Literature has *always* been interconnected. But in the past we could not see many of the connections, and we could not follow them instantly. The new interactive hypermedia make it possible to show and follow these connections electronically.

As I said before, the real nature of information is the perplex: a tangle of relations, some of them contradictory.

A document presents a point of view on some perplex. Literature is a collection of documents (in principle, all documents); so literature is a collection of points of view.

Every point of view wants to be on top.

So literature is a collection of points of view that would all like to be on top.

It is the ongoing summative tangle of documents.

But despite this tangle, somehow we think of literature—and libraries—as places of order. That is because the points of view have been somehow reconciled and made to lie down together, by arbitrary cataloging and categorization. This in turn represents a point of view.

Libraries all have a point of view. That may be explicit in their policies, or just in the fact that they use a set of concepts (like the Dewey and Library of Congress cataloging systems) that honor some groupings of documents and ignore others. The grouping and categorization that brings the documents together is that point of view. But of course it is invisible to those who hold it.

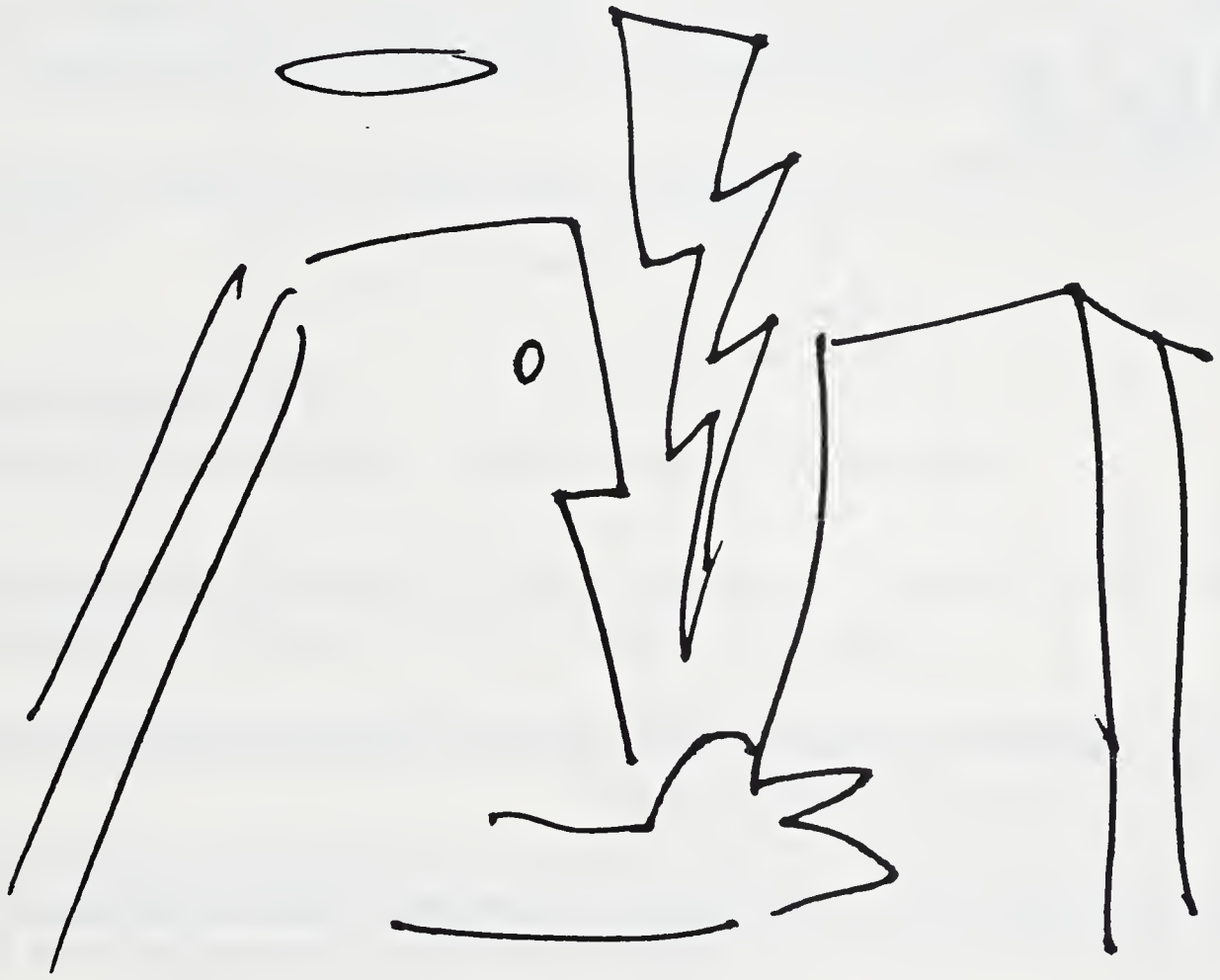
The library represents a compromise, a way of suiting the ideas up to look compatible.

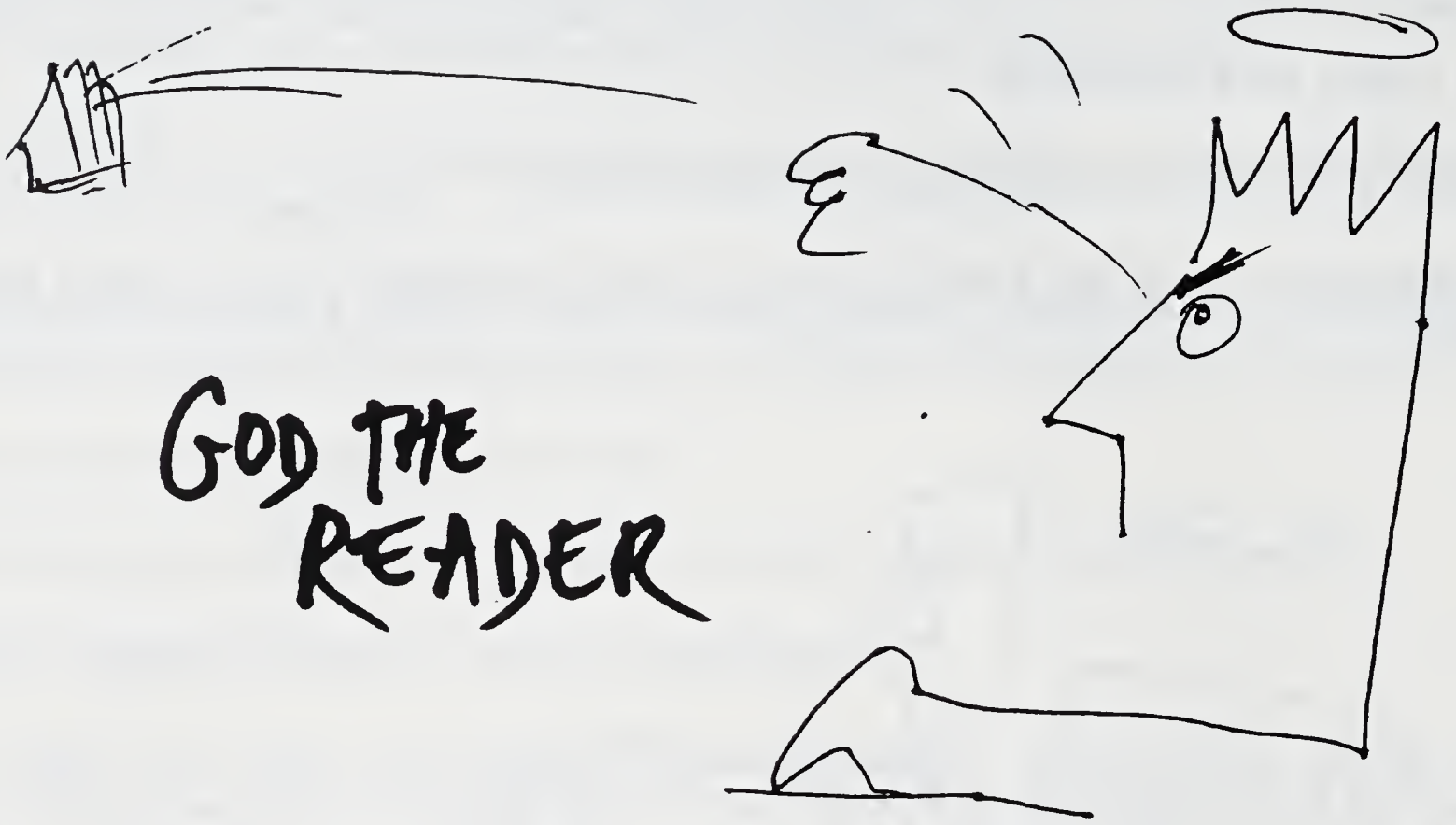
Media, Literature, and Gods 4.3:
The Gods of Literature

The Two Gods of Literature

The tradition of literature has long been a two-god system:

God the Author may create any book He wants, with the intention that you read it just a certain way.





God the Reader is free to skip around in the book, slam the book shut, or throw it across the room—in other words, to use it as He sees fit.

The author proposes, the reader disposes, in a dynamic of fairness. This freedom of information has been the tradition of western civilization since the Renaissance.

This system is elegant, reasonable and empowering to both parties. The author and reader face each other with dignity and equal status. This is the bargain of literature. I think of it as a bargain of gods.

Chapter Five
Hypergods

Hypergods 5.1:
The Gods Go Electronic

Extending literary freedom to our electronic literature of tomorrow, the two-god system of literature becomes, transposed to the screen, two freedoms: freedom to publish in any structure, and free user movement (turning the electronic page in any direction).

Freer connective structure will mean more power to both gods: more freedom for God the Author and more freedom for God the Reader.

God the Author will offer more choices, and God the Reader will be free to make these choices.

Hypergods 5.2:
Interactive Media, Same and Different

Some people think that because tomorrow's media will be interactive, they will be completely different from the media of the past.

I believe that tomorrow's media will be different and they will be the same.

They will be different because they will be interactive across networks. And they will be the same because they will still put forth human ideas and points of view, and they will evolve in version after version.

It is important to understand these ways that media are the same, because the new electronic and interactive media seem so different. Tomorrow's electronic media will have a great deal in common with the media of the past, and indeed will be the extension of literature.

The issue is the correct generalization of the media we have known for centuries—literature, diagrams and writing; and movies, which we have known for one century.

Hypergods 5.3:
Butterflight

The design of tomorrow's media must not be left to the technologists, just as in the old saying, "War is too important to be left to the generals." The design of tomorrow's media is interwoven with vital questions of freedom, access and the politics of information.

The technoid vision, as expressed by various pundits of electronic media, seems to be this: tomorrow's world will be terribly complex, but we won't have to understand it. Fluttering through hailstorms of granular information, ignorant like butterflies, we will be guided by smell, or Agents, or leprechauns, to this or that pretty picture, or media object, or factoid. If we have a Question, it will be possible to ask it in English. Little men and bunny rabbits will talk to us from the computer screen, making us feel more comfortable about our delirious ignorance as we flutter through this completely trustworthy technological paradise about which we understand less and less.

To give up on human understanding is to give up hope, what we call in English "a counsel of despair." I think there is hope for much better and more powerful software designs that will give ordinary people the power over computers that they have always wanted—power with complete understanding. But that requires inspired software design, which I believe is art and not technology.

I believe the technoid vision does not comprehend what is humanly desired, humanly needed and humanly possible. Especially the need and possibility of human understanding. So excuse me from the butterfly crowd; I hope you will come with me to where understanding may be found.

Hypergods 5.4:
Media Convirgins

Much has been made about a supposed "convergence of media" as different media forms become digital, supposedly leading to the fusion of broadcast, publishing and computerdom.

This is not exactly happening. Companies are producing titles—media packages on diskette and CD-ROM—but nothing is standard, and the industry is most uncertain.

What the new communication channels will actually be, and whether they will somehow converge on the same talents and arrangements and distribution channels as broadcast and publishing have in the past, is not so clear. Nor do we know what we will call the result, or how it will be distributed ten years from now.

The notion of "convergence" has an implicit assumption of continuity. If things are converging, they must still be here, right? —so the term is reassuring to the present publishing and broadcasting companies.

There is no reason they should feel reassured. Who says things will stay the same?

No doubt some sardonic churchmen approached Gutenberg and said, "Mr. Gutenberg, how can your mechanical scribe make correct copies if it does not say its prayers three times a day, like a proper scribe?"

The mechanical scribe is not a scribe, it is something different. The interactive media are not necessarily converging, they are something different. How different is the question.

In the last two decades, Media Conglomerates and Great Media Initiatives have come and gone with great excitement, sound and fury, accomplishing nothing.

Untold monies have been spent by various visionary companies on disastrous experiments with interactive media. The fabled "Knight-Ridder" experiments in the nineteen-seventies revolved around the question of what kinds of digital services could be designed for clueless and unmotivated customers by clueless and unmotivated researchers. Much money was spent and few conclusions drawn, except that nobody was very interested on either side.

The most remarkable of these was an interactive system long planned by Time-Warner, Inc. on which they supposedly spent billions of dollars.

Over the last few years we enjoyed the spectacle of Time-Warner announcing their digital Full Service Network of interactive TV and wonderful other things; and then, after several years of important announcements and press interviews, they said sheepishly that they would start gradually, in an obscure San Francisco suburb. The actual start of operations was anticlimactic, when they opened services to *ten homes*. (If it is true that they spent five billion dollars on this operation, imagine how wonderful a service they could have performed for each of these ten homes!) The operation was shut down quietly just now, in 1997.

The Time-Warner disaster makes it clear that money and expensive consultation have no bearing on what will happen.

This interactive-media cluelessness resembles the same cluelessness with which businesses initially approached the personal computer. They did not do the sensible thing, which would have been to ask computer enthusiasts what personal computing would be about. Instead they made numerous muddled stabs at the subject until the computer enthusiasts finally took over the business.

The same thing has happened with interactive media, which have been similarly taken over by the enthusiasts.

Hypergods 5.5: Hypertunities

Writings have been sequential because pages have been sequential. What is the alternative? Why, hypertext—nonsequential writing, and hypermedia —nonsequential presentation of all kinds.

As I suggested in print in 1965, non-sequential writing on the screen would give us great new powers of expression.

People seem to think hypertext is some sort of technical invention. Indeed not. It is a literary form, a way of presenting ideas to the mind and heart.

Hypertext has always been with us. The footnote and the magazine layout are hypertext. Illustrations, headlines were a kind of hypertext.

As I said earlier, literature has *always* been interconnected. But in the past we could not see more than a few connections, and we could not follow them instantly. Which now becomes possible.

The computer screen meant new powers of hypertext, since there was no need to restrict the structure to sequence, as there was with numbered pages.

It is therefore *extended and generalized* text—the generalization of writing and documents as we have known them always. (In mathematics, "hyper-" means "extended and generalized"—unlike the meaning in medicine, where it means "excessive" or "agitated.")

As I see it, hypertext and hypermedia constitute the manifest destiny of literature—"manifest destiny" in the sense that anyone should be able to see that it is the necessary next step of literature. They should bring us everything we ever had with paper media, and more.

Like all the literature and writing of the past, the interactive media of the future will be packages that contain points of view, and have authors and publishers. The questions will be: what kinds of packages will be possible, and what kinds of connections will be allowed.

These are big questions that have been waiting for us for a long time. I tried to point them out long ago.

Chapter Six
Hyperhells

Hyperhells 6.0:
New Freedom and New Imprisonment

Electronic media hold vast potential for freedom and vast potential for imprisonment.

Media of the past could oppress by telling only what the dictator wanted them to say; indeed, that unfortunate tradition continues to this day. In other words, the oppression lay in content and editorial policy.

Whereas interactive media can be oppressive in their very structure.

Hyperhells 6.1:
Misconnections

Today's hypermedia are tangled and limited.

Interconnection is both the joy and the nightmare of today's electronic media.

Hypermedia today are based on surprise, because they can't be based on clarity.

Today's hypermedia have brought us interconnection but not understanding. There are no methods for overview and intercomparison.

Today what we have is spaghetti hypertext and hypermedia, whose connections cannot be followed mentally. Just as in programming, "spaghetti code" means programs that cannot be understood because their connections cannot be followed mentally. The problem has now migrated to interactive media.

In today's interactive media, there is no deep structure, just lots of links and special effects. If we build our media on such systems as HyperCard, MacroMind Director and World Wide Web, there is no system-supported way to provide overview; no parallel viewing or deep intercomparison; no way others can re-use the material (except on the Web); no way to travel backward along a link; and no support for marginal notes or links on an equal footing with the official author.

I have been trying to warn of these problems for thirty years in the field, and prevent them, but here we are anyway, at the era of disorienting spaghetti hypermedia. The restricted link types allow people to jump *to* a document, but not to follow links that have been made into it, no way to see comments, amendments or additions by others. There are no link types. Links cannot overlap. Links can only go either to a whole page, or to a point. There are no overview methods. There is no stable publication. There is no re-use. And there is no copyright solution.

