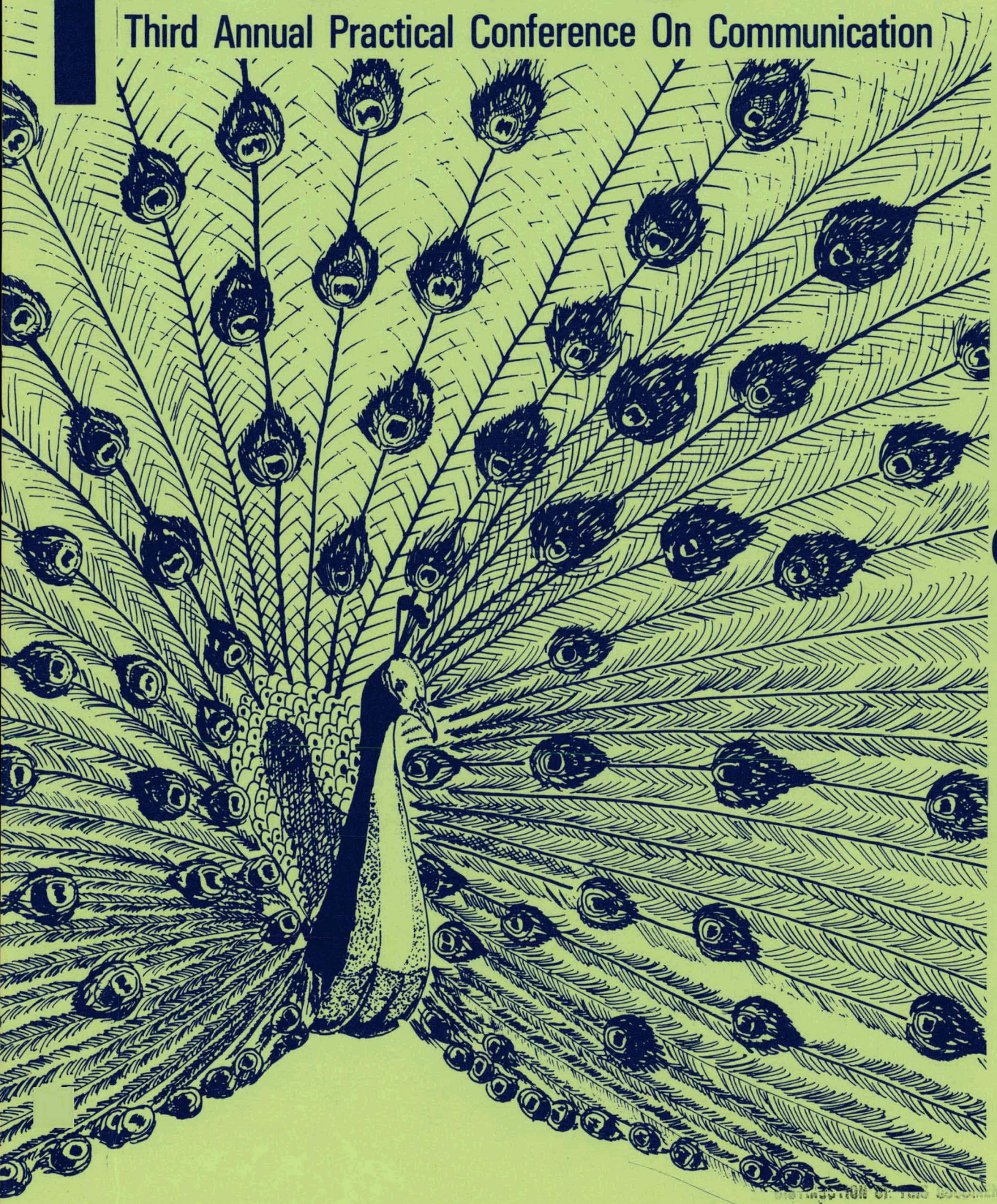
pccc

Third Annual Practical Conference On Communication

Proceedings - 1979



SOCIETY FOR TECHNICAL COMMUNICATION
EAST TENNESSEE CHAPTER

ornl
OAK RIDGE NATIONAL LABORATORY
Operated by Union Carbide Corporation
for the Department of Energy

DISCLAIMER

Printed in the United States of America. Available from
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road, Springfield, Virginia 22161
NTIS price codes—Printed Copy: A07 Microfiche A01

The contents of the presentations at this conference and the opinions expressed in the discussions reflect the views of the participants and do not necessarily reflect those of the individual sponsoring societies.

CONF-791015

PROCEEDINGS—1979

from the
Third Annual Practical Conference on Communication

October 19-20, 1979

Mountain View Hotel and Motor Lodge
Gatlinburg, Tennessee

Date Published: April 1981

sponsored by

SOCIETY FOR TECHNICAL COMMUNICATION
East Tennessee Chapter
Oak Ridge, Tennessee

OAK RIDGE NATIONAL LABORATORY
operated by Union Carbide Corporation
for the U.S. Department of Energy

THIS PAGE

WAS INTENTIONALLY

LEFT BLANK

Contents

THIS PAGE

WAS INTENTIONALLY

LEFT BLANK

From the Chairman

For years the world of technical communication, deeply imbedded in its host community of research and high technology, remained a world to itself, remote from widespread exposure and from the rest of the communications industry. But, in a remarkably short time, the intensifying national emphasis on information, the attendant requirement for effective communication of the information, and the invasion of high technology into the communications industry have brought rapid and substantial change to all aspects of technical communication.

During the past decade, technical communicators witnessed the widespread use of electromechanical, rotary-lens, film-negative photocomposition and witnessed its obsolescence with the advent of sophisticated digitized, all-electronic, cathode-ray tube, fiber-optic, and laser photocomposition. Some of those same technical communicators are now becoming involved in the transmission of camera-ready reproducibles via telephone or satellite to printing plants throughout the nation and the world for printing and distribution on the same day. Today technical information can proceed from the mind of its originator, go through the entire publication process, and be in the form of press-ready plates without having been any more than a collection of electrical impulses in the circuitry of a computer or, at most, magnetic impressions on a piece of recording tape.

In a time when state-of-the-art technical communications is changing faster than the new processes can be documented, regional conferences such as this Third Annual Practical Conference on Communication serve as an invaluable forum for the exchange of new ideas and developments by technical communications professionals and contribute much to the understanding, adaptation, and use of new concepts as the entire industry enters a new era of creativity and innovation.

T. W. Robinson, Jr., *General Chairman*
Third Annual Practical Conference
on Communication

THIS PAGE

WAS INTENTIONALLY

LEFT BLANK

Foreword

The third annual Practical Conference on Communication was cosponsored by the East Tennessee Chapter of the Society for Technical Communication and the Oak Ridge National Laboratory. It was another successful attempt to address the practical aspects of communicating technical information among the members of the scientific community. All these aspects cannot be dealt with in two days, and the papers presented here represent only a cross section of the problems of and approaches to technical communication. They do, however, present some very practical guidance on the production of several forms of technical publications. Many readers will, I hope, find among these pages clues to the solutions to their writing problems.

The contributions of many people are not evident in these proceedings. Joan Ellis, our luncheon speaker, spoke about (and demonstrated) the benefits that can be gained by paying compliments. Her major point was that we will be able to communicate and work more effectively with people if we project a positive attitude toward them and express appreciation for their efforts.

Our exhibitors showed and explained their companies' services and products: the business machines and word-processing systems that are today the major tools of technical communicators. The exhibitors were:

Compugraphic Corporation, Wilmington, Massachusetts
Interactive Systems Corporation, Washington, D.C.
Lanier Business Products, Inc., Knoxville, Tennessee
Royal Business Products, Inc., Knoxville, Tennessee
Wang Laboratories, Knoxville, Tennessee
Word-Power, Inc., Kernersville, North Carolina

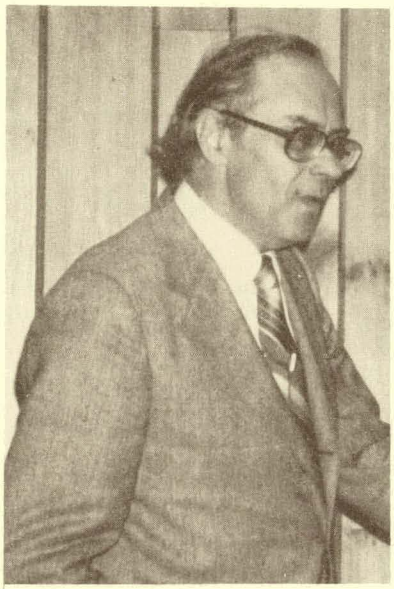
The conference committee, which produced the conference and its proceedings, performed a hard task with excellent results. Committee members were:

General Chairman, T. W. Robinson, Jr.
Equipment Display, E. N. Williams
Facilities, W. R. McCauley
Finance, J. L. Rich
Program, C. B. Andrews
Publicity, L. Foster
Registration, D. S. Griffith
Social Events, S. H. McConathy
Proceedings, A. J. Shelton

The conference committee gratefully acknowledges the invaluable assistance of the Conference Office of the Oak Ridge National Laboratory and expresses thanks to Roane State Community College for help with mailing and registration.

To all these people, the speakers and the sponsors express their heartfelt thanks.

F. M. O'Hara, Jr.
Chairman, East Tennessee Chapter of the
Society for Technical Communication



Dr. Richard Mitchell, conference keynote speaker, is a faculty member of the English Department of Glassboro State College, New Jersey. He is writer, editor, and publisher of *The Underground Grammarian,* a publication dedicated to exposing jargon, faulty syntax, and redundancy in writing. Dr. Mitchell, a popular speaker, has made many public appearances, including "The Tonight Show." He is the author of the recently published *Less Than Words Can Say.*

1. Food for Alligators

I am sorry to say that, in a way, what I have to say today will suggest that you, people highly skilled and proficient in a certain form of writing, are a part of the problem that is plaguing us—an unwitting part, but a part, nevertheless—and I would like to explain why that is so, without, I am afraid, giving you any suggestions as to what you can do about it. I am not known for constructive criticism; I've never had any to offer. People always ask me, when I point out this or that problem, especially in a school system, "Well, what shall we do?" I say, "I don't know; that's not my job." It really isn't my job.

I have given today's talk the title of "Food for Alligators" because I am very interested in alligators. I went to the wildlife preserve on Sanibel Island this past March. As you enter this lovely, large wildlife preserve, which is sandy and marshy, you see a little wooden box containing brochures that describe the preserve. The preserve is primarily one for birds. All kinds of elegant birds, migratory and otherwise, come to this preserve, and they are carefully described in the brochure. I am sorry I can't tell you about them, but I can't tell one bird from another and I am not especially interested in birds. You could see, however, that most of the people who came to this place were very interested in birds. They were clearly bird-watcher types: sensible tweeds, boots, and binoculars. Bird-watchers are very delicate people who worry about the birdies—their nesting grounds and their foods. So, you can understand that the writer of the brochure had a terribly difficult technical problem to solve.

The problem had this nature: There are not only birds in this preserve, there are also alligators. They live in the swamps and the bayous and crawl across the road, and some of them are very big. These alligators happen to live on birds. This is what they do for a

living—they gobble birds. You can imagine the problem the copywriter had of presenting this to the bird-watchers, who would see the alligators—there's no hiding them. It had to be put to them in such a way that they wouldn't be upset about the destiny of the birds. I'd like to meet the writer of that brochure—a genius, an absolute genius—who solved the problem magnificently. The writer said something like "Yes, there are these alligators here and they are engaged in their natural business, which is harvesting the weak and the sick and the less alert." That is beautiful; that is marvelous. God grant that you and I should solve all our writing problems as effectively and smoothly and perhaps even as poetically as that. The word harvesting is so rich in association with good things.

I, however, at the moment, didn't think of it as a triumph; I thought of it as something outrageously funny. I burst into laughter, and I have been laughing ever since because, all of a sudden, then and there, it occurred to me that that's how I make my living, too: by harvesting the weak and the sick and the less alert. In my case, shearing is perhaps a better word because I manage to do this over and over again. In spite of everything I do, I'm a school teacher. Where would I be without the weak and the sick, and especially the less alert, who come to me generation after generation? I, of course, am a member of the club, and so I am very careful to pass my students along, still less alert, to the next guy, so that he will have something to shear and to harvest. Of course, our whole society works that way. Where would we be without the weak and the sick and the less alert? Would the alert vote for our politicians? No; that takes the less alert. Would the alert buy the products that this society pushes so copiously, so vigorously? No; for that we need the less alert. Would the alert watch the television shows that we take tremendous profit from? No. Obviously, the less alert are tremendously important in America. We do not harvest them, but we do shear them. Without the less alert I don't know what would happen, but America would be different. America depends on a vast population—a kind of background radiation, if you like—of the less alert. We have to have them.

Now, I am, in fact, a revolutionist. I mean it. When I was a student at the University of Chicago I joined the Young Communist Club. I did this primarily because I knew it would shatter my mother if she heard the news. Another reason was because there was a rather attractive girl at the card table where they were signing up for the Young Communist Club. I attended a few meetings of the Young Communist Club, and they said to us one day, "Come on, we have a meeting; we'll take you down to Halstead Street where you can meet some men who will talk to you about being young Communists." Well, we went to Halstead Street, upstairs, you know, an empty room with some wooden folding chairs, the kind you see at church picnic suppers. To this day, when I see a wooden chair I think of Communism. We sat on those wooden folding chairs, and one of the two men spoke to us; the other one just sat there. As I listened, a terrible realization came over me: "These people really are Communists." I never went back to the Young Communist Club.

I would like to do something like that to you today. I really am a revolutionary. I don't think of it as a figure of speech; I don't think of it as hyperbole. I am a revolutionary, and I genuinely want and intend to destroy the society in which we now live because that society is a dangerous and destructive one bound for death. We are very concerned about that society just now in terms of literacy: There is a great deal of talk about literacy. Schools are saying, as though they just heard of it, "Oh, yes, we will teach literacy." The schools seem to be saying "Oh, well, you should have told us before that you wanted the students to be literate. Okay, we will do that." Literacy tests of all sorts are appearing, not just among

school children, but among school teachers, for whom they are much more badly needed because many school teachers are far less literate than are school children. These minimum competence tests—they call them minimum competency tests (*they* are people who need the self-assurance of any extra syllable they can get)—are cropping up everywhere, and we are concerned about literacy.