The World Wide Web has shown the benefits of network hypertext publishing. As people grow more sophisticated on the Web, though, they begin to experience concretely the inconvenience of having only one-way links, no way to follow them to their origin, no way to quote material already published by others, and no stable committed publication: Web pages disappear unpredictably like popping bubbles.

Hyperhells 6.2:
A Note from Ray Ozzie

Ray Ozzie,[1] and I have recently been commiserating on the state of the Web, and how the the world we hoped to build is not yet happening: too little creativity by most users.

(Excerpted e-mail from Ray Ozzie follows, dated 19 May 1997. Printed by permission.)

> It's interesting to hear that Xanadu is starting over. Presumably you're starting with the Internet and distributed computing as a new technology base?[2]
>
> I don't know your feelings on the matter, but I have mixed feelings about what the Web has wrought. On one hand, I—as you—had dreamt of a day when "the masses" would use computers transparently to access vast information stores and share things with one another. But it hasn't quite turned out the way that I'd have anticipated or liked.
>
> When creating Notes, we focused our efforts on building a collaboration system intended for business professionals—not consumers—and as you know, it has largely been a commercial success. Although not all Notes users (about 12 million of them as I type this) take daily advantage of the full spectrum of the collaborative application capabilities of the product, I have indeed been very pleased with the "read/write" ratio of the average user. That is, Notes users are most commonly "writers" as well as being "readers." In addition to accessing information posted by others, the typical Notes user also makes many contributions—many compositions —as a part of the daily and productive use of Notes in their jobs. We must've done something right in our initial design choices in order to have made this happen, whether on purpose or through serendipity, and I feel very fortunate that we did.
>
> Instead, the Web has created a medium focused toward "readers" and "publishers." Due to the base ideas established early on (no user identification, no authoring/editing environment, no document database, the name "browser" itself, etc) people got used to the environment as a read-only environment. And there it sits—and in my opinion, even for all its glory, stagnates.
>
> I really wonder sometimes if this was the way that it was all intended to be: because not all people are "thinkers," not all people will be "contributors." Maybe it's just human nature. Perhaps life has become so complicated that people just want/need relaxation, and that if the Web had been more read/write to begin with, it wouldn't have taken off

---

[1] The creator of Lotus Notes™.

[2] He got that right. Smart fella.

as it did. Maybe a true collaboration network can only exist in closed environments, e.g. a corporation, or a special interest group, etc. Maybe people only feel safe identifying themselves in closed groups, and like to lurk elsewhere.

(End of Ozzie excerpt.)

Hyperhells 6.3: HyperJails

In the world of paper documents, we could close the book or turn to the last page. In the world of electronic documents, it is not necessarily so easy.

There are forms of non-sequential writing that allow the reader no free choice. These include some forms of branching instructional text where a choice is made automatically, depending on the reader's answer; or adventure games, where the reader makes choices, but does not know their consequences—and cannot undo them.

These systems are not evil, but I do not consider them to be hypertext. If the reader has no free movement, it is something else. It is a maze. It is a kind of trap and a kind of prison.

That is why I think the correct definition of hypertext is "non-sequential text *with free user movement.*" If you cannot come and go as you please, that is not extended or generalized. If there is a hidden sequence, blocked pathways or irreversible movement, it should be called something else. The same goes for the word "hypermedia."

If you can't go in any direction, or back the way you came, it breaks the bargain of literature.

Hyperhells 6.4: Rights and Wrongs

There is a lot of confusion about the meaning of "copyright" in electronic media. There are a lot of very specific laws, but everybody seems to want to make up their own copyright laws from first principles and assume that's how it is.

More confusingly, the term "copyright" is frequently used to refer to a large number of different kinds of rights—copyright, trade mark, patent and trade secret (all of which are quite different in law); as well as a lot of related rights which are respected in U.S. law, such as privacy, "personality rights," and the laws of libel.

But "copyright" is a system of laws (pretty much the same around the world now, although violated much more in certain countries) which gives owners of a work the right to control its distribution. This means that the rightsholder (the original author or artist, or some party that has obtained the rights from the author or artist) can prevent copies from being made or sold, or even given away free.

This is not the place to teach about copyright law, but I should make a few points.

- The benefit of copyright to authors and artists and publishing companies is obvious; it allows the media industries to function in an orderly way, without extremely nasty behavior.

- Copyright is *not* something "imposed by the government," or by record companies either. It is a political compromise crystallized into a set of boundaries and rules about them—a system of law that tries to balance what is good for the public ("the public interest") against what is good for rightsholders and the publishing industry. (Note that it benefits the public for there to *be* a publishing industry.

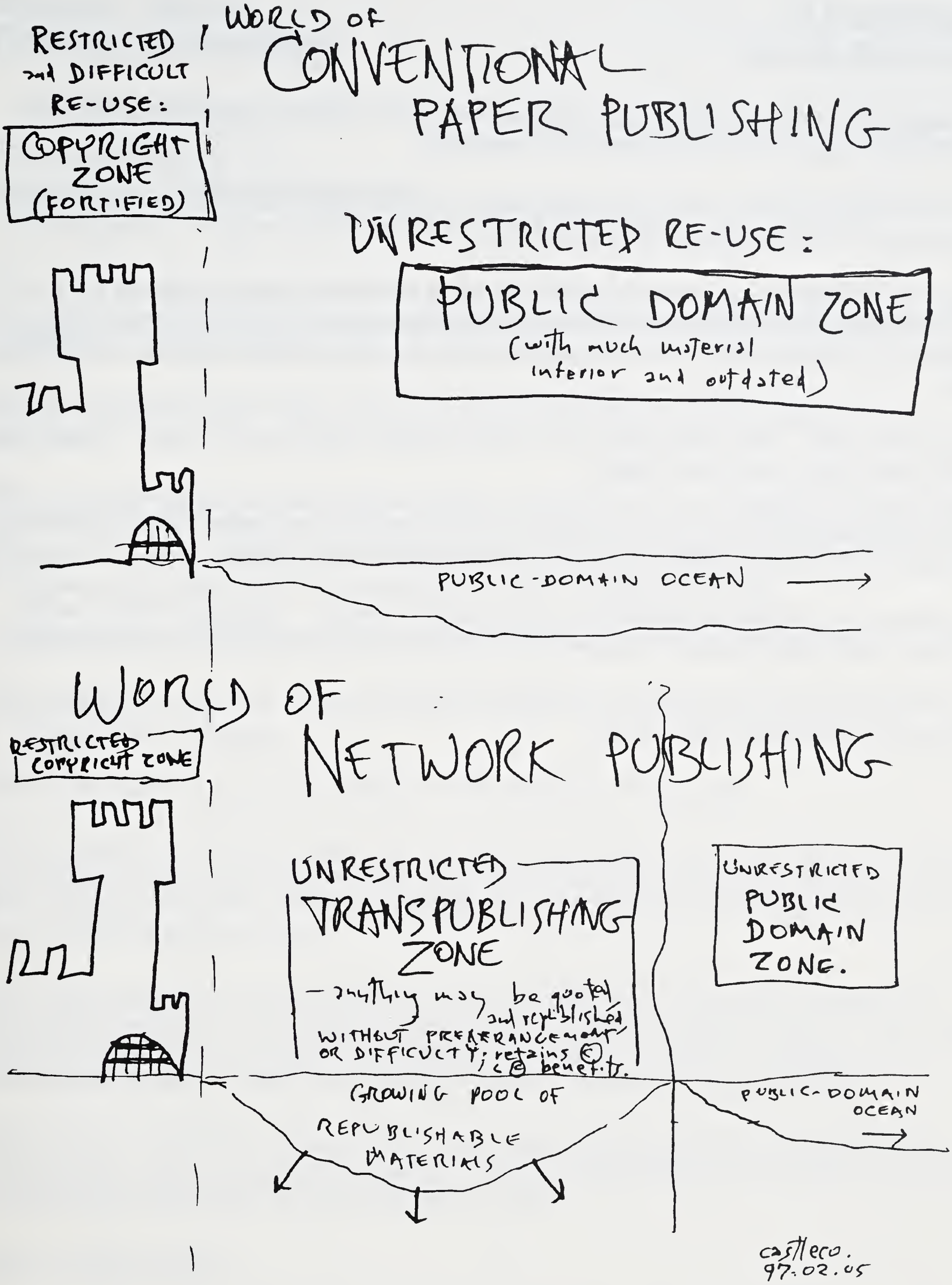
- Copyrighted material costs more, and this bothers people, but everything costs money and that's hardly a ground for complaint in principle. *The special problem with copyright is the restriction on usage*. It would be nice to lighten that somehow.

- On the Internet and the World Wide Web, there is already a tradition that "information is free." This is very nice for people who receive information, but it also keeps rightsholders from making their content available through these channels.

The Two Copyright Zones

In the traditional copyright world, there have been two copyright zones: the material that can be freely re-used (public domain) and the defended fortress of copyrighted material. Each of these zones has desirable aspects.

Wouldn't it be nice if we could combine them?


WORLD OF
CONVENTIONAL
PAPER PUBLISHING
RESTRICTED and DIFFICULT RE-USE:
COPYRIGHT ZONE (FORTIFIED)
UNRESTRICTED RE-USE:
PUBLIC DOMAIN ZONE
(with much material inferior and outdated)
PUBLIC-DOMAIN OCEAN
WORLD OF
NETWORK PUBLISHING
RESTRICTED COPYRIGHT ZONE
UNRESTRICTED
TRANSPUBLISHING ZONE
- anything may be quoted and republished WITHOUT PREFERRANCEMENT OR DIFFICULTY; retains © benefit.
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Hyperhells 6.5:
Hard-Shell Media

By "hard-shell media," I mean materials that have to be used by themselves, and only in restricted ways, and which cannot be connected.

(Isn't it remarkable that you can get dictionaries on CD-ROM, but you can't look up a word in one CD-ROM on another CD-ROM?)

People are not thinking about the problem of using electronic media together. Publishers imagine you'll want to look at their products by themselves because they think they're priceless. But in fact something you can only look at by itself is of limited value.

James Joyce said, "You must spend your entire lifetime studying my work." Other authors don't say it, but they think it.

This is nonsense. Most of us do not have great leisure. We need to be able to get the most out of media in the least time, and to use the materials together.

We need to go to what I would like to call "soft-shell media"—materials which can be combined and linked by users, which can be speed-read and summarized and quoted.

This need not in any way lessen the integrity of the documents or violate copyright. But we have to work out the right ways.

Chapter Seven
Transpublishing

Transpublishing 7.1:
Unrestricted Virtual Quotation:
A Sweeping Proposal for a New On-Line Literature

What I am about to propose has been widely misheard. People have said I was "bragging," or that I didn't understand how computers worked, when in fact I was proposing a radically different form of publishing.

It is an extremely simple idea, but it is devilishly difficult to explain, since it is so different.

This is a proposal for an extremely desirable system with great simplicity, fairness and openness, a unique solution that simultaneously satisfies many different needs. It is a proposal for a new form of universal digital medium from which everyone will benefit, to deepen and enrich what is now available on the World Wide Web.

Call it tomorrow's World Wide Web. Call it anything you like, but let's do it.

A Copyright Solution

First of all, this is a proposed solution to the problem of copyright.

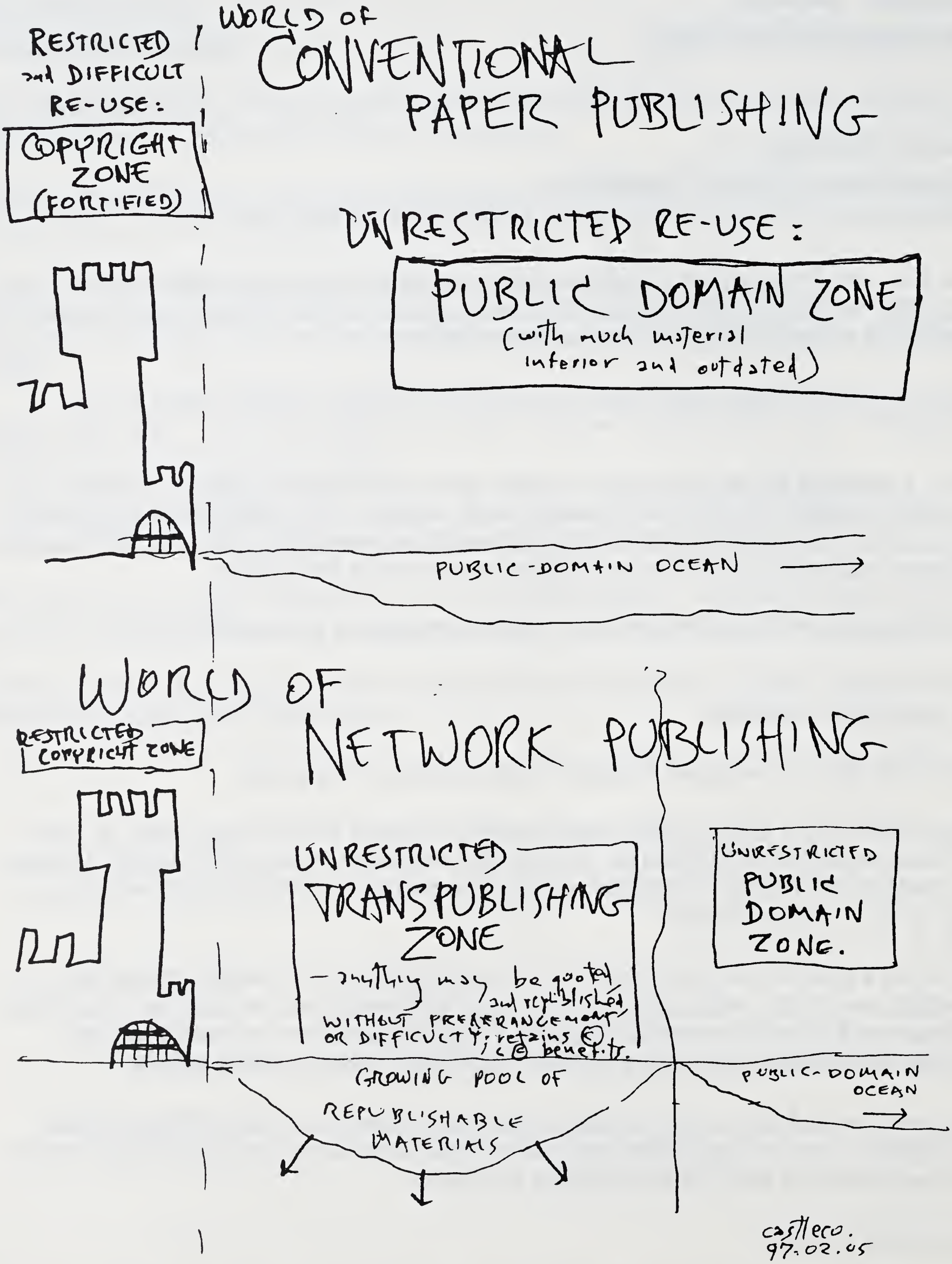
Many people don't like that idea, and want the copyright system to go away, or want only free contents to be offered on the Net. But copyright owners are currently keeping their material off the Net. Whether you like it or not, the copyright system will not go away. It will only get harsher.

This is not a place for an introduction to the copyright law. We simply assume that copyright law exists, will continue to exist, and will sometimes be enforced. But within the framework of what cannot be changed, I hope to take away its restrictions and alleviate its harshness, with a fair method that will be useful to many parties.

Many users would like to have a clear, clean, legal, honest and well-defined system that permits re-use of copyrighted material without negotiation, and that all may use in the expectation that they are not breaking any laws.

This is such a system.

It appears beneficial to all parties, by creating a clean model of copyright, ownership and purchase.


WORLD OF
CONVENTIONAL
PAPER PUBLISHING
RESTRICTED and DIFFICULT RE-USE:
COPYRIGHT ZONE (FORTIFIED)
UNRESTRICTED RE-USE:
PUBLIC DOMAIN ZONE
(with much material inferior and outdated)
PUBLIC-DOMAIN OCEAN
WORLD OF
NETWORK PUBLISHING
RESTRICTED COPYRIGHT ZONE
UNRESTRICTED
TRANSPUBLISHING ZONE
- anything may be quoted and republished WITHOUT PREARRANGEMENT OR DIFFICULTY; retains © benefit.
UNRESTRICTED PUBLIC DOMAIN ZONE.
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This is not merely a proposal. It is a system that can already be used right now—though not as broadly as I hope it can be in the future, if things develop as I am about to suggest.

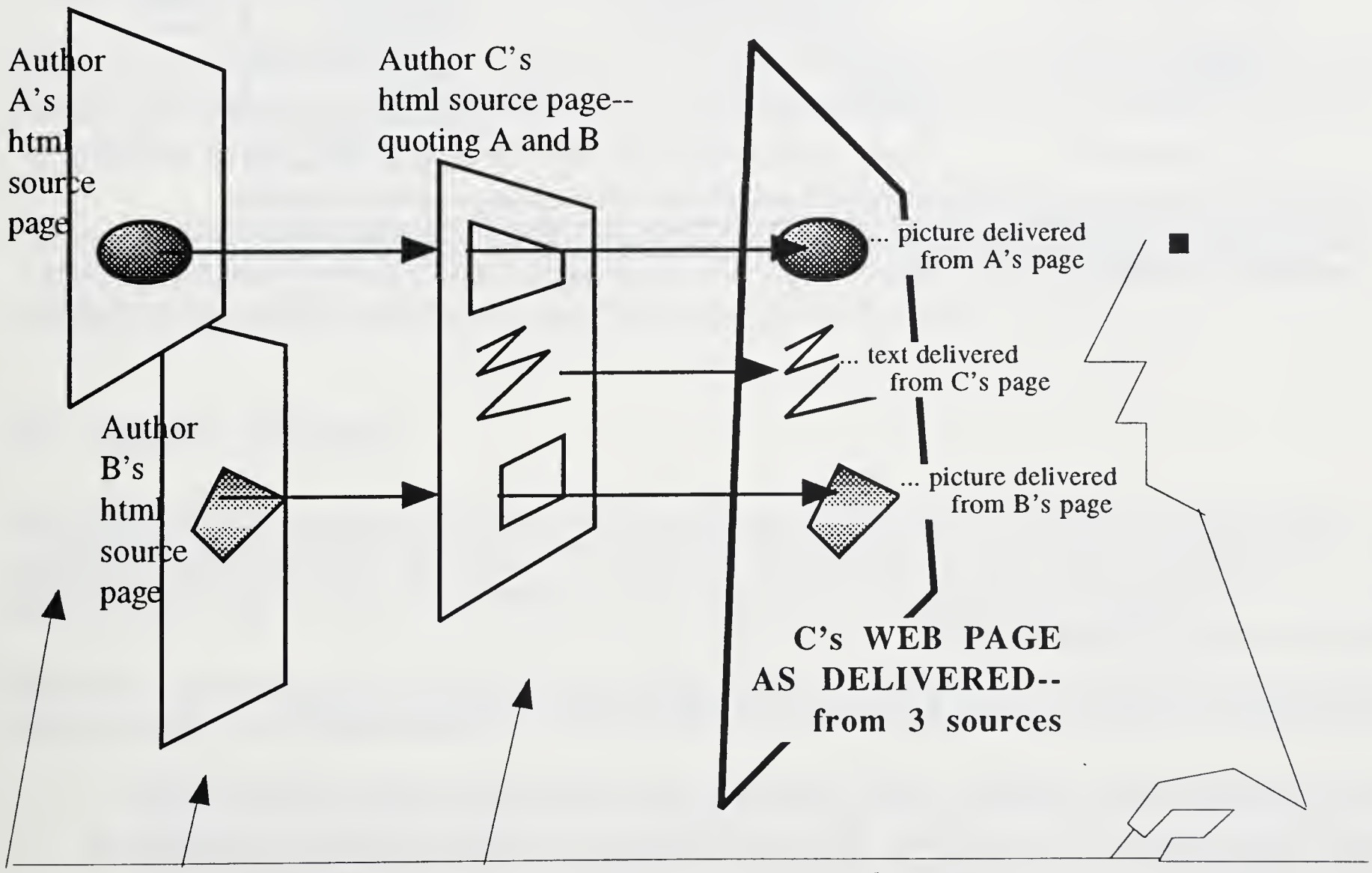
The idea is to extend the zone of people's free operation while working within the existing copyright system, allowing quotability without special arrangement and republication without negotiation.

HARD-SHELL DOCUMENTS

The tradition of copyright assumes that a document is unified, owned by a single party, and obtained only as a whole document (or today, a page from a single server). Quotation is not allowed, except in very small pieces under the "fair use" doctrine, or through the kind of cumbersome negotiations among publishers that have been conventional in the world of paper publishing.

This all made sense in the days of paper and post offices. But for today's networked documents, I think we should have another method.

I want to call this method *transpublishing*.



By user's choice of C's page, user automatically pays A, B and C a very small amount for their pieces.

The idea is extremely simple. The idea is to allow quotation by anyone, in any amount, in on-line documents; provided that the quoted material is always brought from the

original.

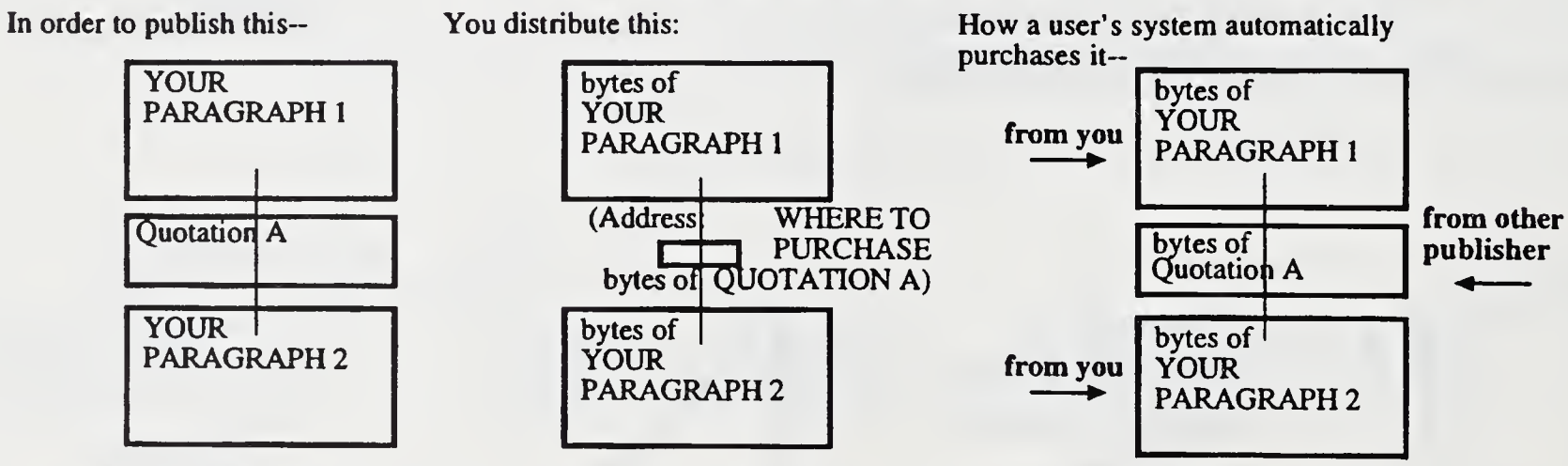
"Transpublishing" is on-line electronic publishing where a virtual quotation is brought in by a pointer. The reader's system gets each quotation from its original source (or some effective equivalent).

Within such a scheme, anything may be freely quoted, and distribution—possibly sale—is by the original publisher. The user also has a path to the original context— the path being that address by which the material is quoted.

There are details to clarify, but that is the basic idea.

MODEL OF QUOTATION (republication, transpublication)

You are free to republish any quotation, in any context you wish it, without needing to negotiate. How?



Therefore: you are free to republish any quotation, in any context you wish it, without needing to negotiate.
(Pre-permission for such quotation is granted in advance by all participating publishers (transcopyright permission).)
Though the material is presented out of context, the original context is IMMEDIATELY AVAILABLE at the same address that quotation A was found.

Let's go over it slowly.

There are several direct benefits.

- The public benefits in general, because anything may be freely quoted.

- Each quoting author benefits, since each author is permitted to use any materials which participate in this scheme. You do not have to explain a thing over again, or draw a diagram, if an excellent explanation or diagram is already available for transpublishing; you can just include it.
- Each author or artist who is quoted benefits, because it provides exposure for that author's work and the ideas—both the quoted part, and the context, which some readers may explore.

- Each quoted publisher benefits, both by advertisement of the fuller work and by sale (if possible) of the quotation.

In such a system,

- everyone could quote everyone else freely and in any amount without negotiation, since the means of quotation would actually consist of a pointer to the original;

- individuals would have the right to own copies just as they own paper copies or recordings;

- the copyright system would be maintained;

- rightsholders would be paid for the use of their material in exact proportion to its use in the world.

This will make possible a new kind of universal digital medium, where all media objects can be freely re-used, like clip art, while still respecting copyright.

We need to be clear about several things immediately.

- This must be a voluntary system for the rightsholders. Because of the existing copyright law, rightsholders must agree to make their materials available on this basis. (How this is done will be discussed later.)

- This only works on line, since the system brings each manifestation from the original. Paper publishing, or any actual redistribution of the materials by a recipient, must be negotiated in the ordinary copyright manner.

- This already works technically for pictures on the World Wide Web; anyone can virtually include pictures from anyone else's page. However, since the permission method is not well established, people are properly hesitant to use it.

The Implicit Bargain

The publisher (who may of course be the author) relinquishes control over possible contexts of the material, in hopes of a number of benefits: more users will see the material, and there may be payment. Each re-use has access to the original.

While this already works for pictures on the Web, extending this method for text and other purposes is the next step.

Access to Original Context

Imagine being able to see the original context of any quotation, or go to other places where it is republished.

Imagine being able to see the original context of news photographs, in deeper coverage.

Imagine seeing a video shot, and being able to go to see its original context in some earlier production. Indeed, for all kinds of documentary footage, it would be enormously beneficial to be able to jump to an original context.

Example: if you use the same video shot in several different on-line productions, the related background information
should be available to all users.

Currently No Sensible Way to Write About, or Review, Movies

This points up an interesting problem. It is extremely difficult to write about movies, because you would want to be able to show shots from the movies you were writing about, and this is very difficult to arrange.

However, if the organization owning rights to the film places the film on the Net under transcopyright—presumably at low resolution—then anyone will be free to "quote from" the film, putting insertion codes into the contexts, such as Web pages, where you would like to show part of the film. Then each user could download the shots you indicated, paying by the individual frame, and those who particularly liked the film could buy larger and larger parts, or the whole thing.

Or consider this example. I recently saw a remarkable documentary of the life of Leni Riefenstahl, a great film director. Unfortunately her principal work consisted of two remarkable films made for Hitler in the 1930s, glorifying the Nazi regime. After the war, disgraced by her association with Hitler, no one (understandably) gave her resources to make any more movies.

But in the documentary about her, entitled "Macht der Bilder" ("Power of the Artist"—but released in America under the title "The Wonderful Horrible Life of Leni Riefenstahl"), we see her—still energetic in her nineties—and hear her argue that the films she made for Hitler were not propaganda, they were Art.

This is a very interesting argument, and we watch her at the movie-editing table, watching particular shots from her film "Triumph of the Will." In her face you can see how much she loves these shots.

What I would like to do, in viewing this film, cannot yet be done. And that is to freeze-frame Riefenstahl watching the particular shot, and to jump on the screen to the original context of the shot she is watching—to judge, in context, her claim of art.

Enforcement Issues

Enforcement issues for digital copyright have become a crazed preoccupation for many people. Security measures are beginning to impose an enormous burden of effort whose result is to annoy and embitter users.

But copyright violation is possible in any electronic system that is not insanely restricted. The question is what benefits the violators will receive, and what losses the rightsholder will experience.

A Different Frame of Mind

Transcopyright rests on a different system of assumptions from the systems of the past, a different frame of mind.

Some of the key assumptions are:

- Tomorrow's stored and salable digital materials will be vast; going on practically forever, with no clear boundaries.[1]

- The prices for most of them will be very low.

- Most importantly, *people will want different things*.

If people steal materials (say, an hour's recording of a certain poetry reading), and redistribute them, what is the likelihood that some random recipient would *want* these materials? Negligible. And for one person to obtain personal copies and then forward them to someone else will probably be a waste of time for that person.

So wholesale piracy is likely only for high-price goods, and most people will have no use for the other material—like old magazines and newspapers.

Therefore: It will be usually be *more convenient* to leave things on the supply network, for each person to get independently.

---

[1] For example, you may offer hundreds of hours of video, organized simultaneously in a number of different ways, stretching out to obscure out-takes. In other words, boundaries will be far less sharp than the old boundaries of yesteryear's released productions.

I have been proposing a precise legal copyright solution for many years, but most people did not understand. I now call the system "transcopyright," although it has been implicitly part of my designs for many years.

Transcopyright is a new legal doctrine which appears to be compatible with all systems of law. It has been accepted with enthusiasm by some members of the law profession in the United States and other countries, but has not as yet been tested in courts.

This is a *permission method*; but in a way it permits a whole new form of copyright.

It is the idea of giving *permission* for transpublishing—advance permission for other people to quote you in electronic documents by pointing, rather than by copying.

It is a method of permission to be given voluntarily by rightsholders. Since transcopyright is based on permission by the rightsholder, no changes are needed in the law.

The transcopyright permission states the following idea (though more formally): "Anyone may republish this material virtually, anywhere, as long as each recipient gets the material from me."

In more detail: "Rightsholder grants permission to re-use and republish this material virtually in any on-line context, as long as only a pointer or address is transmitted by the re-user or republisher, with the intent that each copy of the material to be re-used or republished is taken by the final recipient from some server designated by the rightsholder."

Legally, users do not have any choice. The publisher is not saying, "Get it from my server *please*," but rather "You *must* get it from my server, or you are breaking the law."

Can any user transpublish transcopyrighted materials? Yes, that's in the definition of transcopyright. As long as you include or send out only the addresses of materials you wish to re-use or republish in a new context, you may republish any transcopyrighted material in any virtual context.

But the material is not "transcopyrighted" unless the rightsholder has given permission for this form of re-use.

Compact Form of the Permission

By putting "trans" in front of an ordinary copyright notice, the rightsholder signals a willingness to participate in this method. And by linking a permission page to the copyright notice, these details are filled in.

Relation to "Shareware"

Shareware is a copyright doctrine invented by Bob Wallace. It is similar to

transcopyright in that it is a permission method; it is dissimilar in its particulars. Under shareware, you are allowed to make copies and redistribute. Under transcopyright, you are not allowed to make copies, but only to provide referral information to the downloader, whose browser then gets the material.

(For more on transcopyright, see the Appendices, especially Appendix 2.)

Chapter Eight
Beyond Transpublishing

Beyond Transpublishing 8.0: There's More

Have you had enough? You can close the book now; you know that is your privilege as reader-god.

Or perhaps I should stop the book here.

The idea of transpublishing still shocks some people so greatly that it is best not to jar them for a while.

But if you want to continue, you may.

Transpublishing, as I have presented it, should be a beneficial arrangement for all. It will provide broad re-usability without sacrifice of copyright, and a path from every quoted use back to the original.

It is a generalization—and in some ways a simplification—of electronic publishing that should be good for all of us.

However, there are some other extensions and generalizations of electronic publishing that I believe we also need. I will try to explain these to those readers who dare to go on.

Beyond Transpublishing 8.1: Serious Overview and Deep Intercomparison: Detailed Connections Sideways

These days, you generally look at text on a computer screen in either of two ways: either using the computer as a paper simulator (popularly called Wizzywig, for WYSIWYG, "What You See Is What You Get"), or as spaghetti hypertext (the Web), where the user is completely disoriented as to overall structure.

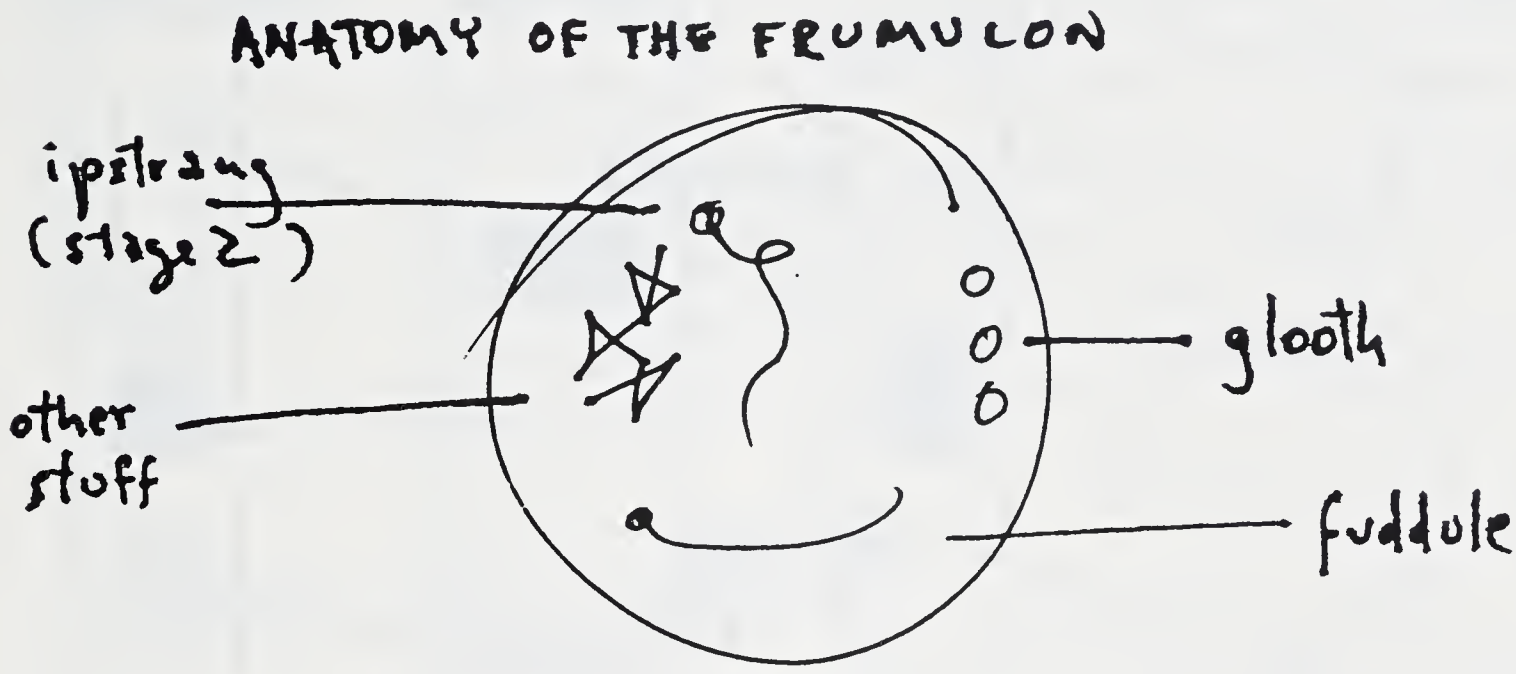
I would like to propose that another kind of presentation is more important than either.