Now, this is what they mean by literacy. I am not joking; you can look at the papers yourself. By literacy they mean that children should be able to read the word poison on a bottle even without a skull and crossbones. Children should be able to read "men" and "women" on bathroom doors. They should be able to read when they get their licenses, not only stop signs but the more difficult yield signs. I don't know that any of them will ever be able to read the street sign that I saw in San Francisco. The best street sign that I have ever seen is at the top of one of those straight, steep hills. The sign says "Right Turn Not Advisable." And, indeed, the street to the right is not a through street. I loved it; it just seemed to me so "California." They are very laid back. They are not going to tell you what to do. It is as though the street sign makers thought, "Now, look, you do your own thing, of course; if you want to turn right, okay, but we really don't think it is a good idea." Literacy advocates want the children to be able to, in effect, identify, many tokens, to identify, sometimes, even complicated tokens like the questions on a driver's license form so that they can check the right box. Then they will say, and many of us will say, "Aha, we have achieved literacy because the children can identify bottles of poison without a skull and crossbones."

That is not literacy in any sense that is of value to us as a nation. There is another literacy. Literacy, after all, is an invention; it is not something that is natural to humanity. Literacy, as much as the wheel or the lever, is a devising of the mind of man. Like any other technological achievement, it has a technological history—as early as 2500 years ago it reached a very high degree of perfection. It is the kind of literacy that the written word serves as the outward and visible sign of the inward and mental process that we call thought. To have a literate society, we can be satisfied only when we have a thoughtful society, and a thoughtful society is a very different society from a merely token-reading society. I am sorry to say that, in many ways, a thoughtful society is not one that is served well by the kind of work that you and I have to do so much of in our culture, and that is all that kind of work that we call technical.

Cast your mind back to neolithic times in Mesopotamia—say, 8000 years ago. In the ruins of those days we find, quite frequently, very intriguing objects—tiny little pellets of baked clay. On these pellets certain scrawls appear. They are not random scrawls because they are repeated—we find them again and again, dispersed over many sights. Sometimes we find an amazing thing—a big ball of baked clay. On the outside are impressions made by exactly such pellets so that the negative image of the figure appears on the envelope of baked clay, and, indeed, it is an envelope because when you break it open you find inside a number of those little clay tokens, which exactly match those on the outside. I think it is not too hard to figure out what this is, and I think archaeologists are right when they say that this is a very primitive form of envelope and letter within. Very simple. The envelope might say "six sheep, twelve jars of wine, four female slaves." Inside you will find six tokens marked with the sign that means sheep, twelve tokens for jars of wine, and four for female slaves. When these things were shipped, the recipient broke open the ball of clay and laid the tokens out. He might have said "What happened to the female slaves?" You can keep

track of things this way; you can keep books. You can move the tokens backward and forward.

Essentially, what we think of as literacy was very probably born with token reading. This is an interesting concept. When you go to the bathroom and find the right door, men or women, is that a job of reading? When you look at the door and it is labeled "men," have you read the word? Is this akin to reading and writing? When you look at faucets labeled hot and cold, have you done any reading? I submit that you have not, not in the sense we are talking about. You have recognized a token. The Mesopotamians, as you know, were able to use, to recognize and to convey to one another, very complicated tokens (the Babylonian cuneiform grew out of those very marks), tokens by which a canal or a temple could be built or a war could be waged. That was a marvelous culture—eventually, a pyramid could be built this way. All it takes is the reading of tokens. When you and I read the instructions for building a swing set—most of them are, in fact, written in Babylonian, it seems to me—we have, in effect, done nothing in terms of the technology of literacy that the ancient Mesopotamians could not have done. This is a complicated set of tokens that we have learned to identify. The same is done in building a DC-10, although there seems to be some trouble with some of the tokens in this case, or in building a nuclear power generating plant. Although it becomes a tremendously complicated system, it is still nothing more than token reading.

We can recognize token reading, or Mesopotamian literacy, in the following way. The tokens of Mesopotamian literacy begin as representations of something in the world—sheep, jars of wine, female slaves, nuts and bolts, engines. They pass through the head of the one who reads the tokens, and at the other end they come out once again as things in the physical world. Whether those things be pyramids or nuclear power generating plants is not important. The business of this kind of literacy is to enable effect in the world, and it derives from knowledge in the world. It can be and it is massively complicated in our culture, and it is, furthermore, obviously essential. It is also essential that children be able to read the labels on bottles of poison. The basic skill of our culture is the ability to read and transform into real things the most elegant and complicated tokens. We could not live without this skill, and we obviously need a higher degree of it in everything that we do.

Unfortunately, the clamor now in education is for a kind of minimum Mesopotamian competence. What we want now is for the children graduating from school to know as much as an apprentice scribe by the Euphrates River in the year 3800 B.C. The apprentice scribe would have had exactly the same kind of training that we cannot now give our children. He would have known the difference between lay and lie and between shall and will, if those things are of any value. He would have been able to recognize many tokens for this and that and to translate them. The Mesopotamian of this time would probably have had multiple-choice questions to answer as he learned his business. That was thousands and thousands of years ago. We cannot do it today. The great danger in this is that we may succeed in doing it. It is not hard to teach Mesopotamian literacy. The reason we haven't done so is partly social and partly because our educational system has slipped from one stupidity to another stupidity continuously for the last 60 some years that I know of. The danger is that if we succeed we will think that we have done a good thing. We will not have done a good thing.

Long after the Mesopotamians counted up the sheep and the female slaves, the Athenians invented a kind of literacy that we now have available to us. Nobody knows how

this happened. Perhaps it was because they had an alphabetical form of writing rather than a symbol form. Perhaps it was because they developed, who knows why, a complicated language, a language with many forms, with many possible syntactical structures, and with many subtleties of vocabulary. They invented, quite clearly and simply, what we must think of as discursive prose. There was no prose in the world before the Athenians. People who don't pay a lot of attention to the history of language tend to think that prose is the basic form and that poetry is a sophisticated and refined elaboration of the basic form. Not so; not so at all. As a matter of fact, there was poetry, even written poetry, long before the first line of prose was ever written. Homer, for instance, a great classic of Mesopotamian literacy, was around a very long time before Plato started writing down some of the words of his teachers.

Prose is, to this day, the newest technology of literacy; nothing has been added. Indeed, the mind cannot imagine what could be added; it was new then and it remains new and a mystery now. Notice its purposes. Discursive prose, unlike the token literacy of Mesopotamia, begins with the world—it begins with sheep, slaves, and jars of wine—but it ends up going not back to the world to build the swing set or a power generating station but further and further out of this world to seek understanding. It impresses upon man that the world needs not only knowledge and manipulation, but that it, in some way, needs to be accounted for. How come this? Why do we do as we do? What meanings can we find not in the physical world but in abstractions and understandings about the physical world? To do that requires a prose that permits the asking of a question or the putting of a statement about the real world. "What duty do we owe to our parents?" Imagine this being asked in a society beginning to wonder about ethics. Such a question could be asked in the form of tokens; a good token system could say it: duty, parents, the obligation involved in "owe." But, when we answer that question—to answer means simply to explore or to seek understanding—we go farther and farther from the world of immediate reality in which the question arose. In effect, we never return to it. We may eventually reach some conclusion. We may say that we owe no special duty to our parents; we may say that we owe a great deal and this is its nature. But what we say will take the form of an understanding and not a reconstruction in the world from tokens.

In effect, the great invented thinking. This may seem a rash thing to say. We look at the people who built those marvelous temples and canals in valleys of the Tigres and the Euphrates and ask if they can have been thoughtless? I say "Yes, they were thoughtless." They were very intelligent, very knowledgeable, and very skilled, but we have no suggestion whatsoever that they were thoughtful. This is an important distinction—the distinction between thinking and other processes in the mind. We cannot have any value from the word "thinking" if by it we mean any invisible process that takes place in the mind. There are so many things that take place in the mind—many of them quite disgraceful, by the way; many of them utterly irrelevant; many of them matters of sheer entertainment or recreation. To label all these things "thinking" is to make the word of no use. We must have thinking mean something special. What can it mean except to search for meaning? Thinking is different from knowing. Obviously, we use what we know in thinking, but by thinking we search for meaning and we do it in the following fashion. We say something; then we say something about what we have said. Then we say something about the differences or the likenesses that we see in the things that we have already said. Then we say something that modifies, qualifies, expands, delineates, or defines, and we say

and we say and we say; and we reach meaning. This is why thinking men will always disagree. It just isn't true that thoughtfulness leads always to the same conclusion. This is obvious because among us we see very intelligent and thoughtful people holding entirely different views.

Knowledge leads and must lead always to uniform conclusions. There is no disparity of opinion about the velocity of falling bodies. There is no disparity of opinion about the relationship of the circumference of a circle to its area. These are matters of knowing. There is diversity of opinion as to which is more important, the state or the individual, and when is that not so? There will always be diversity of opinion because thinking, which starts with the tokens of this world, always leads out of this world. Knowledge, the Mesopotamian literacy which is the vehicle of knowledge, leads always back into this world.

Unfortunately, you and I are mostly in the business of Mesopotamian literacy. The work that you do is essential; it is important; and it is difficult. But, it is Mesopotamian, as is the work that I do and the work that almost all Americans have to do. Because you are so good at your work, society says "Look at those people; they are good at that. Because they are good at that, they have good jobs and make good money; but more important than that, because they are good at their jobs, our culture works." Because you are good at what you do, I can pick up a telephone and punch some numbers and, by God, I am talking to a man in Honolulu—the very man I had in mind. That is a stupefying achievement. You and I hear complaints about how the system is messed up; for example, your gas bill has three digits too many. There are many mess-ups in the system. The amazing thing about all our systems is how well they do work. Even the post office frequently gets letters to the places they are intended to go. So, we look at you and see that you are doing a magnificent job, and we say "Come on, let's at least teach the children to tell the difference between stop and yield signs and move on that path that leads to where you now sit." My terrible fear is that when we do that, when we make the children literate with you and me in mind, we will have made a whole new supply of Mesopotamian literates who, in fact, won't be as good as we are at that work and, being not that good, will be, in a sense, doomed forever to the limitations of Mesopotamian literacy.

Thomas Jefferson, writing about power and where power is planted in a free society, explained that in our society power is given into the hands of the people and that they are to exercise it through what he calls informed discretion; should the exercise of power be unwise, the remedy is not to remove from them the power but better to inform their discretion. Thomas Jefferson was highly skilled in Mesopotamian literacy; among other things, he was a great technical writer. He was also equally skilled in what we might call Athenian literacy, the other form of literacy, and when he wrote the words "informed discretion," I know very well that this was not just the first thing that came into his mind. This was not just something that sounded right; I know that he meant informed discretion. I'd like to focus on the word discretion. It comes from the same word that gives us "discrete," which means separate, distinct. Jefferson meant by discretion what any eighteenth century rationalist would have meant: a fairly simple thing—the ability to distinguish differences between things that seem alike and, at the same time, the ability to see how different things are also alike, in other words, the ability to build bridges between likenesses and differences and, in this case, an informed discretion, to do so on the basis of knowledge. Jefferson's term, informed discretion, is clearly another way of saying thinking with

knowledge. He said that if the people don't think with knowledge, if they exercise their power badly, we don't take it away from them, we better inform their discretion. That is to say, we give them more knowledge so that they can think better.

No amount of knowledge by itself will permit the process of thought. The process of thought must be learned. There is only one way—unless you happen to be a genius—to learn the process of thought. When I come to this point in my meditations I am always reminded of a very strange thing that Plato said. Plato was against literacy. Oh, he liked to have it, and he liked to use it; but he was against teaching it. He was against having too many people learn how to read and write for a very interesting reason. He said that if we start all this reading and writing stuff we will quickly become ignorant and thoughtless. That seems a cryptic remark; but it isn't, really, when you think of Plato and his friends and his milieu. He belonged to a group of people largely comprised of geniuses. They could keep in their heads long and complicated discursive logics. They could pursue proofs, apparently in their heads, from beginning to end. They could find ramifications and qualifications and keep them in order. Plato was afraid that if they started writing all this down they would loose the power of their heads.

I don't know what happened, but we no longer have that power in our heads. I don't know about you, but I am incapable of thinking unless I have a pencil in my hand and a piece of paper in front of me. If I say "I am thinking," I am, in fact, vaporizing and gathering wool. I have an attention span in excess of 20 seconds, which is very good. The average human being can think about most things for less than 10 seconds. The one exception is himself. Most human beings can think about themselves more or less concentratedly for well over 30 seconds. We can't listen to Plato on this score; we have to listen to Jefferson. If we are to have a thoughtful population, we can achieve it only through teaching proficiency in writing. There is no other way for us.

The logic of the paragraph, for instance, is not the logic of the paragraph—it is logic. The sequence with which sentences appear in expository prose is not a pale imitation of logic—it is logic. That is why that sequence is there. This is the only way in which we moderns, not being a select, happy few who can go to the marketplace and talk to the philosophers, can learn to think; and, unless we learn to think by being taught writing, writing, writing, we will not think. This is the real reason for the dislocations and disorders of our society: Most people do not think. Mostly, neither do they want to; and, if we had the choice, we wouldn't want anyone else to. In a society of thinking people, things are not so good for the alligators. We live off the weak, the sick, and the less alert. We have our jobs because there are millions and millions of weak and sick and less alert who can't do our jobs. This situation would come to an end in a thoughtful society. If the weak were made strong, and the sick whole, and the less alert thoughtful, I don't know what would happen, but we couldn't go on like this.

There is a terrible thing about Athenian literacy that is not true of Mesopotamian literacy. We know where Mesopotamian literacy is going, but thought is a terrible thing—nobody knows where it is going; nobody. We like to think of our freedoms in this country, and we like to talk of the freedom to think, even though it is not in the Constitution. Cheap talk—freedom to think has no meaning without the power to think. Freedom to think today primarily means the freedom to choose from a set of slogans. You ask me what I think of Ted Kennedy's presidential chances and I pull out the Chappaquidic slogan. You then hold up

the something else slogan and I hold up the other. You don't have to think to do that. You can make all kinds of decisions without thinking, just as you can make pyramids and DC-10s. The path of thinking is always unknown. By being a free society we have established an educational system and a corporate system supporting that educational system that do not seem willing to take the risk of thought. If we teach those birds to think, we will lose the weak and the sick and the less alert among us, and, as alligators, I don't know how we will survive. That is just what I mean by a revolution. If we, in fact, pursue literacy in its fullest sense—inculcate it in all our citizens—we take a terrible risk. We cannot even name the risk that we take because thinking leads to understandings. Some of that thinking will lead to understandings about alligators, which may, in effect, destroy us and all that we stand for. When a man says we must teach everybody to be literate, therefore, he says a thing which is genuinely revolutionary; and, that is what I am and proud to be it.