Actually we are familiar with this kind of presentation, but we may not recognize the general case. I would like to call the general case *transparallel presentation.*

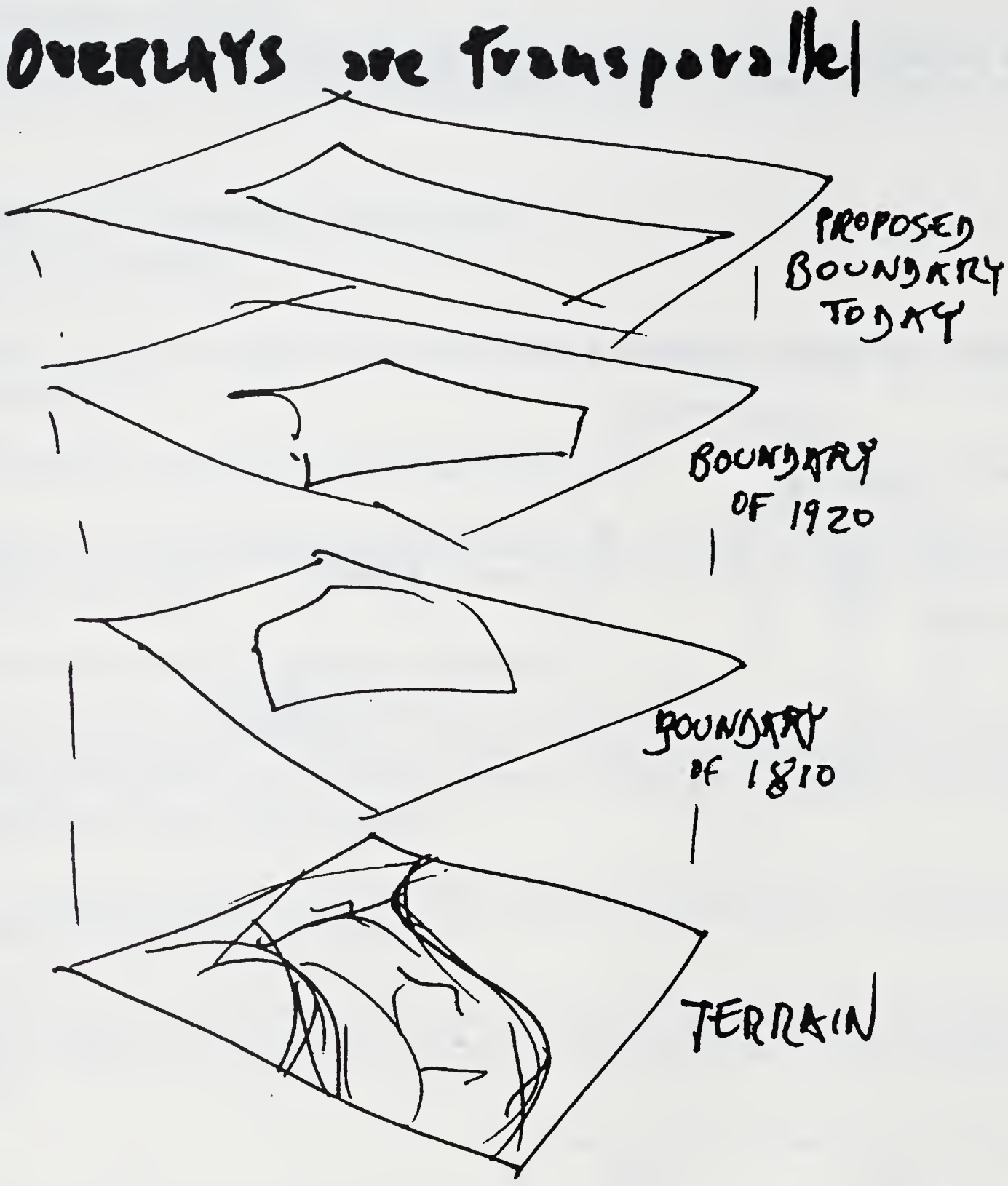
By *transparallel presentation*, I mean showing two or more objects together, with specific connections between their parts.

In transparallel presentation, the reader sees, and may seek to understand, at least three things: the first object, the second object, and the interconnections.

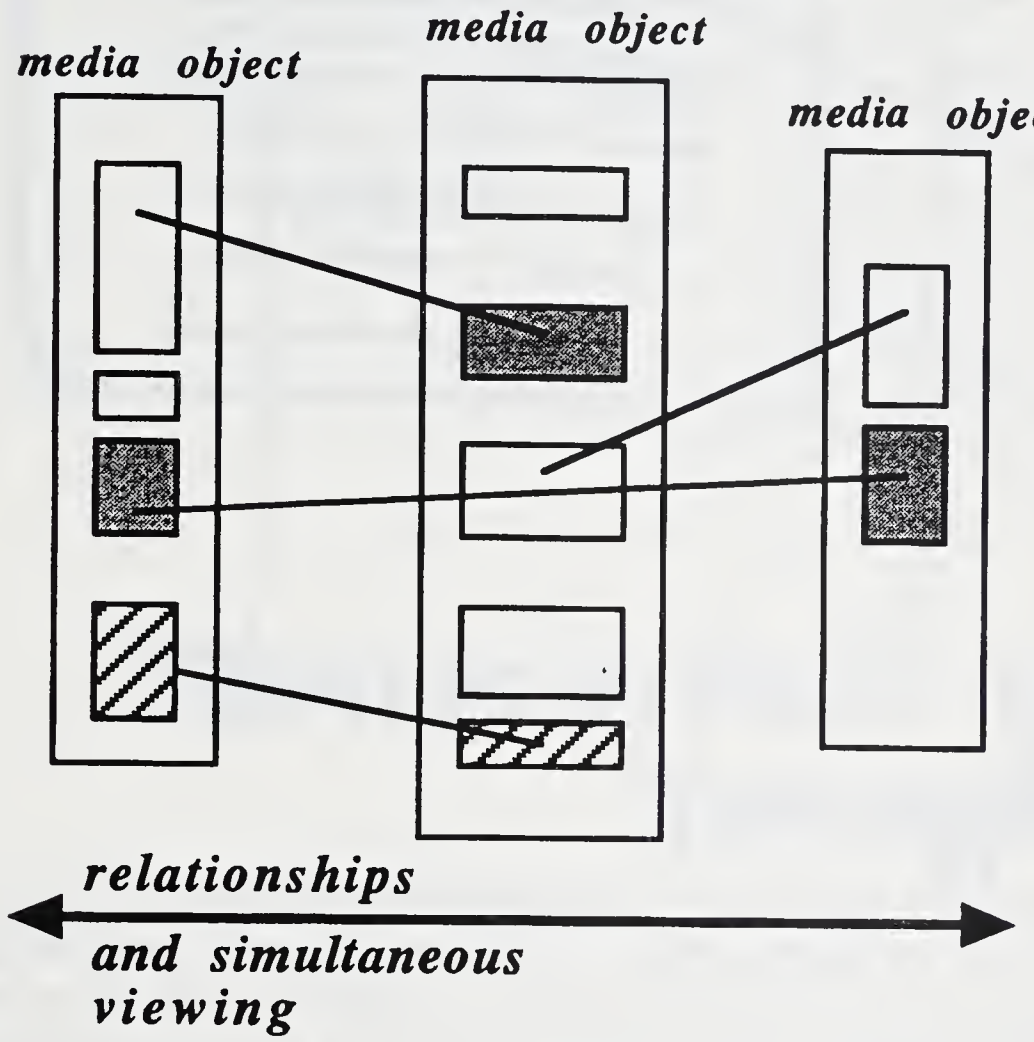
Examples from paper publishing include: biological illustrations with captions; columnar presentation of text with side-by-side commentary.



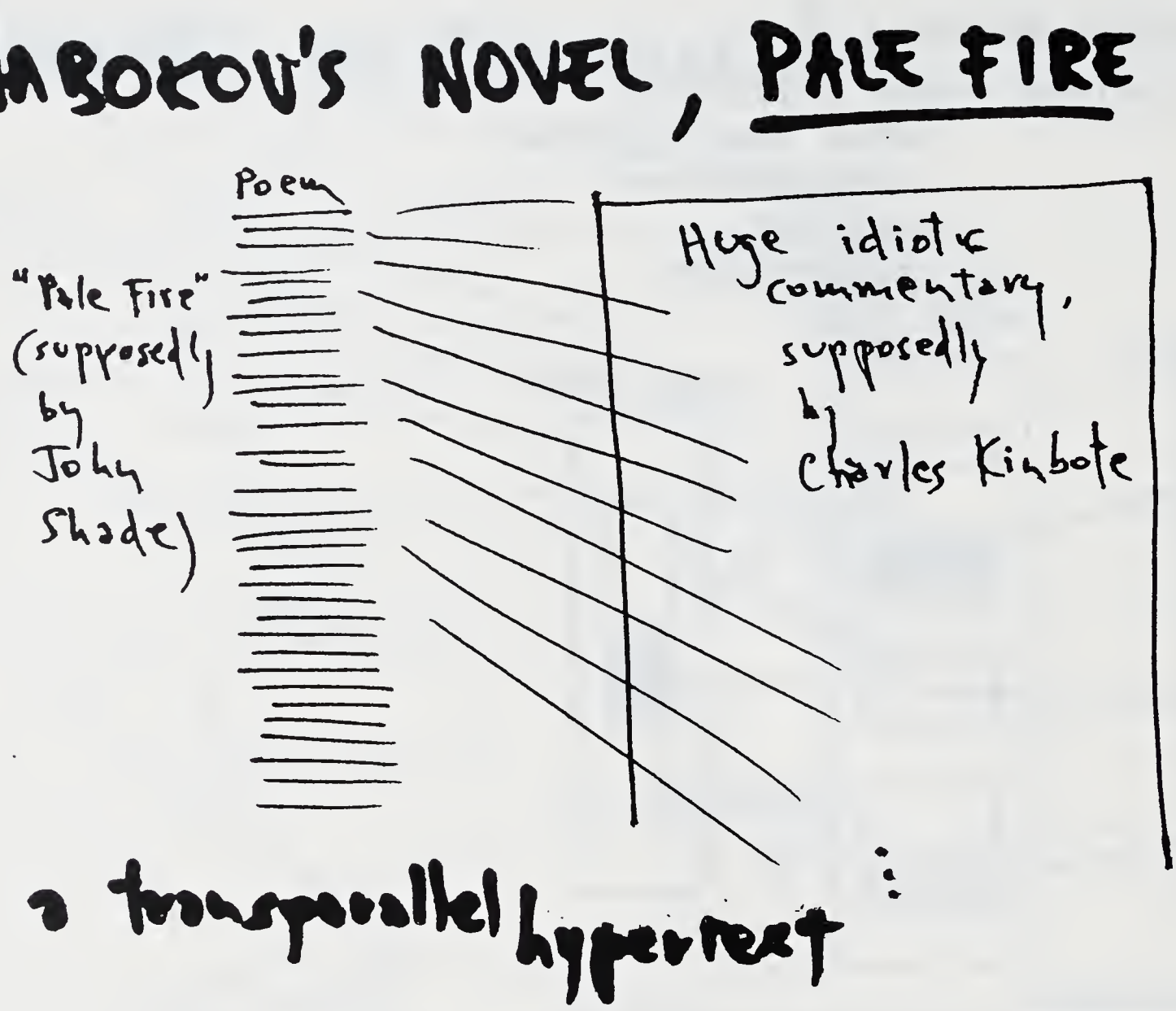
WHO'S WHO IN THE CLASS PICTURE



In general, then, transparallel media are structures whose detailed connections need to be studied—often sideways.



All biology textbooks, and all diagrams with matching explanations, are examples of transparallel presentation and media. But there are many others. The *Variorum Shakespeare* is a compilation of all the variants of Shakespeare's plays, arranged so that their details can be compared. The *Interpreter's Bible* is an edition of the Bible which stresses the connections and parallels among different versions. I can even name two hypertext novels in which transparallel presentation is implicit: *The Dictionary of the Khazars* by Milorad Pavic, and Nabokov's *Pale Fire*.



The Churchill page, too, may be thought of as a transparallel hypertext, with different versions which happen to be wrapped around each other.

Understanding the relation among writings, in this way, is an important part of text work that has not been addressed. Writing and design and scholarship are all cases where we need to compare complex connections; so we need computer text systems[1] that support transparallel viewing.

I long ago proposed that we need to see connections on the screen between the contents of windows.

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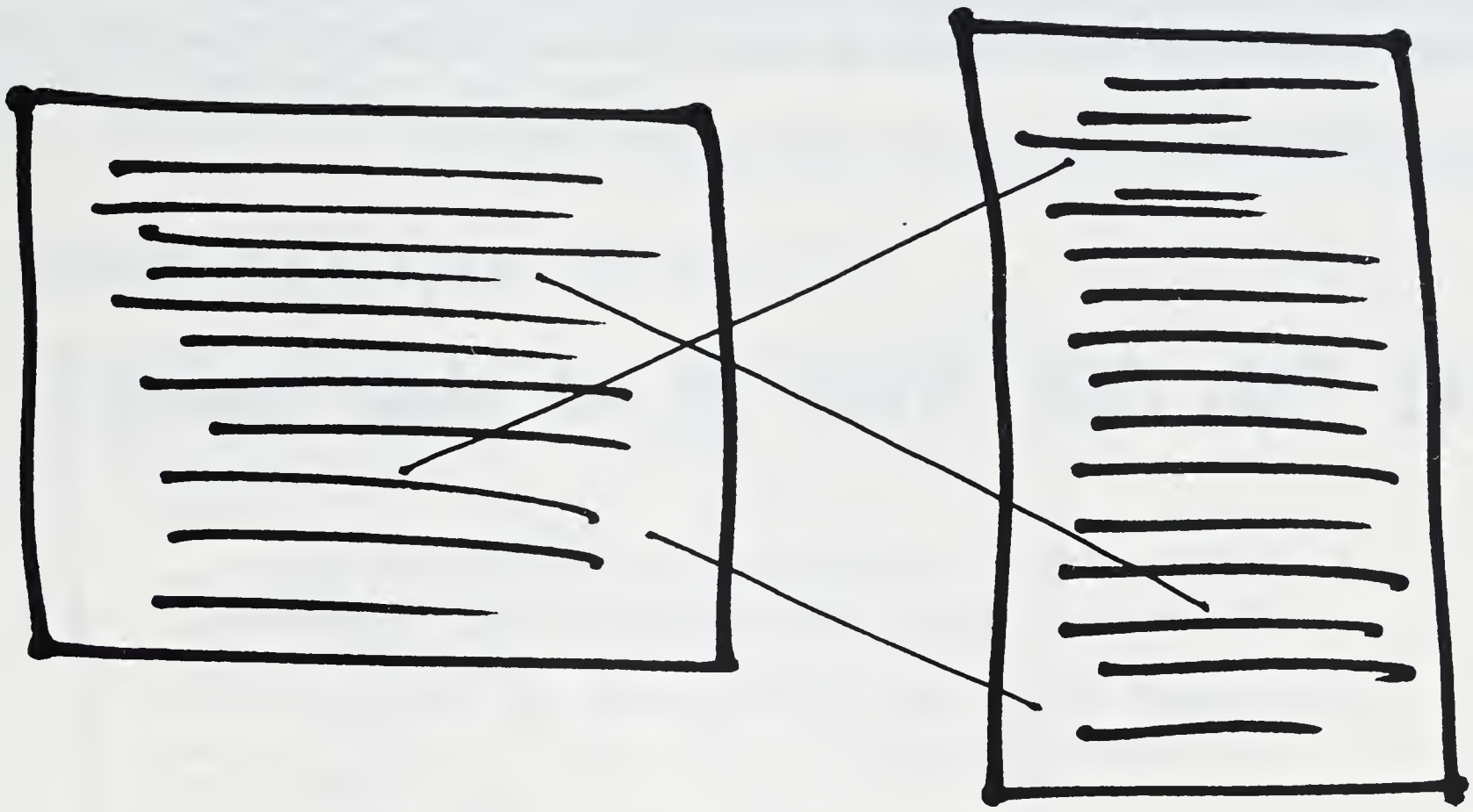
[1] I regret that there is no room to go into the varieties of transparallel graphics that we need.