One last word to you. I know you are all literate people. You are all interested in communication. I know you would all say that you are in favor of literacy for children. I don't think you've thought it through. If you think it through, you may be in favor of something else. If you want to support the current drive for the enhancement of literacy (I am sorry about that dreadful word, enhancement—educationists use it all the time), think twice. Maybe, thinking once is enough. Think. What do you want? Do you want people who will read bathroom signs very well? Or, do you want people who will perhaps turn us all out? It is a hard choice. I have made mine. I hope you can go away from here and say "Son of a bitch, he really is a Communist." I am an "ist," but not, I think, a Communist.

Fred O'Hara (Union Carbide Corporation; University of Tennessee): Your term "thoughtless society" seems to me to be self-contradictory. If there is any society at all, there has to be thought to preserve that society, to set it up and make it work. Those words betray an acknowledgment of a pluralism within our society—that there are thoughtful people in it. They are only a portion of our society, but it is not made up entirely of thoughtless people as is sometimes alluded to in your rhetoric. Did you really mean that we have a thoughtless society, one in which there are no thoughtful people?

Dr. Mitchell: Yes, I meant that society is thoughtless, but I did not mean that there are no thoughtful people in it. I'm not convinced that to set up and operate a society takes thought. I am not sure that this is what history reveals. It takes, of course, a lot of order, a lot of tradition, and a lot of expectable behavior. You have a bunch of people of whom certain things are expectable, and they more or less do those things. For instance, I'm not convinced that the culture of ancient Egypt—a very great, flourishing, and successful culture for a long, long time—had any thoughtfulness in it at all and, perhaps, not any thoughtful people. I believe that thinking had not been invented, had not come into the human species at that time. Furthermore, there is a point to be made that, in effect, there is no such thing as society. Society is not people; it is an abstraction. Thus, it would always be thoughtless. The thoughtful people in our society—and obviously we have many—may or may not be doing things; I don't know. I sometimes find myself tempted by a perhaps stupid conspiracy theory. Suppose we in this room were the last literate people left in America? Literate in the full sense that I mean it. Suppose we were? It's entirely possible. If that were the case, we should close the door and put together right here a little coalition; we could run it. It would take a little while to get established, but we could do it. If we were the last thoughtful, literate people left in this country, we could run it and "they" would never know.

If such a conspiracy existed, you would expect those people to be in Washington cooking things up, but there doesn't seem to be any thoughtful person there. So, I don't think there is any such conspiracy. Things just happen. Thoughtful people in our society are spotted here, there, and everywhere, and thank goodness they haven't found one another and formed a coalition because they would kill the rest of us.

In *The Origin of Consciousness in the Breakdown of the Bicameral Mind,* the author, a fellow named Jaynes, puts forth a provocative theory. He states that the free flow of communication that man now has between the right and the left hemispheres of the brain was not always that free, that it genetically envolved little by little, and that there were times in human history in which the left hemisphere of the brain was so thoroughly dissociated from the right one that a person could lead an entirely cognitive life—knowing how to build canals and temples, how to trade sheep and goats—without input from the right hemisphere. The intuitive messages from the right hemisphere were thought to be voices of the gods. Jaynes suggests that we redefine consciousness: that it is possible to live a perfectly normal, productive, and profitable life without being conscious in the sense that you and I are now conscious. I think his theory is rather zany, but it does suggest many interesting metaphors, because the way so many of us live—perhaps all of us—so much of the time is like that: without any thought whatever and without any search for understanding. In our necessary, even appropriate, responses, our highly polished skills—again, no thoughtfulness is involved.

I am convinced that there have to be some thoughtful people around; I am not convinced that I am one of them. I don't know where to find these thoughtful people. and in the long run I would worry about them. If I were one of the thoughtful people, and if I thought about the consequences of making a thoughtful socicty, I might not want to do it. It is much less dangerous to live in a society made up of "Joe and Mary six pack," motorcycle gangs, the unemployed, and the poor. The poor are so dependable; we can count on them to be the same forever and ever. That keeps plenty of food around for the alligators. (I'm sorry, you really didn't ask a question; that is why I didn't really give an answer.)

George Sadowski (Union Carbide Corporation): Please review your definition of a thoughtful person for me, and answer this question: Can a thoughtful person be recognized by an unthoughtful person?

Dr. Mitchell: I'm not sure I ever provided a definition of a thoughtful person. I would say he is one who can begin with the known, those things that he can, in fact, know in some way or another; discern how things are like each other and how things are different from each other; and follow a process by which he can make a statement about something, make a statement about that statement, and another about that statement, until he reaches what seems to him understanding. Notice that this always departs from the world. The first statement—maybe, the first one hundred statements—in any process of thought are about things: This is so high, and this is only so high, and we are this. From there we can begin; but, we leave the world. I guess I would say that a thoughtful person is one who can use his mind to leave the world of experience and phenomena to search for meaning. Can a thoughtless person recognize a thoughtful person? I don't know; I think he cannot.

George Sadowski: Your definition depends, then, on the test of time?

Dr. Mitchell: There is, I guess, nothing but the test of time to be applied here—the test of time and the test of language. You can come up with a few names—people you think were wise. Think of someone wise—Plato, Shakespeare, Mayor Daley. Ask yourself "What

makes me say that he is wise?" The answer will always be the same: "This is what he said." You will go to his words to know that he was wise. Indeed, how else would you know that he was wise except by his words? Words are far more important than deeds. That is way Richard Nixon said "Watch what we say, not what we do." He did not want us to look at the important things—the words.

There is no such thing as correct thinking in the sense that there is such a thing as correct designing. Thinking will go where it will go, and sometimes we find it wise and sometimes we find it pernicious. Indeed, sometimes we find it demonic; our age has been visited by the results of demonic thinking, which is another reason why I say that we ought to make sure that we really want thinking. You don't think, do you, that the men and women who created the horrors of the twentieth century were all thoughtless goosesteppers? Far from it. Some of them were thoughtful people. They thought evil things, but that is a risk that we always take. The test of time can be applied to that. We might say that these people were not wise and they were not good, but they were thoughtful. The great architects of fascism and communism were profoundly thoughtful people. That is a big risk.

Dixie Goswami teaches English at the University of Tennessee in Knoxville. The recipient of both a National Endowment of the Arts Humanities Fellowship at Leeds University and a research fellowship from the Rutgers Graduate School of Education, Ms. Goswami has directed writing programs and many workshops for teachers of writing. A member of the Commission on Composition for the National Council of Teachers of English, she is working on a literacy research project sponsored by the Department of Health, Education and Welfare.

2. An Academician's View of Nonacademic Writing

Ladies and gentlemen, I am delighted to be here with you this morning, although the idea of following the distinguished keynote speaker, Professor Mitchell, is alarming. At last I know how people feel when they say, as they frequently do when they learn what I do for a living: "Oh, you are an English teacher. I'll have to watch how I talk around you." Well, Professor Mitchell, I feel that around you I will even have to watch how I think. I agree, however, with Edwin Newman, who says that if anyone can help us save the English language it is Professor Mitchell.

I should make it clear at the outset that this English teacher, at least, is not looking at technical and scientific writing as an evaluator or as a critic, but as someone who has questions to ask and much to learn. Moreover, as a researcher, I am indebted to scores of workers, from scientist, to caseworker, to maintenance person, who give me good humor and patience and their time and attention without so much as a promise that my studies will ever be of much practical use to them or their institutions. What I do mean to do this morning is to review briefly for you several studies now in progress, including my own. As you well know, you experts out there, investigations of occupational and professional writing certainly are not anything new and have not always been undertaken by thoughtful people. Perhaps some of these research objectives and methods are new. I trust that I have not chosen the weak or the sick or the less alert, that I have not preselected a comer in the Golden Fleece Award race and that neither will I have put before you half-brain researchers.

The first project I would like to describe was begun in 1978, probably in response to the growing recognition by government agencies and private businesses that they are not communicating effectively with the public. The Document Design Project, sponsored

by the National Institute of Education, draws from a team of scholars and practitioners from the American Institute of Research in Washington and from Carnegie-Mellon in Pittsburgh, where researchers such as Linda Flower and Richard Hayes are especially interested in the writing processes of working adults and are exploring the use of computers and document design.

The American Institute of Research in Washington is studying the problems that documents present to readers, particularly the poor, elderly, and the limited-English-speaking residents of urban neighborhoods. The goal of the research is to develop a set of guidelines for document designers that is both solidly based in research findings and applicable to real problems. Related to its program of research, the Document Design Project maintains a library of journals, books, and articles on topics relating to language simplification, cognitive psychology, psycholinguistics, reading research, and instructional technology. Their literature file now contains more than 450 items and grows at the rate of 30 items per week. It is available free of charge to any individual or group. They report that the most common topics of interest are readability, readability formulas, their advantages and limitations, and alternatives to readability formulas as a standard for plain language. They find heavy use of this file by diverse clients. The project center serves as a gathering place, then, for information about what others are doing in researching topics that relate to document design. Dr. Janet Revish, the project's Washington director, claims that the staff welcomes both inquiries and information from any source—certainly from the group that is here today.

As part of the project, the staff has compiled a file of plain-language bills introduced in state legislatures throughout the country and of Insurance Commissioners' Regulations on the readability of policies and other legislation. To my knowledge, the Document Design Center and Plain Talk, a recently formed public-interest group, have the only complete, publicly available collection of state laws, bills, proposals, and proposed and enacted insurance and banking regulations on plain language.

The Document Design Project offers technical assistance to government agencies and to other institutions. The staff has developed a three-day course designed to simplify documents by using modules on the process, audience, purpose, context and constraints, organization, language, review, and editing. Each module includes objectives and exercises. Several modules include complete guidelines for writers and designers to follow. The modules are put together as a manual in a loose-leaf binder, which includes a background paper on the research basis for the guidelines. (If anyone is interested in obtaining that document, it is available and it is free.)

The Document Design Project also offers direct assistance to clients working with federal agency writers and editors on specific documents. They are willing to provide workshops and/or technical assistance to clients not in the Washington or Pittsburgh area. (If you would like more information about this project, give me your name and address and I will have it sent to you. I had asked to have current brochures ready to distribute today and did not receive them, but I understand that they are available.)

The Document Design Project's work is different in scope and method from the work that Joseph Williams and his colleagues are completing at the University of Chicago, but perhaps you will agree that there are some shared objectives when I describe it briefly. Williams assumes that teachers of writing, as well as technical writers and editors, need

some way to measure simple and complex styles. Williams reminds us that a large literature exists on how readers read—how they respond to, store, memorize, and process different syntactic structures—but very little is known about how writers write. His belief, and he has documented it to my satisfaction, at least, is that we write excessively complex styles more easily and naturally than simple styles—which may explain why so many of us write so badly. He cautions that to ask an adult to write simply—I don't mean simple sentences, I mean write prose that is easy to process—that to ask an adult to write simply is to ask for complex, unnatural behavior, and that that fact must be recognized by those who are in charge of training programs of scientific and technical writers.

Williams rejects, as almost useless, efforts to measure complexity by T-unit criteria, a T-unit being the shortest segment that it would be grammatically allowable to write with a capital letter at one end and a question mark at the other, leaving no fragment or residue. Williams says that the numbers we obtain when we analyze sentences into their T-units do not tell us whether a writer has written something that his or her readers can understand easily. This is important research, at least to those of us who are teaching writing, because many major writing programs in universities in this country are developing programs that teach students to write by using sentence-combining exercises. The students' writing ability is then measured by T-unit criteria. So, this is an important bit of research, for us at least.

Williams does agree that Rudolph Flesch's formula, which factors c number of words per sentence with x number of syllables per word, does help identify characteristics of prose that is too complex to be read easily—long sentences and long words. He calls those characteristics symptoms, not causes, of an unclear style. "Flesch's metric," says Williams, "does not provide us, then, with a way to teach a clear style, either in classrooms or as editors." Williams finds that a more useful index to a complex style correlates semantic, syntactic, and what are currently known as functional components of sentence structure. Readers of English typically read a sentence with the assumption that the subject coincides with the agent or source of what the verb refers to. If a different grammatical or semantic pattern occurs, the reader must call on a second tactic to process the sentence.

Williams and his colleague, Rosemary Hague, of Chicago State University, created papers in which they systematically displaced agents from the subject's position and what those agents do from the verb's position. They gave those passages on different days to about 70 typists of different levels of skills and background. The typists typed the versions in which the semantic agents and the grammatical subjects coincided about 35% faster than they typed the versions which did not, and they made about 25% fewer errors. That is interesting. In short, Williams and Hague are defining the clearest style as the one in which the grammatical structure of the sentence most redundantly supports the semantic structure. The more consistently the grammatical structure reflects the structure of meaning, the more easily the reader understands what he reads. Williams insists that the worst kind of public prose is unintelligible largely because its semantic and grammatical structures don't coincide.

Joseph Williams, who has for some time been a consultant to the U.S. Department of Agriculture, has taught auditors to write in the ways I have just described. He is now

creating a program for the federal government that will be nationwide. On the basis of his research, he has revised rules governing how trains are run for a major railroad system. He has taught courses in how to write for medical journals to physicians in large medical settings, in every case relying on the principles I have described here. I have just read his manuscript, to be published by Holt, Rhinehart and Winston, *The Grammar of Clarity and Grace*, and it seems to me to be stunningly useful to teachers of technical and scientific writing.

Williams says, "I know for a fact that adult writers understand most clearly of all how these patterns work in what they write, and, once they understand the principles of correlating semantic and grammatical structure, they change how they write and thereby write in a way that they instantly perceive to be much clearer." I tried to have sophisticated writers—perhaps I shouldn't say they are sophisticated writers; they are regular writers, most of whom have master's degrees in English and are experienced teachers—use the principles of Williams's research to see if they could transform their prose. I found that what he said was true, that sometimes after two sessions writers would come to the revision and editing process with a different perception of what they were doing, and the nature of their prose style would change in terms of readability.

Williams admits that not all journals favor this kind of straightforward prose, but he insists that scientists and technicians should be encouraged to write in the clearest and most direct way possible when the occasion demands. His resarch, then, is helping us measure and define complexity and maturity in useful, practical ways. His research is helping writers learn how to recognize and to produce the most efficient, clear style. Let me quote Williams once more, very briefly: "I do not believe that we have even begun to understand the notion of complexity and maturity in any but the most primitive ways. If nothing else, I hope we can now get away from the kind of counting of features that have no evident relevance to how we experience good and bad prose. Writing has consequences. Whatever does not bear on those consequences is irrelevant to our task as teachers and editors."

Sylvia Scribner, a distinguished anthropologist and linguist, formerly at Rockefeller University and the Department of Health, Education and Welfare, but now at the Center for Applied Linguistics in Georgetown, is working with Evelyn Jacobs on an entirely different kind of program. Their program combines ethnographic and psychological research on writing practices and literacy, more generally, in a multi-ethnic industrial community. These researchers are asking a number of important questions, it seems to me. What are the functions of writing in this particular community? How are these functions carried out in working and nonworking contexts? What skills are entailed in these functions, and what are the consequences of literacy in this setting?

A distinctive characteristic of their research is the nature of the research population. They are studying adults employed in the electrical and machine industry in the Northeast. According to the U.S. Census, in 1976 one-fifth of the U.S. labor force worked in manufacturing. Little is known about the conditions and educational requirements of this working environment. Uses of writing in industry are rarely reflected in school curricula; nor is there a reflection of the uses of reading and writing among blue-collar workers in their daily activities outside the work place. In short, Scribner and Jacobs intend to sketch the full role of literacy in the lives of workers. They will be studying reading and, more particularly, writing, as they occur within context, from onsite observations. This study, it seems to me, has implications for any industry employing

blue-collar workers, for educational planners, for directors of training programs in government and industry, for personnel directors and analysts, and, of course, for the workers themselves.

Finally, I come to the project that Lee Odell, a Professor of English at the State University of New York in Albany, and I are working on. We are examining samples of writing that people have to do as a regular part of their day-to-day work in business, labor, or government. This past year we worked in a government bureaucracy, a labor union, and an insurance company. Next year we hope to work in at least one more setting, perhaps a large bank or hospital. We have just recently begun examining the writing and writing processes of several scientists established in research groups and working in the Southeast.

Through our study we hope to answer three basic questions: (1) What kinds of choices do these working writers make? (2) What reasoning underlies these choices? (3) Do the choices and reasons vary according to the sort of work the writer has to do? By contrast with many researchers in our field, we don't assign writing tasks to participants. We ask them to keep copies of writing they do over a one- to two-week period. From each worker we try to select a variety of kinds of writing, usually three to five pieces. We then try to identify characteristics and variations.

We'd like to be able to answer several questions: Do the writing demands of the job parallel the interpersonal demands? That is, will we find that people who write for only one or two audiences and purposes are likely to have a similarly limited range of context in their oral language? If workers talk to a wide range of people outside their immediate offices, are these workers likely to be especially sensitive to audience when they write? Our immediate purpose is to test the assumptions from current discourse theory. Are writers' choices affected by their awareness of audience and purpose? Do writers make choices that can be explained by such awareness? If so, what principles underlie these choices? We hope that ultimately the answers to these questions will let us improve the teaching of composition a bit, but the improvement of teaching is not the central purpose of the research.

As we refine observation techniques for onsite research, we find other questions becoming increasingly important. How do workers acquire work-site writing competence other than through training programs? Is it possible to identify people we would like to call writing facilitators, people who are willing to act informally as scribes or editors? How much and in what ways do these writing facilitators affect productivity? Can we begin to measure something we'd like to call employee writing hours and thereby begin to estimate the amount of money that writing costs a department or business? Can we design school programs that accurately reflect work-site demands and situations? After all, technical writing programs are the only programs gaining enrollment in our college and university English departments. Even though our work with scientists is just beginning, we are finding rich sources of data there about the writing processes.

Let me echo Joseph Williams as I close: "I do not believe that we have even begun to understand writing practices outside schools in any but the most primitive ways. If nothing else, I hope we can now get away from our classrooms and anthologies long enough to observe and study reading and writing in the settings in which you work. I hope the eighties will bring a new kind of collaboration among teachers, researchers, technical writers, editors—people working."

Regina Clark (Union Carbide Corporation): You said that schools are gaining students in the field of technical writing. What does the University of Tennessee offer in that field?

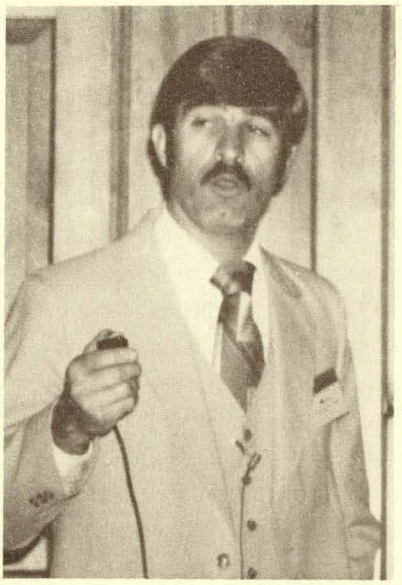
Ms. Goswami: They offer a few advanced courses in technical writing. Freshman students have the option of taking technical writing instead of the traditional courses. The Document Design Project has invited the University of Tennessee to offer one of their courses to juniors and seniors, but no decision has been made on that.

Regina Clark: Is there no degree program?

Ms. Goswami: There is not.

George Sadowski (Union Carbide Corporation): In your analyses of good writing style, techniques, and so on, when is the writer told, and by whom, that he has no message or that he doesn't even understand what he has written?

Ms. Goswami: In the research that we have been doing, we have refrained from acting as evaluators. We have simply tried to look at what writers were doing. In the research, we've not been in a teaching situation. The Document Design Project people do make those kinds of judgments; they analyze particular documents and try to point out to the writers the kinds of things you are talking about. I think that is enormously useful. I've found that if I am trying to get information from people who are hard at work, I must make it very clear that I am not going to tell them that they are rotten writers. If I did, they wouldn't give me the time of day. So, we are not acting as evaluators at this stage.



Max L. Kuhns has been with the Western Electric Company for ten years. He is currently Section Chief of Training for the Data Design Organization in Winston-Salem, North Carolina. Mr. Kuhns has a B.S. in business administration from Franklin University and an M.A. in management and supervision from Central Michigan University.

3. Writer and Editor Training in Technical Publications

The Data Design Organization in Winston-Salem, North Carolina, is the technical publications end of the Western Electric business. This organization produces the documents that enable telephone company engineers and technicians to install and maintain the switching network around our country. It is a complex industry that we serve. Our writers do research and design, as well as the writing of the instructions that guide telephone company engineers and technicians. These publications are field tested by the people who must use them—the local operating companies (in this area, South Central Bell).

Four considerations are involved in the training of our writers and editors—the premise for the training decisions that are made, the sources of technical writers and editors, the scope of the training, and the kind of training that we do.

The approach that we use takes on some of the philosophies that are common at Western Electric. Training is expensive. Thus, we think that when you train, your objective should be to correct performance deficiencies. You should try to get away from the nice-to-know things—the philosophical areas—and should instead concentrate on areas that will change the performance of the person on the job. We want people who complete our training to be improved—to be able to do a thing better than they could when they came to us.

There are basically two types of job deficiency—execution and knowledge. If a person probably can perform, but for some reason does not, that's an execution deficiency. Usually, this type of deficiency is related to the job itself. Sometimes, the reward system may be designed so that a worker actually is rewarded for doing

something other than what he should be doing. Because of a lack of feedback, a worker doesn't know if he is doing what is required. He is unaware that he cannot judge his own performance.

A knowledge deficiency is a person's failure to perform because he does not know how. Training dollars spent trying to solve execution deficiencies are usually wasted. No amount of training will help if the worker is being rewarded for the wrong things. But, training will help knowledge deficiencies.

In our particular organization, how do we define what knowledge deficiencies exist in our people? There are three ways in which we view deficiencies: (1) they are business dependent. In the communications industry, which is a highly technical industry, competition is keen and new products are continually coming into the market. Thus, our people always have some deficiency in their knowledge of the technology. (2) Managers from the major organizations within our business help identify deficiencies. This group knows what new technologies are coming. They also know something about the people we are bringing in to do the work for us. The managers are aware of the deficiencies and the strengths these people are bringing to the work place. (3) The training organization uses problem analysis to study why people are not performing as they should and what can be done about it. We decide if training is the solution or even part of the solution. With execution deficiencies, training is really not the solution. The individual who has a job to do also has a responsibility of making known any problems he has. If he has a weakness in a certain area, he should tell his supervisor.

The training we provide depends, of course, on the individual—his background and experience. The technical editors in our organization have usually worked their way up through the ranks, so they already know a great deal about our business. What they need before they can become productive employees is not a great deal in terms of time; however, it is important. The skills that they require are important, but there are not many that they are lacking when they come into that editing job. Our editors, in addition to helping with the structure and readability of the text, also manage publications through each step of the publications process.

Our technical writers are mostly of two types—the new-hire college graduate and the person coming from an operating telephone company on a rotational assignment. The latter is already an experienced person. He may have as much as 10 to 20 years of experience in his field. His training needs are obviously going to be different from those of the new-hire college graduate. The time needed to make that telephone company person a productive writer is generally less than it is for the new-hire college graduate.

We determine specific needs by determining (1) what the job requires and (2) what qualifications the individual brings to the job; the difference is equal to the training required to make that person a productive employee. For example, if one of our writers is to prepare a maintenance manual on a switching system, we ask what this particular technical writer will need to know to produce that manual. Considerations include such questions as which system is to be described, when will it be available, who will use it, how does the system operate, what happens when something goes wrong in the system, and what should a technician do to correct the problem?

We then evaluate the person's qualifications against the job's requirements. We expect the new-hire college graduate to bring basic writing skills and basic technological skills to the job. He will have some knowledge about certain measuring devices and maintenance

equipment and perhaps even some troubleshooting knowledge acquired from laboratory work done at the university. But, what else will that new technical writer need? He will need to know about the techniques and format of Bell system practices. No one just coming into our organization is going to know the particulars of our style. Another thing the new technical writer needs is knowledge of telephone switching network theory. I don't believe this is taught in any university in the country. Also necessary is some training specific to the hardware he is going to be working on. We like to teach the writer some data-gathering skills so that he can communicate with the engineers and designers of the equipment. Finally, he needs to know about the operation, services, and use of our own production shop.

On the other hand, the person who comes to us from the operating telephone company brings many other skills to the job. He already knows the theory and has some specialized knowledge about the hardware. He is skilled in troubleshooting. Thus, this person primarily needs information on how we produce publications, what the format is, and what the techniques are. He would need the training in data gathering and would need to know something about our production shops.

The training we provide falls into two basic categories—technical training, which deals with communications gear, and process-related training, which deals with the inner workings of our own organization: the production shops, the photo labs, and the print shops.

Technical training is either overview or specific. Overview training provides, in two or three days, general information about a new system, to give an employee a talking knowledge of that system. Specific training goes into much greater detail—how you fix it, what the pieces are, and how they fit together. Training of this type can last several weeks.

We are organized to provide cost-effective training. For example, within the Winston-Salem organization, we provide writers and editors with certain skills and knowledge, including writing and editing formats and techniques, data collection skills, and some theory. For the in-depth, hands-on training, we have central locations within our company to which we send our people. There, the staff gets down to the nitty-gritty of what is really going on in the hardware system.

Sometimes, we use outside training organizations such as manufacturers of minicomputers to provide the skills and knowledge our people need. We will also develop a training program if one doesn't exist. To teach the particular writing techniques we use, we developed our own course.

In summary, training should be designed to solve performance problems. It is important to look at what people bring to the job, to understand their strengths and their weaknesses, and to train selectively. Give the people what they need, but remember that each person doesn't necessarily need the same type of training.

Gayle Sewell (Union Carbide Corporation): About how long do you spend training technical writers—the ones just coming in from college?

Mr. Kuhns: For the people who come to us directly from college, we have a series of core courses that take about four to five weeks. As they get more and more into a particular job, they get additional training. In the beginning, we give them a knowledge of the basic telephone communications system, data collection skills, and writing courses that are designed for our particular business. As they move into the job, they get more advanced training.

Tom Diaz (Digital Equipment Corporation): Is the technical writing done for Western Electric rather highly standardized so that in your technical writing courses for new graduates you are, for the most part, acquainting people with the company standards and publication operation, or are you actually teaching writing skills?

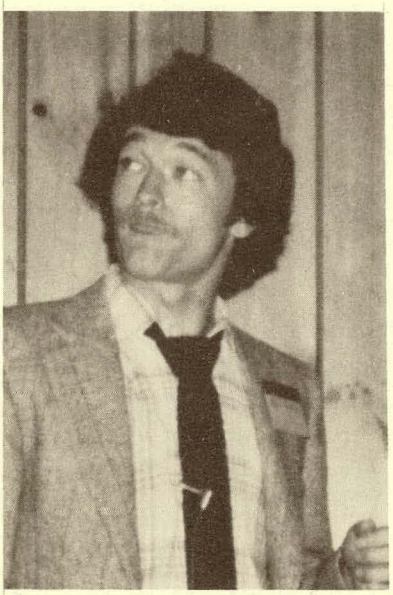
Mr. Kuhns: Yes, it is fairly standardized. However, there are instances in which writing skills are required. Our biggest job is to acquaint the new person with our standards, our specifications, if you will, and have him produce documents that meet those specifications. If a person comes to us with a serious deficiency in writing skills, we provide some help there.

Paul Blakely (Union Carbide Corporation): What is the size of your training staff? What are their backgrounds and experience?

Mr. Kuhns: In Winston-Salem, we have a staff of nine. All the people are recognized experts in a particular area. The total for the whole Bell system is in the hundreds.

Paul Blakely: Do you have continual programs of classes or do you have something like a college quarter system?

Mr. Kuhns: We do operate pretty much on a quarter system in that we offer courses locally each quarter. We offer those courses after we have gathered some data on expected demand. However, our corporate education center schedules courses on an annual basis.



Bill Sims is a graduate of the University of Tennessee's School of Journalism. He is currently the Supervisor of the Publications Staff in the Information Office of the Tennessee Valley Authority (TVA). Mr. Sims has been with TVA since 1975.

4. The Government's Search for Visual Identity

I am going to talk about design and the government, especially the Tennessee Valley Authority (TVA). I want first to ask a couple of questions: Do the organizations you work for have a visual identity program or a corporate identity program of any sort? Do you have a design standards manual that you have to follow? What do you think about that? Is it a problem?