TRANSPOINTING WINDOWS

A word or two about this form of presentation is in order. In this illustration we see visible lines from the contents of one window to the contents of another; the endpoints are supposed to adhere to the points in the text, despite scrolling. I have been proposing this as a principal form of text display since the nineteen-sixties.

While I have been unable to get this design implemented in my own projects, it has been implemented recently in at least two versions. The first was by Prof. Sergey Tolkachev, presently teaching in St. Petersburg; he showed it to me on a PowerBook, running in HyperCard, at the Hacker Conference in fall 1995. (A writeup of this software is presently, as of June 1997, at http://members.aol.com/apreal/.)

The second, by Ian Heath of Southampton University, runs under their "MicroCosm" hypermedia system. Not only does it show links dynamically between contents of different windows, but it actually scrolls the windows, with the connections showing properly across the frame boundaries.

And just because Netscape does not presently support transparallel display, there's no reason they can't—if Netscape and its high-voltage people decide it's a good idea.

Even the Netscape browser could be set up to present transparallel relations; either by Netscape, or perhaps as some third-party plug-in.

We need to be able to attach notes to computer data in a way that cannot be done now: with persistent links that can be viewed in transparallel mode.

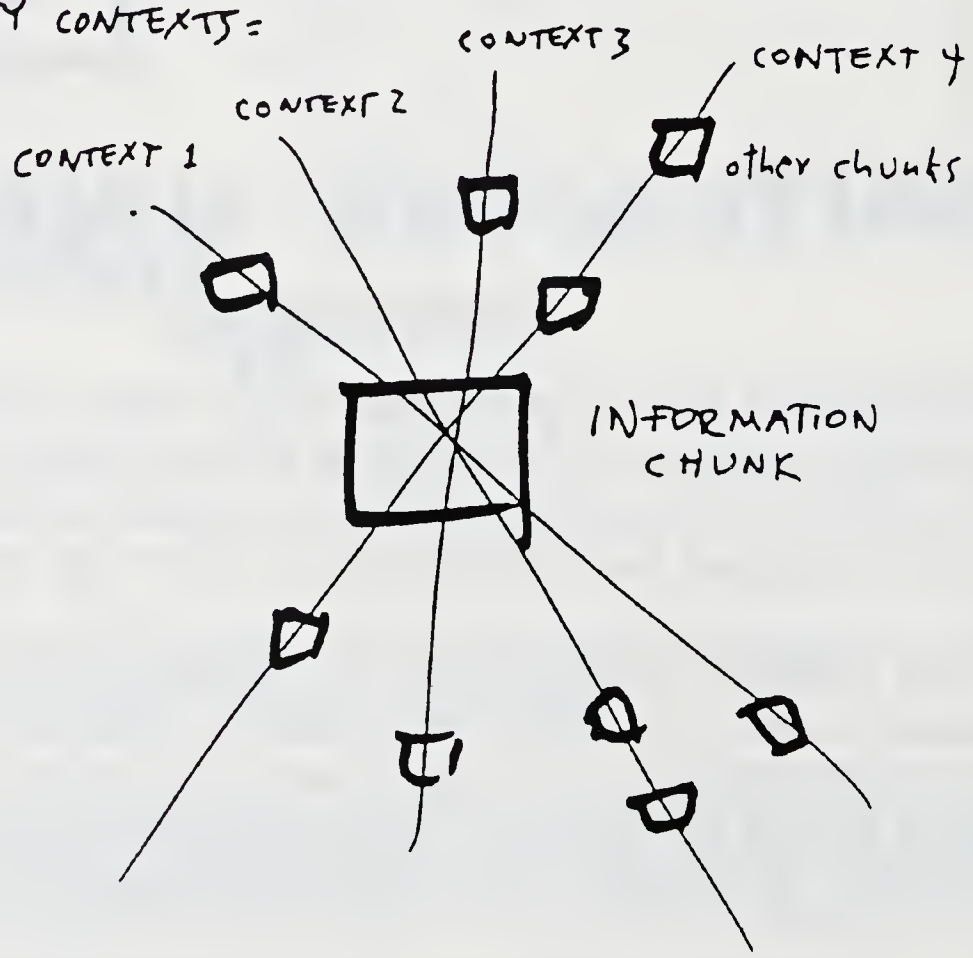
A principal issue in representing complex information is how to re-use and intercompare materials in their different re-uses. How can you compare these re-uses?

This requires being able to see the same thing in many contexts.

HOW CAN ONE THING BE IN MANY PLACES?

A PRINCIPAL ISSUE IN REPRESENTING COMPLEX INFORMATION IS HOW TO RE-USE AND INTERCOMPARE MATERIALS.

This requires having THE SAME CHUNK OF INFORMATION IN MANY CONTEXTS=

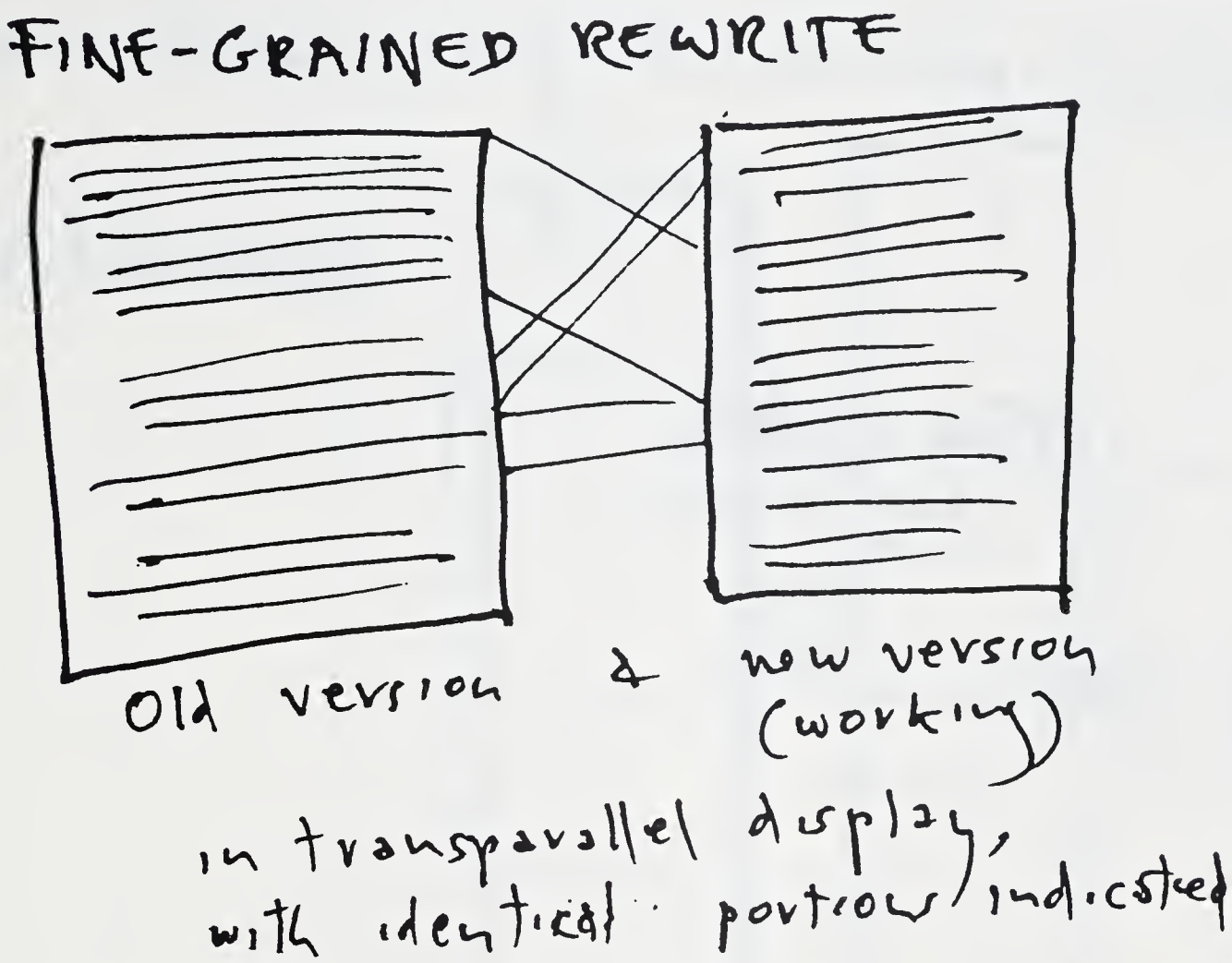


The Churchill manuscript page is a nice example. The manuscript actually shows the same phrases in more than one context—except that the contexts are wrapped around each other visually, embedded within one another.

We may think of it as a connected presentation of different versions which shows specific connections between their parts—*a connected transparallel presentation of versions which shows which parts are the same and which are different.*

We could separate these visually, for research and study, by showing the same two versions digitally in side-by-side panels, highlighting the parts that are the same and the parts that are different.

Indeed, this could be made the interface for a new kind of editing system—one which shows the relationship of old to new.



I have long advocated this as a real writer's system.

But showing such shared material raises another problem: *the system has to know the details of what parts are the same and what parts are different.* We need some way to manage the sameness of data.[1] The system has to keep track of what parts are the same and what parts are different. And that brings us to Hyper-Sharing.

In more general terms, how can we re-use things and know where they came from? And get to the original?

Transpublishing, discussed in the previous chapter, gives access to the original. But what about seeing *other* uses?

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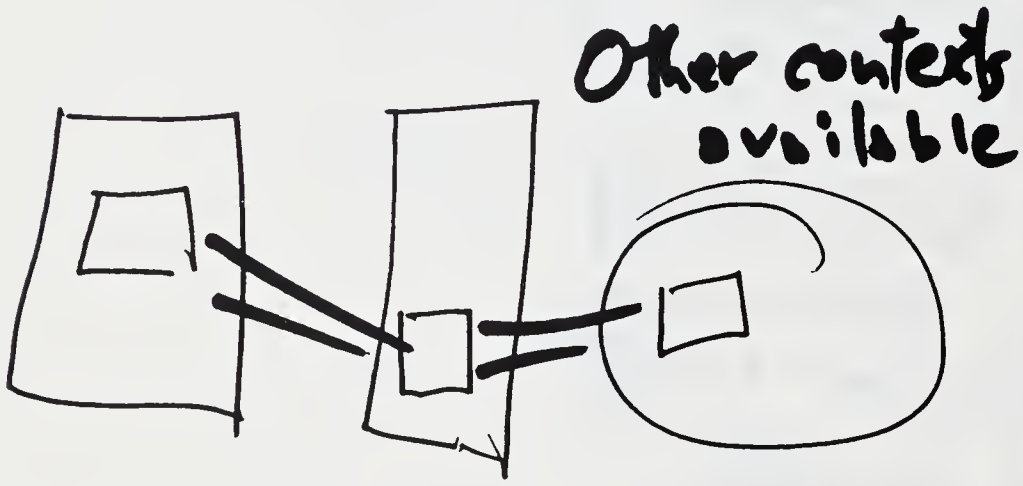
[1] You can't just scan for it, not in remotely reasonable time.

We are used to doing this many ways in paper systems. Cross-indexing is one of them. We refer to the different uses by saying, "see page so-and-so."

With computers, we have come to have many techniques for re-using material; they are extremely different. (See Appendix 5, "Identic Relations.")

But the computer can also offer a more elegant solution. Why not arrange to show the different contexts side by side?

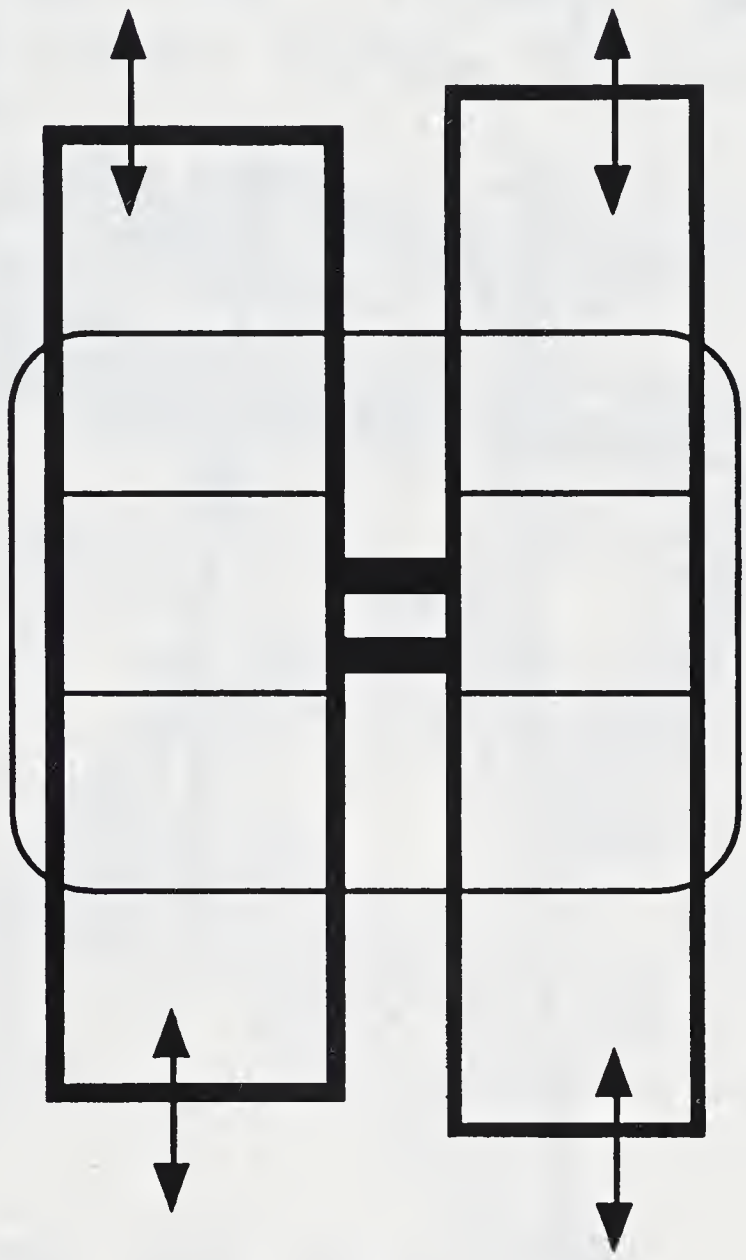


I have been promoting this idea for years under many names. In this book I will try calling it "hyper-sharing," to see if that helps people understand.[1]

[1] Since 1987, I have used the term "transclusion" for it; but I think "hyper-sharing" sounds friendlier. This also helps separate what have become different senses of transclusion, and different ways the word is now being used on the Net.