The government got into this area in about 1973 when the National Endowment for the Arts began a program to encourage all the federal agencies to clean up their graphics, to standardize them a little bit, and to follow the lead of most of the major corporations in the country. For example, there's Xerox and IBM—they have pretty good graphics programs. They take a simple logo or corporate identity symbol—golden arches or the letters "TVA"—and apply it to everything: business cards, stationery, house organs, brochures, technical reports, annual reports, posters, event programs, maps, slide shows, press kits, bumper stickers, employee training programs, certificates, exterior signs, interior signs, equipment and vehicle identification, etc. The best programs are usually the ones that cover all these bases. Some programs, though, are primarily oriented toward publications because that is where the greatest need is.

I came to the position I hold now at TVA about a year ago; I had been a house organ editor. I saw that there were hundreds of publications being done, and there was absolutely no consistency—not even within the offices. There was nothing that really tied them all together. For examples, brochures on the conservation of energy, which are issued by the Office of Power—you could examine them, and, most of the time, you couldn't even tell where they came from. They either didn't have "TVA" on the cover or you would have to

really look for it. There were some content problems, too, and that is also my responsibility. But I decided to try to get into this by looking at design—management by design—because that seemed to be where the greatest need was. Most of the editors felt like they could take care of their editorial problems if we could give them a little help with design.

So, we started investigating. We found that TVA spends about $4 million per year on the printing of its publications—that's just to print them. About $1 million per year was being spent on design services, which came from many different sources, very few of which were competently trained or professional design people. The people at TVA who do designs are not professionally trained designers—it could be an editor, a draftsman, or anyone who could at least draw a cartoon. I am sure that you are all aware of the many fine schools in this country that are turning out some great designers. Well, I looked at TVA and I thought: "There is no way we can ever get good designers because there is so much red tape that nobody could put up with it." That is the way I have always felt. It is very hard to get good creative people in the government or in a big organization like TVA. (TVA has 17,000 employees and is spread over 7 states.) We decided to try anyway.

We solicited bids from about seven or eight major design marketing and consulting firms from around the country. They turned in some really interesting proposals, but most of them were oriented toward doing a new logo and a manual. They didn't really get very much into the organization of our design function, our procedures: the way things are produced, how they get cleared and approved, etc.

We wanted a flexible program that encouraged creativity and that encouraged good people to come to TVA but one that lessened the time spent on basic questions such as the page size of the publication, its format, where to get the photograph, and the type of paper to print on. These considerations take up a lot of time. At TVA, you can run the maze forever. It can take you months to get out a small brochure just because you don't know where to go. There is no central design staff. There is the Information Office, but we are really not very much help to these people.

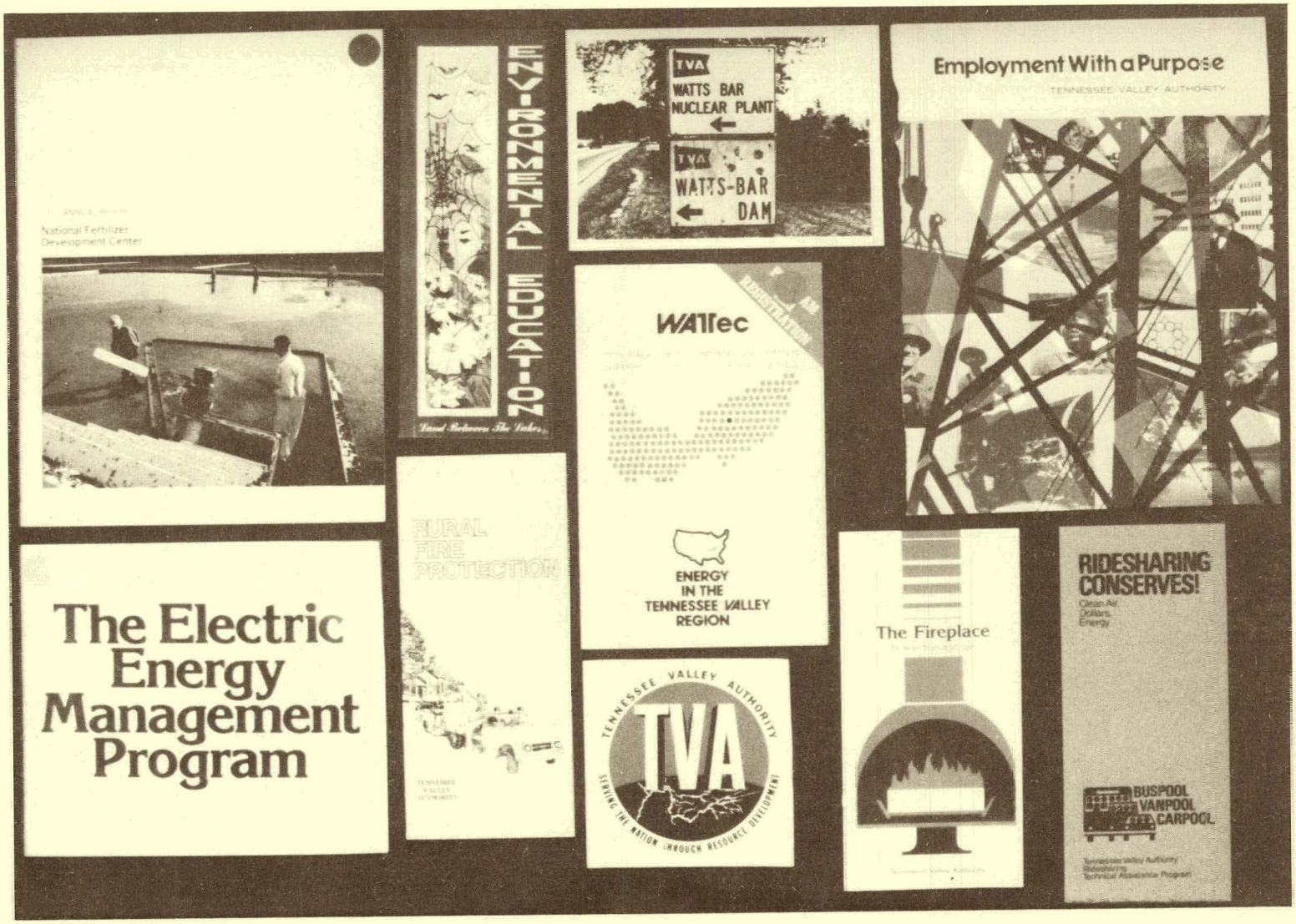
Incidentally, the slides I will show you today are some of the ones used to brief the general manager and board and office managers at TVA about this program to try to convince them that we needed to spend $150,000 to clean up our graphics. It has been one hell of a sales job.

Slides 4.1 and 4.2 show some typical TVA publications. Notice the many different logos—there are about twelve or thirteen being used in TVA right now. If you want to, you can just come up with your own logo and start using it. (We tried to get one logo approved by the board, but that's a hard job.) With all these different programs within TVA and the profusion of publication styles, the public has a right to be confused. Most people think "utility" when they think of TVA; they may not know of all the other areas we're involved in. And each area does its own thing with its publications. There is no consistency in size, type styles, or anything.

Slide 4.3 shows some of our signs. We spend a lot of money on signs because we have dams and reservations all over the valley. The amazing thing is that there are sign shops in each of the different areas, but they didn't know of each other's existence. How could there be any consistency in design? One of the good things about the program I'm working on is that the designers throughout the organization are finding about each other. They are now getting together and talking about their problems.


GUIDE
for Buying an ELECTRIC HEAT PUMP
WHILE
YOU
ARE
WORKING
TVA
DIVISION OF ENGINEERING DESIGN
A DECADE OF PROGRESS
A FUTURE WITH PROMISE
TVA in the KNOXVILLE AREA
TVA TODAY 1977
OPPOR TUNITIES FOR MINORITY STU DENTS
RACCOON MOUNTAIN PUMPED STORAGE PLANT
1978-1979
HUNTING GUIDE
Land Between The Lakes

Slide 4.1


National Fertilizer Development Center
Land Between The Lakes
TVA
WATTS BAR NUCLEAR PLANT
TVA
WATTS-BAR DAM
Employment With a Purpose
TENNESSEE VALLEY AUTHORITY
WATTec
ENERGY IN THE TENNESSEE VALLEY REGION
The Electric Energy Management Program
RURAL FIRE PROTECTION
TENNESSEE VALLEY AUTHORITY
TVA
SERVING THE NATION THROUGH RESOURCE DEVELOPMENT
The Fireplace
RIDESHARING CONSERVES!
Clean Air
Dollars
Energy
BUSPOOL
VANPOOL
CARPOOL

Slide 4.2


U.S. T.V.A.
WATTS BAR
NUCLEAR PLANT
EMPLOYMENT
← OFFICE —
SINGLETON TVA
MATERIALS ENGINEERING
LABORATORIES
TVA
BEECH
ISLAND
TVA
WATTS BAR NUCLEAR PLANT
TVA RESERVATION
MELTON HILL DAM
VISITORS WELCOME
BEECH
BEND TRAIL TVA
LENGTH: 2 MILES
TIME: 1.5 HRS.
DIFFICULTY: EASY
PEDESTRIAN TRAFFIC ONLY

Slide 4.3

When the National Endowment for the Arts (NEA) began to encourage the federal government to clean up its graphics, one of the first agencies it started with was the Department of Labor, and they did a good job there. John Massey, a fairly well known designer, did their program.

A graphic design manual was prepared. In this manual type styles, sizes, and colors are specified for all types of publications, signs, and related areas. This may have been a bit too restrictive, but that's what you're after with this type of program: to make people aware of what graphic design is and of how important design is for publications. Whether it's a technical publication or a general-interest publication, it has to be packaged well before anyone is going to look at it. I'm sure that many of you have argued, just as I have, about the importance of this.

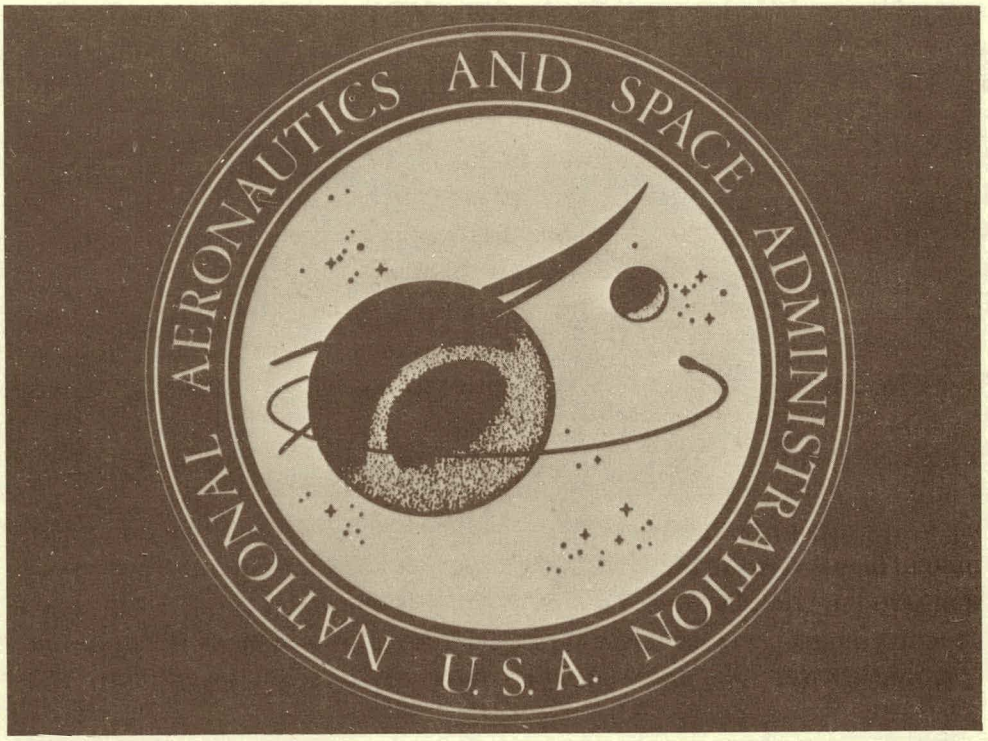
There are quite a few organizations that have been involved in this program. The usual course of events is that the NEA brings a panel of graphic experts from around the country to evaluate your publications, etc., and make recommendations for a program. We realized that our stuff was so bad that we just asked them to give us some names of people and let us get on with it.

In Slide 4.4, on the left side, you see NASA's old logo; I think they call that the meatball logo. NASA called in a design firm from New York, and the resulting new logo is shown on the right. Before they established a firm visual identity program, they had the same problem TVA has. NASA also hired a graphics coordinator and gave him the authority to make the final decision about design, publications, and all these other things. He is a fine designer and a good manager, which is very important. Their manual shows how to use the new logo. You wouldn't think that there would be a problem with this, but people will take that mark and run it upside down, screen it out, put bars behind it, reduce it too much, or enlarge it too much. NASA extended the use of the logo to astronaut patches, the space shuttle, rockets, trucks, airplanes, helicopters, and airplanes—everything NASA. We can't put a logo on a TVA airplane because we don't want the public to know that we have airplanes; we have a whole fleet of them, as a matter of fact.

For the TVA effort, we hired some designers from Louisville, Kentucky, to look at our capabilities. We sent out forms to everybody. We talked to editors and designers to find out what they needed. We found that instead of needing a manual with very specific instructions, we needed more of a resource book to tell people where to go to get done the things they needed done.

We have found that our program can actually save money. For example, by standardizing the sizes for different types of publications, paper and, thereby, printing costs can be significantly reduced. Savings have generally been about 10 to 15%; 10 to 15% of $4 million pays for the program fairly quickly.

We want to project a positive and consistent visual identity; instead of twelve or thirteen different TVAs, we want to project one TVA to the public. In Slide 4.5 are some of the many ways "TVA" has been graphically represented. Our proposed new logo can be seen in Slide 4.6. We wanted something that took advantage of the letters TVA because people are already familiar with them; we didn't think a symbol of any sort would really communicate anything. We wanted a mark that was modern, one that would project an aggressive agency that is technically oriented, and one that also had a human feel about it. Also, there is "valley" (Tennessee "Valley") indicated in the downcurve of the letters. We proposed to use this new design on memorandums, press releases, vechicles, and so forth. We also would, of course, use it on our publications.