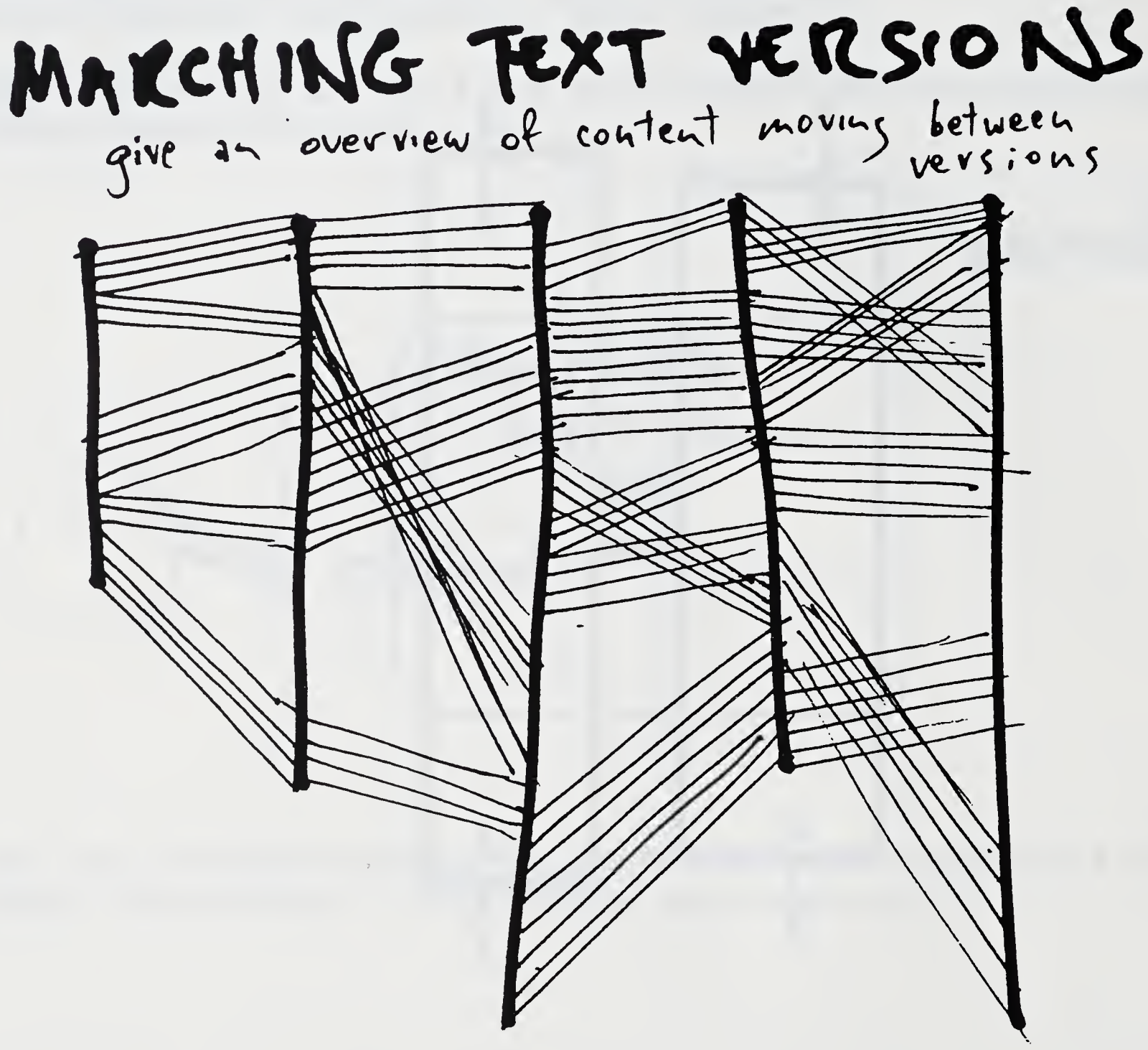
To see the same paragraph in two different contexts, the system would show the contexts side-by-side and show also that the paragraph was the same. One term for this is "H-Viewing."

H-Viewing



The simplest and most obvious use of hyper-sharing is for version management, so that a writer or editor can see where the materials are going from one version to another.

An overview of text versions could look like this:



This diagram shows the movement of text bytes among versions of a text document (showing the bytes sequentially). Note that such an overview could be used as an interface as follows: if you dag[1] any of the vertical lines (documents), you would go to that position in the document, and if you dag any of the transit-lines (indicating the movement of bytes between versions), you would see the same materials side-by-side in the two versions.

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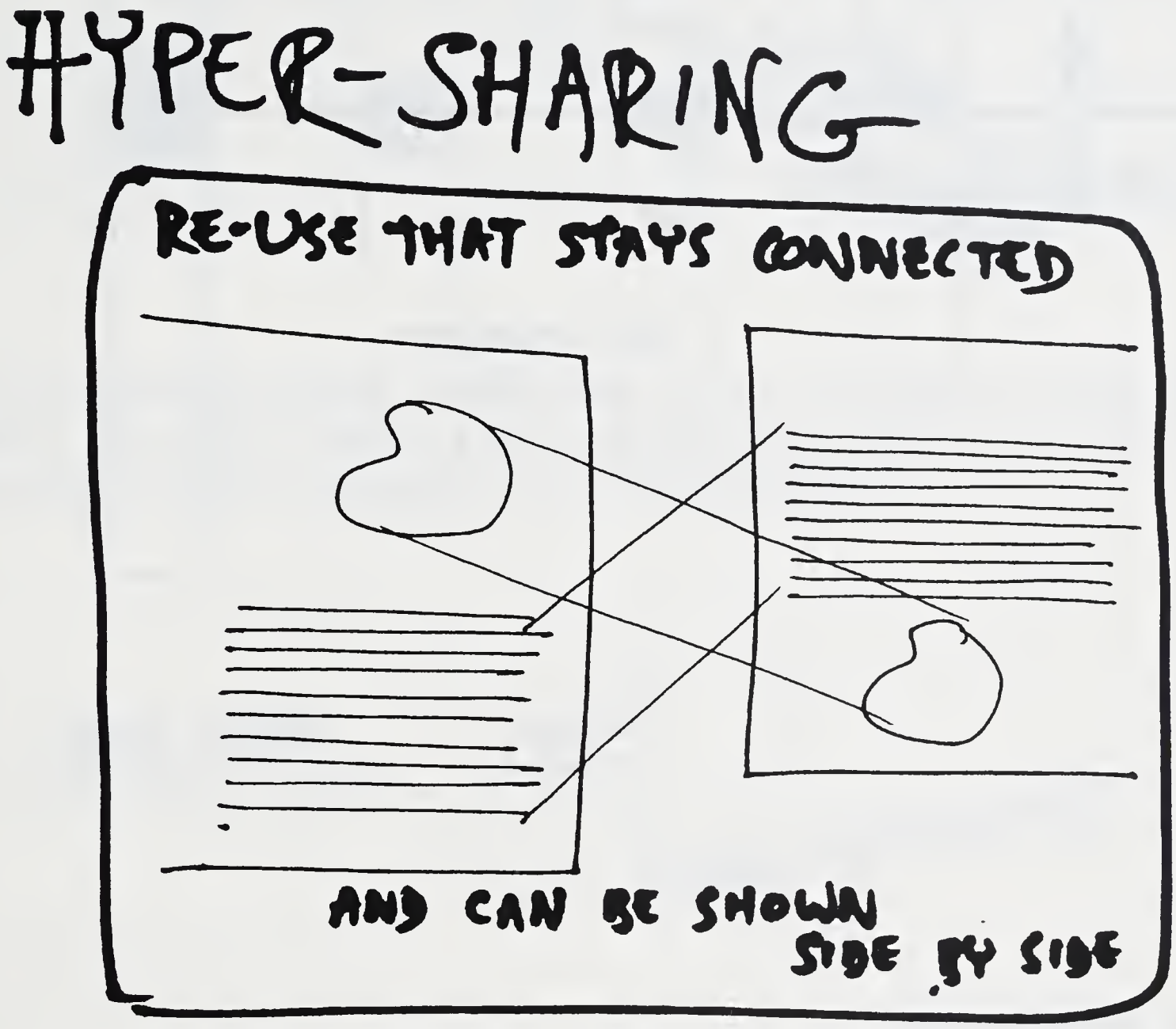
[1] I prefer the term "dag" to "click on," as a broader term for all forms of screen pointing.

This brings us to a first definition of hyper-sharing.

Hyper-sharing is using the same material in more than one place, and seeing these different uses of the material, and knowing that they are the same material.

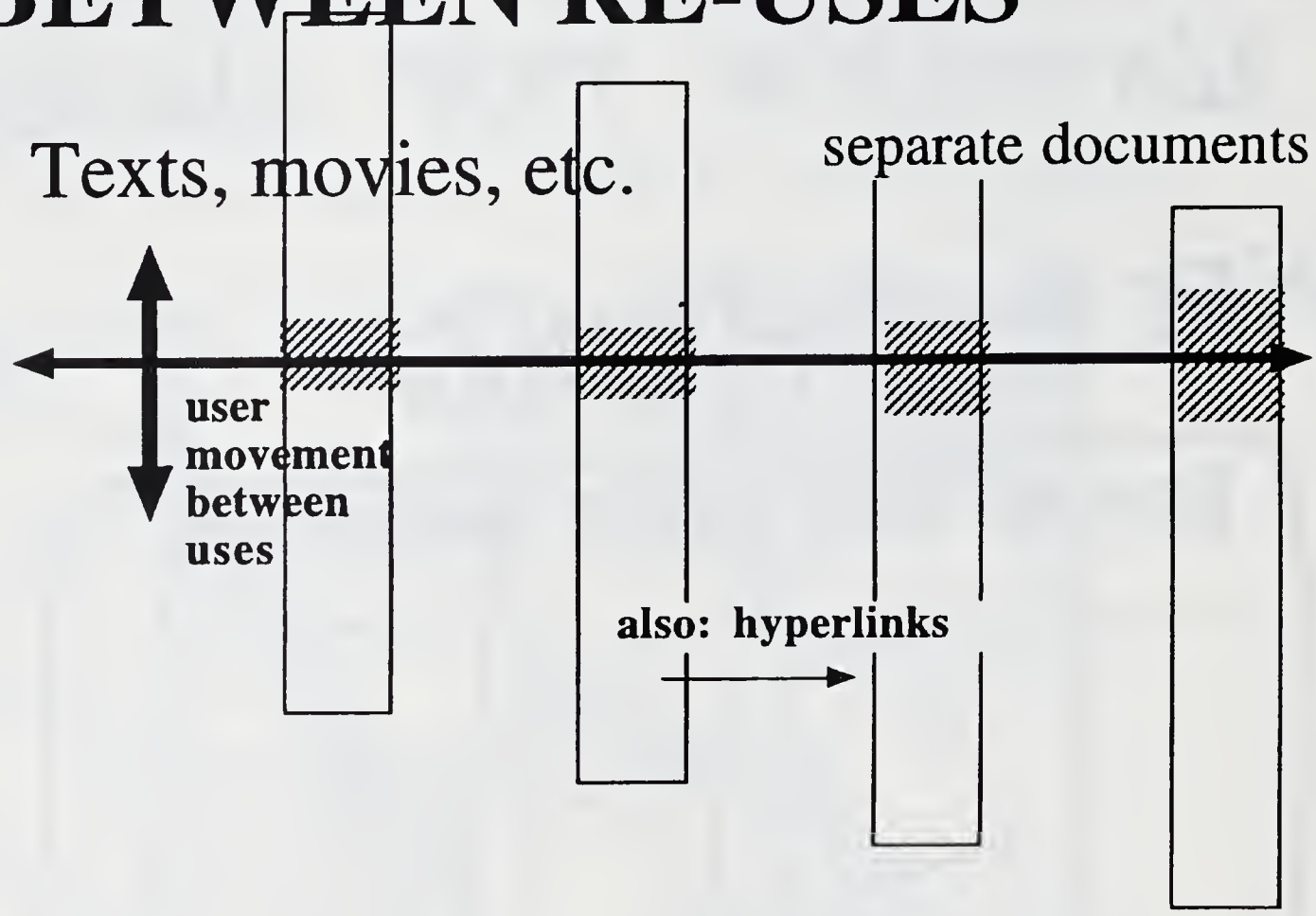


Note the uses of maneuvering among them, following from one use of the material to another.

Note that the technical problem is how this re-use stays connected. But that technical problem is irrelevant to the general objective.

This implies being able to move among re-uses.

MOVING SIDEWAYS BETWEEN RE-USES



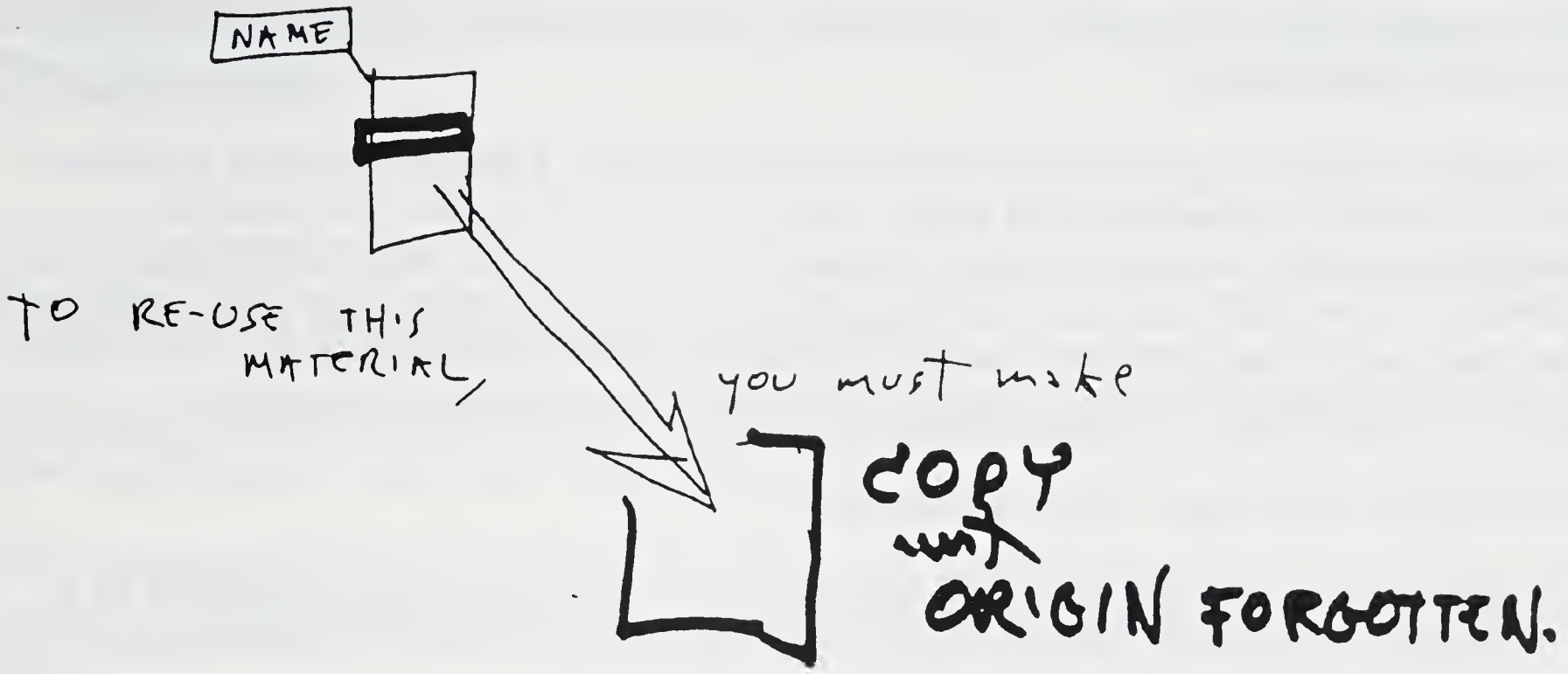
Deep Version Management

As I have said, the objective of a computer text system should be exactly to represent the complexity of thought.

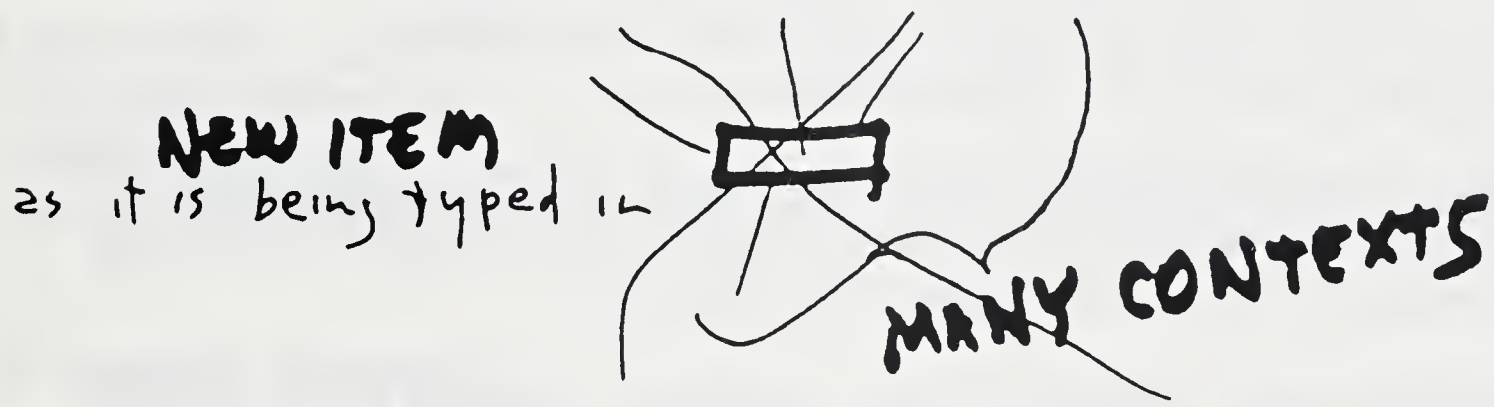
I believe the system we need for text handling will show us the different versions and alternatives of different drafts and possible uses of the same material.

And this will need to be based on hyper-sharing.

In today's software, when you re-use material you have to copy it. This loses the connection to the original.



This is convenient from the programmer's point of view, but not useful from the writer's. The writer's Literary Machine should place each new item simultaneously in every context where it belongs, even as it is being typed in.



The question is, how can one thing be in many places? This is an important question of virtuality—the construct logic of a particular virtuality.

Virtuality and Construct Logic of Hyper-Sharing

What is the exact virtuality—the construct logic—of hyper-sharing?

We are not talking about a *copy* of the shared material, or *instances and master* of the material, or *scanning for* the material, but about something different. (See Appendix 5, "Identic Relations.")