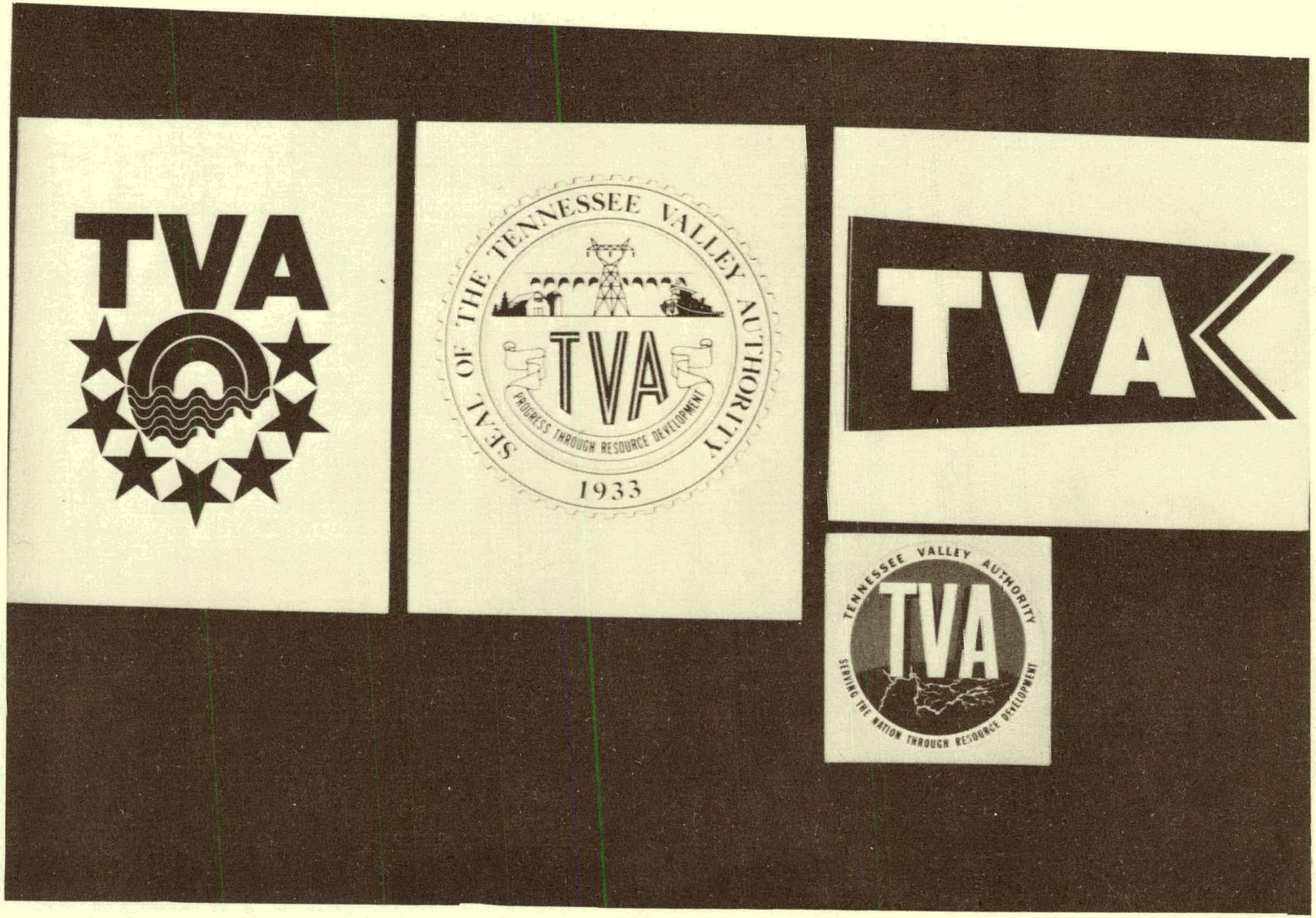

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
U.S.A.

(a)

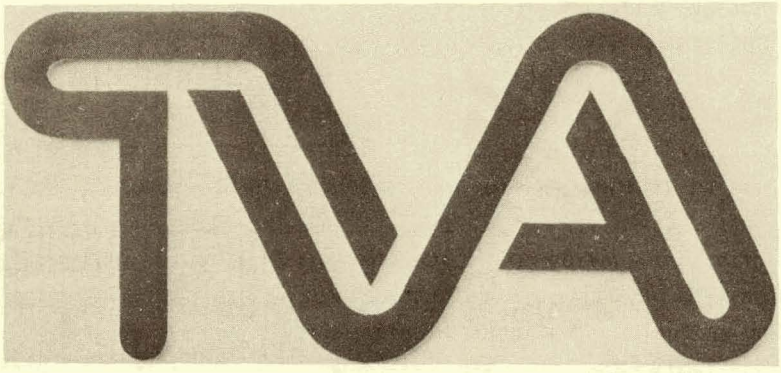

NASA
National Aeronautics and
Space Administration

(b)

Slide 4.4


TVA
SEAL OF THE TENNESSEE VALLEY AUTHORITY
TVA
PROGRESS THROUGH RESOURCE DEVELOPMENT
1933
TVA
TENNESSEE VALLEY AUTHORITY
TVA
SERVING THE NATION THROUGH RESOURCE DEVELOPMENT

Slide 4.5



Slide 4.6

Our designer feels that technical reports should be very strictly controlled; that not much time should be spent on sprucing them up. I am interested in what you all think about that. Are other communications people or scientists or engineers interested in the fancy stuff or do they want just a straightforward, clean looking publication that can be put out fairly quickly?

We presented this logo to Dave Freeman. He said, "I don't like it." He said he tought that the letters TVA, just the plain letters TVA, were perfectly adequate and that the new logo looked too corporate. I told him that I didn't think so. I said, "Dave, we are competing with McDonald's and Coca-Cola to get our message across to the public; we are going to have to be slick and look good. We are going to have to have a mark that the designers and all the employees can be proud of, one that will be distinctive." I did not convince him, so we still don't have a logo.

We are still trying, though. We've come up with a couple more logos that we hope to be able to sell to the board. We still plan to carry the program through to upgrade design and to get training for our designers. We are working with the University of Tennessee now to get some courses set up. We are setting up a design library. We have hired a graphics coordinator—a woman who is an experienced book designer—to work with designers, editors, and engineers. We are making progress, but I think that the government's search for visual identity is going to be a long, long one.

Greg Whitt (Union Carbide Corporation): How can you convince your corporation that they need to update their image? How do you go about it?

Mr. Sims: You have to convince your management. Get information and examples from other agencies who have done these programs. Talk about things that managers are interested in. They don't really give a damn about design, but if you can say you are going to produce better stuff more efficiently, they will be more likely to listen. Set some examples with the publications you do or the things you do have control over. Just keep working at it. It is an educational process; it is a consciousness raising. If you could get the National Endowment for the Arts involved, you might have more luck. They are an outside organization, and when they come in with all their experts and tell you that your stuff is bad, managers pay attention. They don't pay as much attention to people inside the organization.

Janice Asher (Union Carbide Corporation): I am curious as to why you presented Mr. Freeman with only one design? In my experience, I have found that managers prefer three designs, from which they will choose one; otherwise, the choice is yes or no.

Mr. Sims: We did have many other designs, but we never got a chance to present or discuss them. I did feel very strongly in favor of the one we did present, but the meeting got way out of hand, my temper flared up, as usual, and the whole thing became a real fiasco. We wanted to make a strong presentation for the design we thought was best. The board did later look at the other designs; they didn't like them either. We are now going to send three designs and ask them to pick one.

Jack Rich (Union Carbide Corporation): I am in sympathy with you. I do like your proposed new logo.

We have about 18 or 20 different divisions at the Oak Ridge National Laboratory, and in each of those divisions there may be 15 or 20 different groups. Every group seems to have gone logo crazy. They are doing their own design, rather than coming to us, the graphic artists.

Mr. Sims: You have to draw the line somewhere; there has to be mutual respect. There has to be some recognition of your competence. You don't try to do the other fellow's job; he shouldn't try to do yours. I advocate bringing designers in on the communications decisions at the conceptual stage. When a manager says he wants a publication, not only is there an editor there, there is a designer there also. The designer can say which format would be best and make many other important suggestions about the appearance of the final product. This initial involvement of the designer has proved successful around the country. You have to set some examples to prove how it works and slowly work yourself into those decisions. One way to do it is to win a lot of awards. That helps a lot, we've found. People say, "Oh, that guy's good; he's won a lot of awards." We have been tempted to make up our own awards. Then people leave you alone.

Tom Diaz (Digital Equipment Corporation): I want to state my agreement with you that the success of programs such as you discussed depends largely on "politics." I think that your argument that TVA has to compete for its identity with large corporations that spend millions of dollars on advertising is a persuasive argument. I would also point out that the environment has changed, times have changed, and we have to change.

I also wanted to respond to your question about whether or not technical literature calls for the same kind of sprucing up and careful design given to other types of literature. I definitely think it does. I have the same kinds of arguments with my own management on this question, and I do generally follow the same line of argument: that the business I'm in has changed very dramatically and is addressing a lot of new people; something has to be done to make even rather heavy technical matter attractive. I'm all for what you are doing, and I wish you success.

Mr. Sims: I like this type of gathering because of the mix of types: we have writers, editors, compositors, designers, and managers. This is a good opportunity to increase awareness. I hope you all will start communicating with each other a little bit more.

Hugh Keedy (Vanderbilt University): In any area of design there are certain objectives you want to meet. I think that the objectives are many times formulated in the mind of the designer without input from those who will use the design. How deeply did you dig into the acceptance by the public or those for whom these publications are meant? Did you do any surveys?

Mr. Sims: Since we are a government agency, we can't survey the public. We talked to the people involved closely with the production of publications. We asked them what things did or did not go over well. What we are looking for is functional design, not design for

design's sake. We want design that makes things functional and simpler and communicates quickly and more effectively. Designers do sometimes go overboard; they might spend a lot of time on a small publication with a very limited audience. But, designers are not alone in this "sin." The same can be said of those working on other aspects of publications. I would like to see more of the marketing philosophy incorporated in our planning, but we cannot do this as a government agency.

THIS PAGE
WAS INTENTIONALLY
LEFT BLANK

Shirley Diane Thorne is a member of the Systems Engineering Department in the Data Design Organization at Western Electric Company. She received an A.B. in mathematics from Catawba College and an M.A. in mathematics from Wake Forest University. Before joining Western Electric Company, Shirley taught college mathematics for nine years.

5. How Readable Are Your Technical Documents?

State governments are passing legislation requiring readable insurance policies and setting guidelines for determining how understandable a policy is. Manufacturers are now being held legally responsible for the consequences of the lack of understanding by persons using their equipment and instructions. Can a topic, no matter how complex or difficult, be written about in a style appropriate for any level of reading skill? Is it possible that some documents cannot be written in a style appropriate for readers with limited reading skills?

Tests indicate a steady decline in reading skills; yet, there exists a rise in technology. When readers encounter difficult material, there exists increased cost of maintenance, decreased service to the customer, and an inability to get the job done. How well do your technical documents convey information to their intended audience or users?

One basis for evaluating whether a document conveys information effectively and efficiently is to measure the readability of that document. A readability measure is an index of the reading skill required to read a text without having difficulty with its writing style. Readability is not directly related to the content of a text. The style in which a document is written depends on the writer. The elements of style include word length, word familiarity, sentence length, sentence structure, paragraph length, overall organization of major topics, and numerous other aspects.

Reading skill is usually expressed in terms of a reading grade level as defined by a score on a standardized reading test. Reading grade levels are assigned to both readers and documents. A reader's assigned reading grade level is the school grade for which his score on a standardized reading test is typical or normal; that is, a person who reads at a tenth-grade reading level and an average tenth grader would have identical scores on a standardized reading test.

A reading grade level is assigned to a document on the basis of its readability index. Currently, there are many formulas for predicting the readability index of a document. These formulas involve counts of language variables such as the following:

1. average sentence length in words,
2. average number of prepositional phrases,
3. average number of syllables per word,
4. average number of personal reference words,
5. average number of nonfamiliar words,
6. average number of one-syllable words,
7. average number of connectives, and
8. average standard deviation of word length.

Increases in word complexity, word length, sentence length, sentence complexity, verbal connectives, modifiers, and paragraph length tend to decrease the readibility of a document. An increase in the number of personal reference words (provided clarity exists) tends to increase readability.

Readablity formulas have generally been intended for wide usage; but, because of the extensive time and effort required, usage has been restricted. Recently, several computer programs have been developed to provide scores on many of the well-known readability formulas.

The formula used depends on the needs of the user. One researcher's suggested guidelines for choosing a formula are based on the following considerations:

1. specific versus general needs,
2. manual versus computer applications,
3. simple versus complex formulas,
4. word length versus word list formulas, and
5. sentence length versus sentence complexity.

Computer programs are preferred to manual ones if a large quantity of material is being analyzed. A simple two-variable formula of word length and sentence length is generally sufficient to make a relatively good prediction of readability. The word variable is consistently more highly predictive than the sentence variable when each is considered separately. The use of a list of familiar words seems to be slightly more predictive than counting word length. Content words such as nouns, verbs, adjectives, and adverbs might constitute a familiarity list. Although sentence complexity greatly affects readability, good predictions can be obtained from counting sentence length. Sentence length and complexity have been shown to be highly correlated.

Generally, there are two factors considered in choosing a readability formula: (1) appropriateness of a formula for a set of documents and its users and (2) accuracy of prediction of a formula. In determining the appropriateness, it is useful to examine how the formula was constructed and upon what type of reading materials the formula was based. In determining the accuracy of prediction, there exist various statistical techniques for evaluating how well a formula predicts the difficulty of passages. It has been shown that the predictive power of a formula varies with the school grade of the material. The formula chosen should be the best predictor over the range of difficulty appropriate for the users of a

document. For example, a formula good for evaluating material intended for persons with limited reading skills may be a poor one for evaluating material intended for more skilled readers.

Having selected an appropriate readability formula, a basis for selecting the reading grade level of the document must be determined; that is, a level of acceptance must be specified. To determine an acceptable reading grade level, emphasis must be placed on facts about (1) the reading skill levels of the intended readers, (2) the number of intended readers, and (3) the cost effectiveness of the specified level of acceptance.

In specifying the readability level for a particular document, it is usually appropriate to pick a reading grade level that is at or below the reading grade level of the intended audience of the document. Research indicates that reading efficiency increases as readability decreases below the skill level of the reader. If the reading grade level of a document does not exceed the reading grade level of its intended audience, its readers are expected to possess the reading skills required to cope with the writing style of the document.

Estimating the reading skill levels of the intended users of a document is usually somewhat troublesome and questionable. Measuring the reading ability of individuals in a population group by administering a standard reading test is one method; however, testing is a very time-consuming effort and is not very efficient. Usually, a higher educational level implies a higher reading skill level. Information about the minimum reading ability of employees can sometimes be obtained from a personnel qualifying test and the level of reading skill required to pass the test. Additional information can be obtained from training sessions.