Each appearance of the hyper-shared material must be a *separate manifestation* of the data which *somehow is kept connected to its original.* The original must also be kept connected to its manifestations. Thus it is not an "instance."
Hyper-sharing is re-use that stays connected and can be shown side-by-side. It is this

virtual structure that is important. To stress this virtual structure, the best explanation is a theological explanation.

If you meet a saint or a god in the road, He or She is not a Copy of the saint or the god. He or She is not an Instance of the saint or the god. No, He or She is a particular Manifestation of the very saint or god Himself or Herself. If the saint or god is manifesting in two different parts of the world at once, conversing (let us say) with two people, then each manifestation is aware of where the other manifestation is, and what the other manifestation is doing, and with whom the manifestation is talking.

In other words, *gods hyper-share themselves*.[1]

It is important to understand that hyper-sharing is not a link, but the complement of a link. A link is a connection between two things which are different. Hyper-sharing is the system's cognizance of two things which are the same.

Hyper-Sharing Publication

This introduces the interesting possibility of publication systems with hyper-sharing, where many contexts of the same material may be followed from the other contexts.

This presents many technical difficulties. Indeed, people have made fun of my other published discussions of this subject. Evidently there has been a deep misunderstanding as to the level of the discussion.

It seems that a number of people thought I was saying there must be an infallible network connection to a sole master copy. In other words, they thought I was raving about the imagined properties of an impossible implementation.

It's rather more subtle than that. I was talking at a completely different level, about a highly desirable virtual structure that will be of benefit to all. This virtual structure must be implemented, I believe, by whatever means possible.

For our media system of the future, we will want to enact a system which *behaves exactly as if* the delivery is from the original. I am not saying how this has to be done; there are a number of ways to do it. It is quite easy if you are dealing with large chunks which do not overlap. It gets very difficult if you want to do it for huge quantities of text, whose re-uses can overlap arbitrarily.[2]

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[1] Note that you do not actually have to believe in any gods to believe in hyper-sharing. I am saying theologically that *if* there are gods, this must be their means of apparition. And if we are to have electronic re-use, this must also be its means of apparition, however achieved.

[2] The two main parameters are granularity and transvisibility. "Granularity," in this context, means that big chunks are more easily hyper-shared than little ones. "Transvisibility" means how great a body of re-using contexts may be seen. If each manifestation only needs to see its original, that is easy; but if each manifestation is to remain connected to a lot of other manifestations, this becomes a much harder problem.

Chapter Nine
Godpower

Godpower 9.0:
Agenda for a New Electronic Literature

This book has been a statement of my agenda: to build a new electronic literature and to power up the gods—all of us—who will use it.

I have endeavored to state this in a way completely different from the ways I have said it before—without what others have called "bragging" or mixing it up with business plans.

So the core of this agenda will be recognized as a proposal for a new system of media— extensions in new directions that will be beneficial to all—transpublishing, transparallel presentation and hyper-sharing.

The point of this book is to show what we will need to make a true and viable literature on the Web (or whatever we will come to call the world's publishing grid) —a literature that is better and deeper and more lasting than that of paper.

I have briefly explained what it will take—
- to lighten the burden of copyright and facilitate re-use (the easiest part, transpublishing);
- to facilitate intercomparison with links, annotations and content re-use.

A Modest Proposal

Let us implement these for all media, as the electronic publishing world of the future.

This is a proposal for the generalized medium of the future—or rather, the metamedium, since most previous media can be included in it.

This is not a specific mechanism; a variety of technical and business mechanisms could do it. (For instance, bivisibility—being able to see a link from either side— could be accomplished by the economic means of a paid registry for links sorted by destination.)

The idea is a new world of sharable materials (open transpublishing) which can be compared side by side on live screens (transparallel visualization), and unified by connections of both linkage and hyper-sharing (traceable re-uses).

I consider these to be literary forms, but if you would rather think of them as something technical, that's all right too.

This whole grand metamedium I suggest calling *open transmedia*.

We could still have all this on tomorrow's Internet, or tomorrow's electronic

publishing grid.

Everything I describe here is possible. It is only the faddists and followers, who don't understand details, that think it is not.

But it means some things have to be opened up, and turned inside out. And the browsermakers will need to participate.

To make it work, we will have to make electronic documents liquid in new ways, purchasable and quotable in tiny amounts. But it is technically possible. It is also legally possible, if rightsholders want to participate. And I believe that many will.

Objections

It is interesting that some people have said this proposal is impossible because I don't understand how computers work.

Wrong. It is possible, and so it is they who do not know how computers *can* work. The question is, do we *want* computers to work this way? If that's what we want, then we can do it.

There is also a sort of HTML orthodoxy going around that says "if we can't do it on the Web real soon, forget it."

This is the wrong approach. The question is whether these are *the right things to do*. If they are the right things to do, then a way will be found.

I hope you will agree with me that this is very much worth doing.

The same goes for the argument that "these proposals are not efficient."

Compared to *what?*

Compared to not having their benefits? There is no way that anything like these benefits are available in the world as presently constituted.

Someone who argues against open transpublishing or hyper-sharing on the basis of "efficiency" simply has not yet become convinced that they are the right things to do.

I once got a subscription renewal notice that said, "our computer requires all customers to have their subscriptions end at the same time." (Strange that the computer didn't require all the customers to have the same name or live at the same address!) This was probably a phony claim, but some programmer might have persuaded the magazine publisher (temporarily) that it was more efficient to end all the subscriptions at the same time. But such a programmer would eventually have had to accept the inefficiency of subscriptions not ending at the same time—because that's what people need.

I think it is the same way with transpublishing, transparallel presentation and hyper-sharing. This goes so contrary to the way people are used to doing things that it seems

to be a great waste of resources—until the importance and benefit of these ideas sink in. These are what people need, and so ways will have to be found to do them efficiently.

Godpower 9.1: New Gods and Their Dimensions

Literature as we have always known it was a two-god system: God the Author and God the Reader, in a kind of balance.

But new gods await in other dimensions.

Tomorrow's electrogods must include:

- God the Quoter, through transpublishing;
- God the Comparer (through transparallel presentation, for both linked and hyper-shared materials);
- God the Commentator (whose links can be seen by anyone).

The mechanisms available to the readers must be equal to those of the authors, and their links just as good, and visible from both sides.

Indeed, all these powers should be vested equally in all participants. *We must all be these gods.*

(Did I say other dimensions? People think that other dimensions are somewhere else. No. Another dimension can be thought of as a new angle on where we are already and the direction we should turn next.)

Gods are an endangered species (as are we); and for their salvation, genetic diversity is important. So there must be as many of these gods as possible.

As many of them as there are of us.

Godpower 9.2: Tomorrow's Media: Human Choice versus the Myth of Technopush

Technoids want us to think that "technology" is some kind of a force that we must surrender to. What they really mean is, "surrender to us, and do what we say."

Technology is not a force we must give in to; technology is the variety of options that

we face. Anyone who claims that technology has its own imperatives is surreptitiously promoting his own agenda. We have the right and duty to choose our future.

Whereas the technoid vision is barren and bullying and abandons the hope of human understanding.

The real issue is the human choice of what kind of a world we want.

Chapter Ten
Posterity

Posterity 10.0:
Ozymandias

And on the pedestal these words appear:
"My name is Ozymandias, King of Kings:
Look on my works, ye Mighty, and despair!"
Nothing beside remains. Round the decay
Of that colossal wreck, boundless and bare
The lone and level sands stretch far away.

—Percy Bysshe Shelley

Posterity 10.1:
Tomorrow, What a Concept

In previous eras of human history, people at least *thought* they knew what was coming. Now, no longer.

Posterity 10.2:
A Time of Peril

We are entering a time of peril. We know now that earth's life, including humans, exists in a fragile ecosystem. There is also prima facie evidence that the human race is approaching a terrible endgame, possibly the closure of history.

We are about to reach demographic climax: a maximum population that will be the largest possible, and that will be only temporary. (The limit of "standing room only," which Heinz von Foerster predicted for the second decade of the twenty-first century, will probably not be reached.) And then there will be some sort of population collapse, of whose unpleasant details we presently know nothing.

We face a melancholy timetable for the extinction of species, the final destruction of rainforests, and an unknown schedule for the deterioration of the environment in response to our chemical insults, as we watch the other endangered species wink out, and changes in the environment become swifter and more drastic.

Optimism consists of hoping that there can be a soft landing from a hard fall; that the population collapse which will surely come can leave some structure of civilization and learning that will carry the survivors forward through the unknown landscape.

Posterity 10.3:

Information Haves and Have-Nots

One of the things you hear people say nowadays is, "We don't want to have society divided between the information Haves and the information Have-Nots."

This is an extremely peculiar thing to say.

Because there have *always* been information Haves and information Have-Nots. There is no way around this. Through natural circumstance, through family and observation and chance and natural ability, some people see and understand more than others.

There are indeed some of us who strive through all our waking hours to be information Haves—buying and skimming hundreds of books and magazines, pressing our noses to the computer screen to follow more and more leads.

Kings and heads of state, and their appointed information gatherers, have always been the biggest information Haves. And they have always had a budget for it.

Knowledge is Power. Therefore knowledge is hoarded. So that sometimes the information Haves are not going to give up some of that information without a struggle.

But I don't think that is generally what is meant by people who talk about information Haves and information Have-Nots. What they have in mind, I think, is a notion of modern society as having a certain base level of understandings—the same news broadcasts, the same libraries, the same newspapers—and that to add a new channel of information drastically alters that balance and that unanimity.

Posterity 10.4:
The Polarity

The surprise-free scenario for tomorrow's politics will be: increasing poverty, increasing terrorism.

The hostage crisis in Lima, ending in the killing of the hostage-takers, showed tomorrow's situation in stark and painful terms. On the one hand, the poor and desperate; on the other hand, order and reasonableness and civility. But violence on both sides.

As a guess, tomorrow's politics will be the Lefts, the Greens, the Indigenous peoples and the minorities versus the educated, the home-owners, and everyone who wants peace and quiet.

And both sides will be trying to manipulate information to the public.

Governments and people trying to defend their homes and businesses will be extremely concerned about the growing terrorist threat. (Somehow no one noticed how vulnerable a developed society is: any fool can take out a bridge or a tunnel, blow up a building, gun down a hundred people.)

And on the other hand, what the Unabomber said about pollution wasn't all wrong.

Everybody is right and everybody is wrong.

Tomorrow is a perplex.

Posterity 10.5:
The Coming Information Wars

All wars have been about information. But the confrontation level is rising fast.

There are very different standards in the world about what may be said. The extremes of (say) San Francisco and Amsterdam liberalism and the fundamentalisms of Iran and the Deep South create a tinderbox atmosphere.

Now a lot of people want to stifle the free speech a lot of other people expected to enjoy.

Government spokesmen in various countries are actually talking about saving people from the dangers of False Information. This would be humorous if it weren't so scary.

In Germany you can go to jail for denying that the Holocaust happened. In Belgium you can be fined for maligning an historical figure. In Georgia (USA) you can be prosecuted for what you put on a computer network in San Francisco. But meanwhile the heavy breathing on the Internet is surprisingly high.

Parental fears of what children might see on the Internet are very peculiar, considering what children can see on the walls in public restrooms.

But the big fear is that groundwork is being laid for stifling political dissent.

The U.S. government's efforts to stop private encryption have been a surreal musical-comedy attempt to look like the worst Big Brother. The government's schemes for crippled encryption and key escrow could not possibly have had as their objective the stamping out of terrorism or crime, since terrorists and criminals have all the best encryption.

A cynic might say that the anti-encryption politicking was not about encryption but about sweeping powers. They can't stop encryption, but the kinds of laws that are being talked about would allow broad search-and-seizure of anything that LOOKED like encryption—and since all data (particularly accidental garbage) looks like encryption, everybody would be good and scared.

Such laws would create the presumption of wrongdoing for any defense of privacy, and not having all your directories open and available to investigators at all times would put you in the wrong automatically.

Fortunately, I think the problem is just that nobody has thought these things through.

These proposals may not have been so much government evil as the search for job security.

Posterity 10.6:
Who Controls History?

"On the Internet, no one knows you're a dog." Not only that: on the Internet, nobody can tell if you exist. People pretend to be what they are not; soon spoofoid programs will be pretending to be people, probing you, checking you out.

Anyone can jam the Internet, spy the Internet, fake on the Internet, stalk on the Internet.

And photographs have lost their evidentiary value.

The Bradbury Temperature

In the story *Fahrenheit 451*, Ray Bradbury foresaw a time that governments would seek to destroy all books and history. (That was in Orwell too.)

If we don't have strong encryption, there will be no way to authenticate digital documents.

Always Two Stories

Every historical event has two stories about it. You either believe one or the other. Every massacre did or did not happen, every head of state was or was not an evil conspirator, every public event was or was not a coverup, everyone in prison says he was framed (and no doubt some are telling the truth).

For the last five hundred years, since printing, we have lived under the paradigm of rational sharing of information, so that new evidence might come to light.

What I fear is a world of tomorrow's information in which nothing is known any more, and everything is hoaxes and lies.

The Princes in the Tower

It was an old wives' tale that Richard III kept two little princes locked up while he stole their kingdom. Everyone thought it was a fable, till they found the skeletons.

With today's shredders, as well as means of disposing of bodies, it is less certain that anyone will ever know.

Anything.

Posterity 10.7
Tomorrow's Documents Today

There are more and more people and more and more publications, but fewer people able to read, and fewer publications surviving.

How will our literature survive a time of dwindling population and resources, let alone dwindling budgets? Where will we put tomorrow's literature and who will save it, and how?

Even as we know it now, modern human life exists as a fragile tissue. To see the fires of the Kobe earthquake burn out of control warns us how easily the entire establishment of life as we know it can be smashed.

How will our literature survive a time of potential terrorism and other terrible dangers? Where will we put tomorrow's literature, and who will save it, and how? —especially as a smaller and smaller portion of humanity can read, or has time to?

We do not know the future; we do not know who will come after us. But we want them to know us. Ultimately all they will have of us will be the literature we leave them.

A Literature for Tomorrow

Past and future are always present, in everything around us and everything we do.

All of the human past that reaches the future must survive the present. And all ideas and knowledge must either join this new electronic literature, in a survivable form, or disappear.

It is vital for the survival of humanity that we maintain our information base, even as it grows more complex. The power of hypertext and hypermedia is now partly understood. The power of full-power hypertext, and general open transmedia, awaits us. We need it badly.

Appendices

Appendix 1:
What it Will Take for Transpublishing

The requirements for getting a transpublishing system underway—not necessarily just on the Web—are several.

1. STABLE PUBLICATION! Paper publishing could not be recalled, whereas servers can go down or be turned off. This involves huge differences. Stable and committed publishing systems must be instituted for the Net.

2. Permission by the participating rightsholders. (I have covered this elsewhere under the heading of "transcopyright.")

3. Fine-grained micropayment and a scheme for obtaining it for transpublished materials.

4. An image quotation method (already available on the World Wide Web as the <IMG SRC> tag).

5. A text quotation method. (Andrew Pam and I have proposed for the WWW a method parallel to <IMG SRC>, providing in-line inclusion of a quoted portion, which may be arbitrarily selected from a longer document stored elsewhere. See Andrew Pam's proposed definition of a <TXT SRC> tag, available on request.)

6. Caching methods that do not defeat separate payments per download. Note that it is also possible to defeat these caching methods. The important thing is that all parties recognize the reasonableness, not worry so much about the *wrong kinds* of "efficiency."

7. The transaction must be made as short and simple as possible.

8. Later, browser plug-ins capable of showing original and new context side-by-side.

9. Eventually, a media storage and organizing system at the user end.

Basic Terms of the Transaction

- PRO RATA sale by the element (text byte, frame, etc.) at a fixed unit price. Micropayment is by the single element; the price of ***n*** elements is ***n*** times the price of one element. This makes calculation of the price of materials smooth, without discontinuities. (But note that the price per element may be different for different sections of a document.)

- The user need not "open" a transcopyrighted document, like a CD-ROM, to see some sort of pretty opening title. (The "user" will usually be a program which will merely

take some of the contents for use in another new context.) A browser or FTP can come in and grab what is required.

- SALE RATHER THAN LEASE: The user gets permanent possession of the materials purchased, with the right to back them up.

Appendix 2:
Sample Transcopyright Permission

This is a sample transcopyright permission statement for pictures on the Web right now. This should be linked to a "transcopyright" symbol always kept with the picture. The mechanism for doing this is explained.

Here is the way the sample permission page looks.

The visual permission page is followed by the HTML source for the permission page, which shows clearly the string arrangement that will bring in the picture, *and* the transcopyright slug, *and* maintain the link between the transcopyright slug and the permission page itself.

PICTURE OF DOUG ENGELBART

No Title. To original context of picture **Date taken: August 1996**

Subject: Douglas C. Engelbart To Doug Engelbart's Home Page

Photographer: Ted Nelson To Ted Nelson's Home Page

Charge per downloaded copy: Zero.
Availability: as long as it remains on source page.

Transcopyright Notice:
PERMISSION TO REPUBLISH VIRTUALLY
on the World Wide Web

(Read more about the Transcopyright Permission System, a Win-Win sharing method.)

Permission is hereby given to republish virtually, by the method explained below, the picture to be found at

http://www.sfc.keio.ac.jp/~ted/celeb.pix/doug.in.garden

Please note that permission is NOT given--

- to transmit this picture from any server except http://www.sfc.keio.ac.jp/~ted/;
- to put the actual picture data on your page, or on any other server;
- to modify the picture in any way.

Rightsholder / copyright owner:
Ted Nelson
January 19, 1997

TRANSCOPYRIGHT PERMISSION DETAILS

PERMISSION IS GRANTED ONLY TO USE THE FOLLOWING METHOD, which will:

1. allow anyone to re-use this picture as clip art on any Web page in the world;
2. deliver the picture to each user from my designated server;
3. include with the picture its transcopyright emblem;
4. maintain connection between the transcopyright emblem and this original permission page.

Permission is granted to republish virtually by including one of the following sequences of characters in your Web page. (You probably cannot see or copy the characters right now, since they are doing their job of bringing in the images. However, they can easily be seen and copied from the source HTML.)

1. For half size, include the following source string:

2. For full size, include the following source string:

Appendix 3:
What it Will Take for Open Transpayment

The following are some technical requirements for any payment system that will support transpublication—meaning unrestricted virtual quotation, with very small payment for each quoted portion paid for by each downloading user. (Note that I am working with Japanese firms to make such a system possible.)

I. Very Low Pricing

I propose as the appropriate unit of payment the nanobuck, or $0.000 000 001, or somewhat less than ¥0.000 001.

While no individual transaction will be this small, using this base denomination means that royalty rates can be listed by the byte at levels comparable to conventional media profits and royalties—for example, what an author receives per byte on a book. For example, if an author receives $2.00 royalty on each copy of a book containing 500,000 bytes, this is equivalent to a royalty rate of /nB/4000 per byte. And if a motion picture distributor clears $4.00 profit on a 2-hour videotape, this is equivalent to /nB/18000 per frame (including sound track). A currency of nanobucks can handle several orders of magnitude above and below this level, so it seems like the appropriate range for realistic royalties.

Present on-line payment schemes, such as DigiCash, NetCash and Visa, are not practical at these low levels of payment.

II. Required to Make Transpublishing a Valid Literary Form:

1. No installation necessary in the user's browser.

2. Zero interface option: the user has the option of not seeing payment occurring. User just clicks, automatically making payments (up to a preset price) for incoming Web pages and transpublished inclusions.

The user's click is an implicit unperceived purchase, just like a telephone call—where dialing from a private phone, or staying on the line, is an implicit unperceived purchase of service. If you dial a number, or continue on the line, you're purchasing.

Detailed accounting is not kept; instead, credible systems are trusted, as with telephone billing.

3. There is no such thing as a "user session," from the point of view of the Mint.[1] The Mint experiences only the arrival of randomly-occurring separate payment events.

4. There is no rounding of infinitesimal payments. It is desirable to have extremely fine granularity of counting by the seller, able to *tally* purchases/payments as small as
$.00 000 000 01
WITHOUT ROUNDING. (Note, however, that this need not be in the payment system itself, but is our recommendation for the pricing mechanisms of vendors—especially for the sale of portions of text and video.)

5. Very low overhead cost of payment event.

6. Very low overhead of customer maintenance. Millions of accounts must be maintainable at low cost.

III. Economic Requirements for Widespread Acceptance on the Internet:

1. Anyone on the Internet must be able to sign up easily as a buyer OR seller.

2. NO GOOD-CREDIT REQUIREMENT. User may pay into the system with cash.

3. Users must be able to use credit cards.

IV. Political Necessities:

1. The Mint is not involved in the transaction, merely in the conveyance of monetary value. No record is kept of what's read or downloaded.

2. Anonymity for Buyer.

3. Anonymity for Vendor. The Mint does not keep records that allow matching of buyer, vendor and document in a transaction. As with local telephone calls in the USA, only the aggregated purchases need to be reported to the user.

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[1] I will refer to whoever performs financial services as "The Mint." Whether the Mint is really a distributed collection of service providers, and/or a legal bank, and how this payment system connects to the world banking grid, are separate issues from the micropayment system itself.

Appendix 4:
What it Will Take for Open Transmedia

This is a preliminary listing of options.

There are many ways to implement these things, but some may be much better than others.

For the large scale, the problems of networking, scale, robustness, redundancy, etc. make all of these issues daunting. But these matters are not for the faint of heart.

What We Need for Fine-Grain Hyper-Sharing (local)

Hyper-sharing editor:
1. data structure management which registers, maps, maintains or senses re-use;
2. version management for hyper-sharing re-uses;
3. display system (browser plug-in?) for hyper-shared editing.

What We Need for Transparallel Viewing and Deep Intercomparison

User front ends, or browsers and/or browser plug-ins, capable of showing transparallel overlapping connections.

What We Need for Open Transmedia Publishing

Like all forms of publishing, these will have to be voluntary on the part of publishers, and made a simple standard by ISPs.

What We Need for Transparallel Publishing and Bivisible Links

Server-side:
1. conventions of link storage;
2. server for fine-grain, overlapping attachments;
3. link service registry and service.

What We Need for Fine-Grain Hyper-Shared Publishing

Global registry services and/or recognition systems for shared addresses.

Appendix 5:
Identic Relations

The matter of hyper-sharing is of great intellectual interest.

There are many forms of data identity in the computer field, with different properties. For instance,

- The *copy* loses its connection to the original.
- The *instance* keeps its connection to the master, but not vice versa.
- *Caches* have complex relations to their master copies.
- The *Macintosh alias* brings up its original, but the originals don't know the aliases.
- *Extra Unix hard links* re-use the material, but at large granularity, and side-by-side comparison is not supported.
- *Unix soft links* ditto.
- Macintosh *"publish and subscribe"* supports re-use, but not intercomparison.

I enumerate these to stress the differences (and so that certain readers will understand that I know the differences). *Hyper-sharing is a proposed virtual structure different from all of these, with great benefits to authors and readers*. It is for this reason that means of exactly implementing hyper-sharing must be chosen.

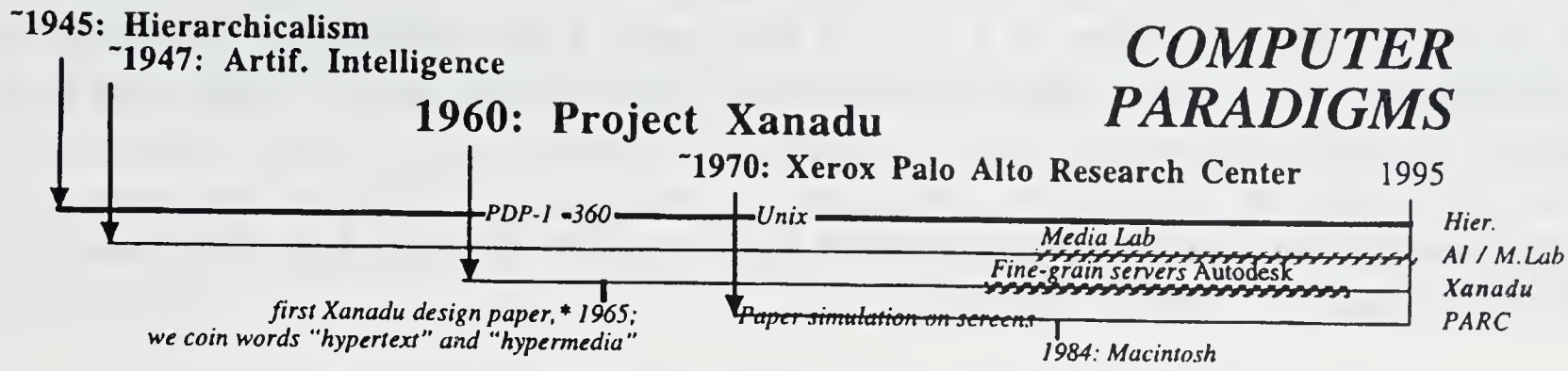
The word *transclusion* (coined in my book Literary Machines) has been used to mean both supply of material from a common original, and intercomparable contexts for the same material. Because the word has now achieved a certain popularity and looseness, I am using the term *hyper-sharing* for knowable re-use and intercomparison of shared materials.

Appendix 6:
A Brief History of the Xanadu Project

In the text of this book I have not mentioned project Xanadu, except implicitly.

The Xanadu project began in the fall of 1960 and continues to this day. ("Xanadu" is a software trademark of Project Xanadu, Sausalito, California.) The project has involved perhaps fifty people, either as implementors or as willing participants in strong support roles.

To understand our perspective, consider the time-line:



The Xanadu project has always been intended to create a principled system of network hypertext publishing, and take it commercial as a network of franchised servers—not just for the money, but as the optimal distributed literary system.

Many people think the Xanadu project was endeavoring to create the World Wide Web. On the contrary, we were trying to prevent what has happened—links that can only be seen in one direction, links that break when documents change, only one way to mark up a document. Our family of designs dealt with all these things at once.

As defined in 1960, it was to be a world hypertext network of peer-to-peer servers with a specific data structure (now a family of data structures). This data structure was defined around a very simple and clean model of ownership, sale, and permitted quotation. The plan was always to have a chain of franchised servers under a common publishing and user contract, functioning as a distributed whole, with distributed caching of documents.

Since 1992, the ideas of the Xanadu project have been turned inside out for the new Internet environment.

Major Periods of Project Xanadu History

1960-70. Nelson alone.

1970-79. With several collaborators (notably John V.E. Ridgway, Cal Daniels and William Barus), we discovered a family of new algorithms with special powers for keeping links in place on evolving documents.

1979-81. The system redefined and redesigned by Nelson, Roger Gregory, Mark Miller, Stuart Greene, Roland King and Eric Hill. Miller, Gregory and Greene work out a general theory of our data structures (general enfilade theory) and a system for networked address distribution (tumblers and enfilade algorithms to match). K. Eric Drexler invents a crowning data structure and algorithm for these purposes.

Work begins on a fine-grain hyper-sharing networked transpublishing server under Unix, with Miller as chief architect.

1982-8. Work continues while funding sought.

1988-92. Major funding from Autodesk, Inc. Rights to the work and trademark are vested in XOC, Inc. in Palo Alto. The system begun in 1981 is completed—and shelved, untested. Work begins on a second fine-grain hyper-sharing networked transpublishing server. Miller shares architectural design with Dean Tribble and Ravi Pandya.

1992. Autodesk drops funding (at just about the time Tim Berners-Lee develops World Wide Web as simple hypertext format).

1994-current. Work continues on the second XOC fine-grain hyper-sharing transpublishing server, under Roger Gregory and Keith Henson.

Meanwhile, Nelson moves to Japan with collaborator Marlene Mallicoat. At the Sapporo HyperLab and Keio University, all the Xanadu concepts are turned inside-out for today's Web environment.

Negotiation for new funding continues in Japan.

This book is the first move in the new Xanadu plan.

The new Xanadu project has to work within the present circumstance of the Internet and the current established position of HTML, HTTP and the "browser" model.

From 1992 to the present I have completely reworked the Xanadu idea, which I had always seen as monolithic both in its definition and its solution, into the form presented here. I am working with companies in Japan and the USA to bring about a form of micropayment satisfactory for transpublishing and a new Xanadu company suited to world realities of the Internet.

Appendix 7:
Are We Scientists?

This book has been to some degree in response to an article on the Xanadu project which appeared in WIRED magazine in June, 1995, entitled "The Curse of Xanadu." It appears to have been written with extreme viciousness, extreme dishonesty,[1] and extreme care.

An assertion which Wolf makes repeatedly in the article is that the Xanadu team were "not computer scientists." This is a curious statement to keep making, since "computer scientist" is not a well-defined concept; and especially since various members of the Xanadu team had qualifications which normally would identify them as computer scientists, e.g. degrees in computer science and work experience at that cathedral

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[1] My great-grandfather, Edmund Gale Jewett, had a favorite story.

The first mate on a ship had a birthday party, and drank a bit too much. He was dismayed to see, in the ship's log the next day, that the captain had written: "The first mate was drunk last night."

"But this will ruin my career," said the mate.

"It's true, isn't it?" said the captain.

Next day the captain read in the ship's log: "The captain was sober last night."

This charming story shows that the highest art of deceit and dishonesty can be the architecture of true information so as to give false impressions.

Gary Wolf, the author of "The Curse of Xanadu," appears to be a master at this demanding but artful form of dishonesty. While there are numerous factual errors in the article (beginning in the first sentence: there is no "Marin Boulevard" in Sausalito, California), the article was constructed with extreme care from factual materials to give the reader a number of clear impressions which I believe Wolf clearly knows to be false. They were these:

- the objectives of Project Xanadu were absurd and obviously impossible;
- my colleagues of Project Xanadu were ignorant buffoons;
- I am myself a vacant and gibbering doofus incapable of harboring, let alone expressing, a coherent thought.

I do not understand the motivation for the remarkable expenditure of effort made by WIRED to malign and blacken the story of our work. I suppose it to arise from some deeper intrigue, and presumably grudge, in the editorial labyrinths of the magazine. But as with certain other noxious gases, further inquiry as to origins could only involve details which were even more disgusting.

We have given considerable thought to the possibility (and cost) of mounting a libel suit against WIRED and the cunning Mr. Wolf. Though all good attorneys counsel against such litigation as expensive and unwinnable, the potential benefit of such a lawsuit for thwarting a future public stock offering by WIRED keeps the plan alive as an important strategic option.

fortress of computer science, Xerox PARC.

Since the technical details of our work are unpublished and still the intellectual property, under non-disclosure, of XOC, Inc., there is no way that we can refute this irritating assertion at the present time.

However, in a reply to the WIRED article in 1995, I suggested that someone like Prof. Donald Knuth, the world's authority on algorithms, might look at our work under non-disclosure and comment publicly as to whether it qualified as computer science, and whether or not it was well ahead of the published literature, which we believe to be the case.

Amazingly, since that letter appeared, Don Knuth has agreed to to act as just such a public referee! He has offered an oral non-disclosure agreement as to our methods until the publication of the final volume of his algorithms books (which all agree will be at least a few years).

Unfortunately, Don says he will be fully occupied for quite some time; but that I should call him in February 1998 to schedule the disclosure seance.

That is where the matter rests at the present time.

The matters to be revealed in this private presentation to Knuth are:

The original enfilade work (Nelson, Ridgway and Daniels, 1970); General Enfilade Theory (Miller, Gregory and Greene, 1979); and that dataplex (and its algorithms) whose very *name* is a secret, invented by K. Eric Drexler about 1980, around which the XOC server has been engineered.

Appendix 8:
Origins of the Ideas

I have read strange statements saying that the Xanadu project came out of "the hacker culture" and the "hippie underground." These could not be further from the truth. My involvements were always literary, intellectual and theatrical, especially movie-oriented. I was seriously involved in technical philosophy and the social sciences as an undergraduate.

The parallel approach to both data and presentation has its origins in: 1) my undergraduate work (A.B. philosophy, Swarthmore) where I concentrated on the resemblances and differences of complex objects; 2) a boyhood fascination with layered and parallel presentational systems, especially 3D viewers, multistrip "old Technicolor" process, 3D projectors, and travelling-matte special effects; 3) annotation and footnotes; 4) interconnection.

The idea of transpublishing and hyper-sharing occurred to me during a computer course I took in the fall of 1960. However, I was unable to resolve these ideas into a well-formed design until 1965, when I published my first article (Bibliography, 1).

Appendix 9:
Bibliography

This is just a short list.

1. T. Nelson, "A File Structure for the Complex, the Changing and the Indeterminate." Proceedings of the ACM 1965 National Conference.

2. . Nelson, *Literary Machines* 93.1. Mindful Press, 3020 Bridgeway Suite 295, Sausalito CA 94965, USA.

3. T. Nelson, "The Heart of Connection: Hypermedia Unified by Transclusion." Communications of the ACM, August 1995.

4. K. Ookubo and T. Nelson, "ZipEditor: A Collaborative Workspace for Shared Material." Submitted to the Fifth World Wide Web Conference, Paris, May 1996.

5. Andrew Pam, proposed definition of <TXT SRC> tag in HTML.

Ted Nelson is a designer and generalist. He discovered hypertext in the nineteen-sixties, and coined the words "hypertext" and "hypermedia."

He has always thought about the media of the future in ways that no one else does. This book is an attempt to convey his very different ideas.

For over thirty years he has endeavored to get backing for his software designs, which have been considered too strange and different. While none of them have been implemented, his influence has been great. The World Wide Web is thought by many to be based on his work; and Lotus Notes, HyperWave and MicroCosm—products by others—were strongly influenced by his ideas.

He is now in Japan, teaching at Keio University and finding new sponsorship for his designs.