General estimates of reading skills can be extracted from various demographic data. The distribution of educational levels attained by the intended audience can be estimated from U.S. Census data that relates educational level to occupation. The distributions of reading skills over educational levels can be estimated from the normative tables of reading tests. By extrapolating from the census and reading test data, the reading skills of a particular occupation can be estimated.

To specify a reading grade level for a document, one should also consider facts about the number of users of a document. A document with a large number of readers should be more readable than a document with few readers. For example, tax forms (which are used by most of the U.S. population) should be more readable than material with just a few readers.

The interval of acceptance might vary, depending on the number of users. For documents that are more widely used, the interval of acceptance might be shorter. Perhaps those widely used documents should have an interval that is indicative of easily readable material.

Generally, poorly written documents produce increased maintenance costs, decreased customer service, an increased rate of on-the-job accidents and mistakes, and conditions that hinder job performance. In selecting an appropriate readability level, cost effectiveness must be considered by examining effects on job performance, effects of mismatches between readability and reading abilities, and costs of revising documents.

Readability has been shown to have strong effects on job performance. A difficult document takes longer for an employee to read, thereby resulting in a loss of time for the employee. Some research has indicated that employees will consult fellow employees for

information about a task rather than use a manual that is not easily understood. This results in a loss of time for the employees consulted. It may also result in insufficient information or misinformation given by those consulted. To put loss of time in perspective, I will cite an example: In 1975, it was estimated that on the basis of 16,000 maintenance personnel in the Bell system, saving 1 minute per day per person would mean a savings of about $300,000 to $500,000 per year (based on 1975 salaries).

Research also indicates that the occurrence of on-the-job mistakes is directly related to mismatches betweem readability and reading ability. These mismatches result in costly errors in following technical instructions and in performing equipment maintenance. These errors often result in increased down time of expensive equipment.

There has been proposed a method to determine an appropriate readability level in terms of the probability of a mismatch between the reading demands of a document and the reading skills of the intended audience for that document. This method is based on two assumptions: (1) Readability is a measure of the reading skill required by a document, and (2) a document will cause some difficulty if its intended readers' level of reading is below that required by the document. For a single document, the probability of a mismatch is calculated by finding the proportion of readers whose reading level is below that required by a specified level of readability. For a group of documents, the probability of a mismatch is the joint probability that a document from the group is more difficult than the acceptable level of readability and that a reader's reading level is below that which is required. This probability of a mismatch can be calculated for different levels of readability and for different populations of users. The consequences of various specified reading levels for various levels of readers can thus be predicted.

The cost of accepting documents at some specified level of readability is the monetary loss that results from a mismatch multiplied by the expected number of mismatches. This monetary loss is determined by analyzing and evaluating the costs of the specific consequences of a mismatch for a particular job.

If a document is rejected because it does not meet the reading level required, it must be revised or rewritten to provide a more readable document. The costs of revision, which may include both developmental and production costs, are relatively easy to estimate. The additional costs of revision must be compared with the losses that may be incurred if that document is accepted, that is, the costs of using a document not suitable for its intended audience.

In analyzing the readability of a document, the use of a readability formula and language variable counts alone should not determine the acceptability of a document. Readability analyses applied as merely an end result of the writing process can indeed be hazardous. Several other factors should be considered. For instance, a document can be classified as easily readable by a formula and yet be totally incoherent. Using short words and sentences doesn't necessarily make a document more comprehensible. Organizational structure definitely affects readability. The purpose and use of a document should be considered. Some research has indicated that readability is not as critical for information to be used for reference as for information to be learned or remembered. The environment in which a document is used should also be considered. Some research indicates that highly motivated readers are unaffected by readability. Also, if time is not a critical factor, a reader may be more receptive to tackling a difficult document. Information may be sometimes be more effectively presented in nontextual displays such as tables and illustrations. The

format of a document should definitely be considered. A document classified as highly unreadable might be made more readable by changing its format rather than the writing style. Such characteristics as text density (measured by the number of characters per page) or the sequencing of procedural directions might affect the readability of a document. Features such as section headings, major and minor headings, and paragraph headings can help the reader overcome difficulties.

Most definitely, changes in text features that produce more desirable readability results do not necessarily convey information more effectively and efficiently. A document should always be proofread to see if it makes sense.

With the relative ease and inexpensiveness of small word processing systems based on microprocessor technology, the use of computer systems in writing environments is expanding rapidly. This trend lends itself to the increasing use of readability checks within the writing system and to the development of new techniques for assessing written information.

In a computer-based writing environment, there exists a variety of possibilities for on-line reading analyses. By providing timely, periodic feedback about such major features as paragraph size, word length, sentence length, word redundance, word familiarity, and indefinite qualifiers, on-line analyses can help produce better documents. This feedback on writing style can result in the writer's constant awareness of the aspects of good writing. Studies for specifying the timeliness of feedback and assessing writer productivity under on-line reading analyses are appropriate. On-line analyses can also provide mechanized assistance for writers to evaluate their writing during training classes.

Generally, the most effective use of readability analyses is to locate difficult sections of a document as it is being written, thereby minimizing the costs of later revisions. The decision as to whether a certain difficult section needs to be rewritten, presented in a nontextual format, or left as is should reside with the writer. Passages with long sentences or unfamiliar expressions might be more easily identified in this manner and could be improved by separating the long sentences into several shorter ones or by substituting preferred-usage or more commonly used synonyms for the unfamiliar expressions. Computers can be used to find words that are too difficult for some intended readers and to generate a list of appropriate synonyms. This can simplify the translation process for international documentation.

Unfamiliar expressions might also include nonstandard acronyms, abbreviations, and definitions of terms. A data base containing a master glossary of acronyms, abbreviations, and definitions would provide consistency in these areas among sets of documents. Computers can be used to locate the nonstandard expressions and to substitute standard expressions or to provide standard expressions on request.

The area of computer aids for written composition becomes more and more important as our writing interval becomes more and more critical. Computerized readability analyses can provide the means to check a set of documents written by more than one person for consistency in writing styles. Although a variety of techniques exists for measuring the effectiveness of text, new techniques need to be developed for assessing the information content of nontextual displays such as tables and illustrations.

I will conclude by reiterating some important points. Readability formulas can predict whether a particular piece of writing is likely to be readable by a particular group of readers, but a formula does not tell how to make a piece of writing more readable. By comparing the

readability of a document with the reading abilities of its intended readers, one can determine whether the information in the document is likely to be conveyed to its intended readers. One of the most useful applications of readability analyses is to locate difficult sections in a document as it is being written.

With the increased emphasis on consumer and employee protection and government regulations regarding this protection, there is a need for producing quality technical documents. Computer-based writing environments strongly affect the use of readability analyses in maintaining appropriate readability levels in technical documents.

Remember that even with readability analyses, a document should always be proofread to see if it makes sense.

Tom Diaz (Digital Equipment Corporation): I am very interested in one point you made about your computer-based writing system. You suggested that its use and the use of readability checks would simplify foreign language translation. First, how is it that you actually translate such documents, and, second, does your experience with computer-based systems show that foreign language translation can be simplified?

Ms. Thorne: We have just started in the international market. One of our senior engineers has been working with some UNIX programs, and our systems engineering group has developed a program for flagging both familiar and unusual words. What we are doing now is just experimental. In translating from English to Spanish, for example, there are certain words our writers use that are not used by the Spanish. Therefore, we are flagging those words and offering a suggested word. We are using a DEC-10 system for our interface, and we are considering using DEC-200 word stations. Some of these stations will be stand-alone units, and some will be tied directly to the system.

Regina Clark (Union Carbide Corporation): Who can best determine the readability of a document—the editor or the scientist writing the document? In many cases, scientists or researchers use technical jargon that they know can be understood by their readers.

Ms. Thorne: Our system has not been implemented. We are just now developing our document development system, and the last word I heard was that it may be in operation by the end of the first quarter of 1980 or by the beginning of the second quarter. Right now we have to use our own system engineering, and I don't believe any readability analyses are currently being conducted in the system. But, I think that if you will recall all the factors considered in determining readability, you will see that it will most likely be a combination of the two—editor and writer. In one of our writing books the goals we should seek in writing are mentioned, but I don't believe this is checked.

Max Kuhns (Western Electric): Disagreement between the editor and the writer as to the choice of words is not an unusual problem. I often hear our writers say, "Don't make your editor mad. If you do, the processing of your document will be slowed down."

Ms. Thorne: Let me emphasize that we are hoping to promote the computer system as a writing aid for the writer. He can get immediate feedback on his document whenever he wishes, and this feedback is just between him and the computer. His boss doesn't have to know his mistakes, and the editor won't have to point out all the errors he has made. He can get this feedback by himself and on his own time. I've found that writers sometimes are very sensitive about their material. I know I am.

Paul Blakely (Union Carbide Corporation): I want to make sure that everyone understands that the acronym Shirley used is spelled U-N-I-X; those unfamiliar with the system might have misunderstood it by the pronunciation alone.

Ms. Thorne: UNIX is a trademark for a software operating system developed by Bell Laboratories, and we're using it because they do provide inexpensive software for us. I believe that for a nominal fee, educational institutions may also have access to it.

George Sadowski (Union Carbide Corporation): Will you please repeat your definition of readability.

Ms. Thorne: I believe that everybody defines readability differently. I have defined it as the index of the reading skill required to read a text without having difficulty with its writing style. I look at readability or readability analysis as depending on writing style, the way a writer chooses to express himself.

Tom Diaz: Are readability measures used to evaluate the performance of writers, and, if so, could this be the reason why the writers are a bit resistant?

Ms. Thorne: The performance of our writers is not judged through readability analyses, and I don't know of any readability analysis currently being conducted within the Western Electric System.

Max Kuhns: However, every document that is written is checked at least three times before it is printed. Each document is reviewed for formatting, readability, and grammatical accuracy.

Paul Blakely: I will direct this question to Linc Sootoo. How is the objectivity of such analyses determined? What kind of standards do you use to determine whether or not a document that has been prepared to be used as a performance evaluation tool is indeed not lengthy or wordy or what have you?

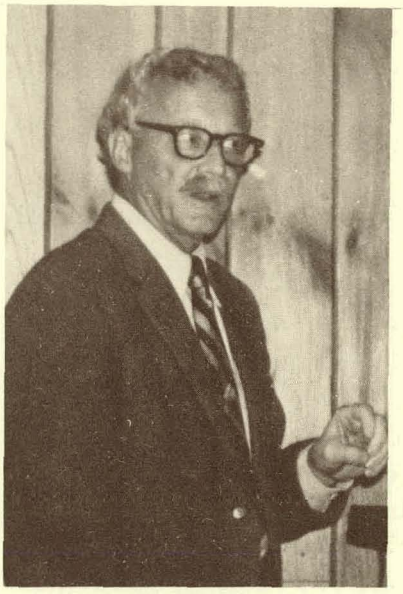
Lincoln Sootoo (Western Electric Company): Well, we have project coordinators for certain groups of equipment. I am responsible for five groups of equipment, and I hope I know as much technically about this equipment as any of my writers. I read all the material they produce, and I check it against their source material. It is then edited and it goes through the standards group. All this takes place before we send it out for review to our people in the labs and in the field.

Ms. Thorne: Again, the writer is getting feedback after he has completed his document. Previously, we have never had the capabilities of a mechanized system with which we could do these readability analyses and provide the writer with immediate feedback while he is actually composing the document and before it gets to his lead writer, lead engineer, or whoever. This difference is what we are hoping to promote.

THIS PAGE

WAS INTENTIONALLY

LEFT BLANK



Wallace Clements is a technical writer and editor at Lawrence Livermore Laboratory in Livermore, California. His major responsibility is as training coordinator for the laboratory's large staff of technical writers and editors. He has presented papers at four of the Society for Technical Communication's international conferences.

6. A Guide for Beginning Technical Editors

In retrospect, it seems clear that we had needed a guidebook for technical editors at Lawrence Livermore Laboratory (LLL) for at least a decade before we finally took action to produce one. As long ago as the mid-sixties, our staff of editors in the Technical Information Department began its growth from an initial half-dozen to the forty-odd editors we have today. Although the growth was not continuous, the trend was generally upward, reflecting the growth of the laboratory itself. Over the years, dozens of editors came to LLL, some with substantial editing experience in previous jobs, some with less experience, and some with none at all. All these new people, regardless of their previous experience, needed a certain minimum of orientation and familiarization with LLL's editorial philosophy and procedures. In addition, the less experienced editors needed various amounts of instruction in the art of technical editing.

The orientation and instruction were mostly provided to each editor by his or her supervisor. As the editing staff grew larger, the editors were split up among several supervisors; consequently, the kind of orientation and instruction a new editor received depended to a considerable extent on which supervisor he was assigned to. Different versions of LLL's editorial philosophy were handed down by different supervisors, and some things were not handed down at all. New editors thus formed different ideas of what was expected of them, and they sometimes found that learning the editing ropes at LLL could be a frustratingly slow and uncertain process.

A further problem with this one-on-one approach was that supervisors sometimes found themselves spending inordinate amounts of time working with new editors to "bring them up to speed" so that they could begin to function efficiently in their jobs. This problem

was most evident whenever the hiring rate increased to the point where we had, say, a half-dozen or more new editors starting work within a period of a month or so. Then supervisors complained that they had little time for anything but training the new editors.

It was during such a period of rapid hiring in 1978 that we finally saw the light—now grown to beacon size—and realized how much more efficient it would be to bring together in one booklet the kinds of information that new editors need. Thus, we began writing a guide for beginning technical editors.

We began with several basic ideas that would control the nature of the guide. Foremost among them was that the guide would be directed specifically to technical editors, particularly those who work mainly on scientific reports, and not to technical writers. Therefore, the focus would be kept on editing.

A second controlling factor was our assumption that the editor begins his work on a technical manuscript only after the author has prepared a complete draft. Thus the editor generally does not assist the author in preparing the draft; instead, he receives a completed draft from the author and starts his editorial work at that point. This is the typical procedure at LLL in the reports and journals groups, where most new editors begin. (Other editors at LLL often assist the scientist-author in writing reports.)

A third controlling factor was our desire to keep procedural discussions as general as possible so that they would remain useful even if the detailed procedures changed. By the same token, they would also be useful to editors in organizations outside LLL.

We particularly wanted to include a number of observations on what might be called our philosophy of technical editing. For example, we wanted to consider such questions as: What are the guidelines for the editor in deciding how much he should change the author's writing? How far should the editor go in arguing a point with the author? What are the basic responsibilites of the editor? Of the author? What is proper exercise of editorial restraint? How can an editor improve a paper on an esoteric subject he knows nothing about and lacks the background to learn much about?

For the benefit of the inexperienced editor we wanted to include a detailed procedure for editing a technical manuscript, which would cover all the steps in the publishing process for which the editor has responsibility, starting when the job is assigned to the editor and ending when the final page masters are completed and ready for printing. We felt that treating the editing process as a sequence of well-defined steps would not only make it easier for the new editor to learn and remember the basic considerations involved in technical editing but would also provide him with a kind of do-it-yourself checklist to guide him in his work.

Finally, we wanted to include basic information and guidance on some of the more technical aspects of technical editing: using proofreaders' marks, citing and listing references, editing mathematical material, constructing tables, and arranging for the preparation of illustrations (both inked drawings and photographs). This material would round out the guide by showing the editor how to do many of the things mentioned as needing to be done in the step-by-step editing procedure.

The organization that evolved is illustrated by the listing of major sections in the table of contents:

What You Do as a Technical Editor
Skills You Need as a Technical Editor
Technical Editing in Prespective

A Systematic Approach to Editing Technical Manuscripts
Using Proofreaders' Marks
Editing References
Editing Mathematical Material
Editing Tables
Editing Illustrations

The first section describes generally what a technical editor does at LLL, with emphasis on the importance of maintaining pleasant and productive relations with authors and with the production specialists who do the work of composition, proofreading, illustrating, photoprocessing, and so forth. The second section discusses the skills we feel are important for a technical editor to cultivate.

In the third section we attempt to put technical editing in perspective as we view it at LLL. This necessarily involves some philosophical considerations. Our philosophical remarks on technical editing are not confined to this section, however. They appear throughout the guide.

By far the largest section is the fourth one, which presents a systematic approach to editing technical manuscripts. We regard it as the key section of the guide.

The last five sections contain practical information for the editor on how to do many of the things mentioned in the earlier sections. Some of the material in these later sections will be found useful by experienced editors as well as by new editors.

Some of the editing philosophy contained in the guide can be illustrated by brief quotations.

On editorial restraint:

> Remember that you are the *editor,* not the author. Therefore you should work within the framework of the author's style—assuming he has a recognizable style, as most authors have—and not try to impose your style on him. For example, if he has been careful to avoid use of the first person, don't gratuitously change to the first person just because you prefer it.

On looking before leaping:

> Don't start right in with sentence-by-sentence editing (when you are assigned a manuscript to edit). You need to get the whole job in perspective first—look through it from end to end, see how it's put together, mull it over in your mind for a while—before starting your detailed editing. This deliberate approach in the beginning can save you time and trouble later.

On ill-conceived editorial changes:

> A cardinal principle of editing is to avoid making unnecessary or wrong changes. It is particularly inexcusable for an editor to change something that is correct as it stands and thus make it wrong. The best way to ensure that the changes you make are improvements is to give careful thought to them. Don't base a change on only a superficial analysis, especially if you are not sure what the author is trying to say.

On leaving well enough alone:

> Occasionally you may receive a manuscript to edit that has nothing of significance wrong with it. If that happens, have the grace to acknowledge it and make no changes. And don't fail to let the author know that he has turned out a piece of writing that is satisfactory as it stands. You are not expected to make changes for the sake of change, just because you are an editor.

On editing highly technical material for an audience of specialists:

> Therefore in editing an esoteric report for specialists, you need not try to make it comprehensible to laymen. Instead, you should focus your attention on carefully checking the mechanical details (spelling, grammar, the sequence of figures, tables, and equations, etc.), on trying to make the figures and tables more effective for their purposes, and on giving careful instructions to the compositor, particularly about typing the mathematical material. These are areas in which you can contribute importantly to the quality of a scientific report, regardless of how abstruse the subject matter is.

On the editor-author relationship:

> After all, the author's manuscript is not just a casually prepared rough draft. It is the culmination of weeks or months of research and many hours of planning, writing, and rewriting. Having invested so much time and effort to explain the results of his research as well as he can, the author is understandably sensitive to criticism, however well intended. To avoid making your editing seem like a frontal attack on his ego, you must conscientiously strive to develop a harmonious relationship.

The sequential steps discussed in the guide's systematic approach to editing technical manuscripts are:

1. Appraising the job
2. Editing the draft
3. Reviewing the editing with the author
4. Preparing the reviewed draft for composition and artwork
5. Conducting the author review of finished galleys and artwork
6. Preparing the reviewed galleys and artwork for corrections and layout
7. Verifying that corrections and layout are done satisfactorily

The first step, appraising the job, is the obvious place to begin. Even so, editors of all levels of experience sometimes need to be reminded of the various things to consider in this essential first step; otherwise, they may overlook some of them in their eagerness to get on with the editing.

Not surprisingly, the second step—editing the draft—receives the most space, by a wide margin. We try to touch on all the important considerations in editing a manuscript. We recommend a deliberate approach at the beginning, in which the editor takes time to gain some understanding of the manuscript as a whole before making editorial changes to it. We emphasize the importance of careful wording and legible writing of editorial changes and instructions; the desirability of paying the greatest attention to achieving clarity of writing in the most widely read parts of the publication (the abstract, introduction, conclusions,

and summary); and the need to methodically check mundane things such as the sequentially numbered items (figures, tables, references, equations) to see that they are present and accounted for, correctly numbered, and in the proper order.

In step 3 we suggest an efficient procedure for the editor to follow in reviewing the editing changes with the author. The importance of maintaining good relations with the author is stressed, and ways of doing this are outlined. Chief among them is presenting the editorial changes as suggestions subject to discussion rather than as accomplished facts. We reiterate the need for the editor to reach agreement with the author on all points of difference during the author review stage.

The four remaining steps carry the job through the various production stages leading to completion of the camera-ready page masters. In all these steps we stress the importance of the editor's continued checking to make sure the job turns out the way he and the author intended.

In the section on using proofreaders' marks, we approach the subject from the viewpoint of the technical editor, who normally works on copy that has lines spaced well apart, rather than from the commonly presented viewpoint of the proofreader, who normally works on copy that has lines spaced close together. The editor can indicate his changes more directly and effectively by writing many of them in or between the lines, where they logically belong, rather than in the margin where proofreaders are forced to put them. Therefore, our examples of the use of proofreaders' marks differ in a number of respects from those commonly given. We believe ours are more appropriate for technical editors to use.

The section on editing references describes the standard ways of citing references and listing the bilbiographic information. Examples are included.

Editing mathematical material requires some knowledge of conventional practices in mathematical typography. These practices are discussed, as well as the kinds of instructions the compositor needs to type the material correctly. Also addressed is the question of punctuation in text-with-equations. We recommend full punctuation, using the same rules to determine the punctuation before and after an equation (or other mathematical expression) that one would use if the equation were a statement in words. The advantage of using full punctuation is the greater precision of meaning that it allows.

The section on editing tables covers construction principles (Slide 6.1), sizing considerations, and different types of tables. We emphasize the desirability of making each table complete in itself, so that it can be readily understood without reference to the accompanying text. This requires giving the table an adequately descriptive title and paying careful attention to the wording of column and row headings so that they communicate their meanings precisely and completely.

Editing illustrations is an area in which many beginning editors have had little or no experience. In this final section, we discuss the basic considerations, including sizing figures, editorial instructions, ordering line and halftone prints of photographs, and using computer printouts as figures. As with tables, we advise making each illustration-with-caption complete in itself—understandable without reference to the accompanying text.

Our first printing of the guide was a run of 500 copies in April 1979. We included an evaluative questionnaire and a postpaid return-addressed envelope in the first few hundred copies we distributed. These copies went to all LLL editors and to other interested LLL

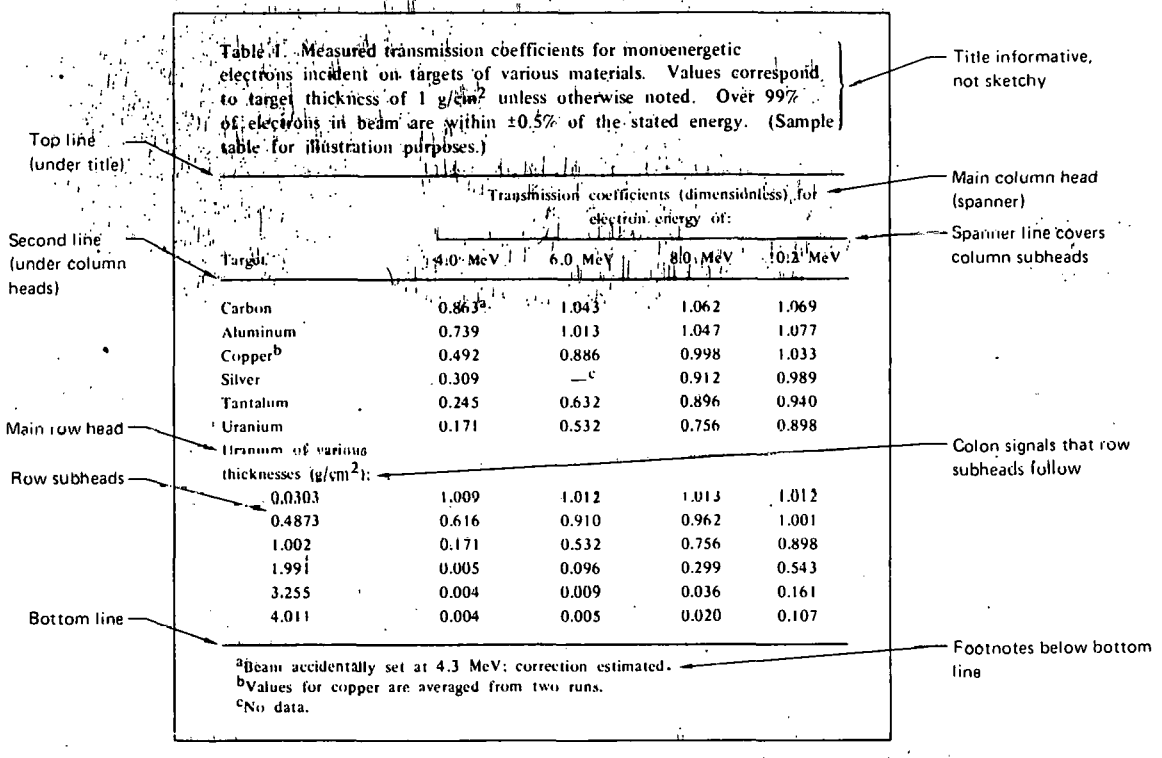


Figure 1. A typical table, illustrating some of the construction details. Note that the units of measurement in which the entries in the field of the table are expressed (in this case dimensionless) are given in the main column head. An acceptable alternative would be to give them in the title. The units of measurement in which the row subheads are expressed (g/cm^2) are given in the main row head.

Slide 6.1

people in related areas of work, to some 200 of the attendees at the 26th ITCC (International Technical Communication Conference) in Los Angeles, and to fill some of the early requests for the guide that came in as a result of the ITCC exposure.

We hoped to use the feedback from the returned questionnaire as a source of ideas for revising the guide, which we intended to consider doing if and when reprinting became necessary. We still have this intention, but when our first reprinting was needed (September 1979) we had neither the time for extensive revision nor the suggestion from the questionnaires that it was necessary. So in this second printing we made only minor corrections and revisions, the most significant of which was to add a short bibliography of reference books on American English usage and style conventions to the section entitled "Skills You Need as a Technical Editor."

Thus far we have had about 30 of the evaluative questionnaires returned. We have read them all but have not yet tabulated the results or attempted to analyze them (this will be done). Our impression is that most of the respondents were favorably impressed with the guide. Some gave glowing testimonials to it, whereas others were more moderate with their praise. Various constructive criticisms and suggestions for changes were received, and, of course, a few typographical errors were pointed out. We corrected the typographical errors in the second printing, and we will take the criticisms and suggestions into account in any future revision. We are grateful to those who took the trouble to answer the questionnaire and return it to us.

George Sadowski (Union Carbide Corporation): What would you say provides the editor with a realistic perspective on the role he or she is expected to play? What is the role of an editor?

Mr. Clements: Sometimes an editor may have the feeling that he essentially is an English teacher correcting a student's theme, but we don't want to adopt that attitude. Our editor is supposed to be a person who has skill and knowledge in effective writing and communications and who can serve as an advisor to the author. The editor's primary function is not just to tell authors what they do wrong but to advise them of how they can best improve their communications.

George Sadowski: In your organization, does an editor compromise quality to meet a deadline, or does he continue his work until satisfied that he has fully completed his responsibilities as he sees them? If a manuscript must be edited in 45 minutes, what should the editor do? Should he do a "quick and dirty" job or take it back and say I can't handle it?

Mr. Clements: Sometimes you must do a quick and dirty job. If help is needed and it has to be provided that fast, we give what service we can. Of course, we would rather have the time to do justice to the manuscript.

George Sadowski: If you have the time and ideal circumstances, how many pages per hour do you think a good editor should complete?

Mr. Clements: I am opposed to a page-per-hour estimate because I disagree with that principle. As all of you who have edited know, the number of pages per hour depends on the type of material. Since there is a great variation in the difficulty of material, I don't like to talk in terms of pages per hour.

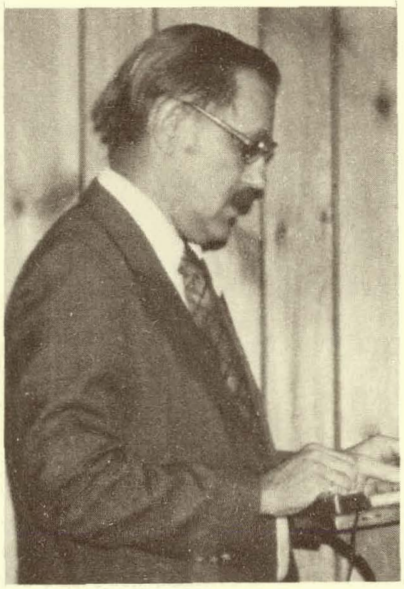
George Sadowski: I gather from the conversation here and the responses to my questions that there are no hard and fast rules for an editor—that there is a great deal of flexibility. An editor must take compromises, and he must fit himself into the total situation regardless of what it is. An editor is part of a team; he is not the quarterback.

Mr. Clements: Instead of telling all the editors how to do everything, we like to leave quite a broad area open for what we call editorial judgment. We figure that the editor should need only fairly general guidelines to work within. The editor can, with general guidance, make necessary decisions satisfactorily on his own.

THIS PAGE

WAS INTENTIONALLY

LEFT BLANK



Hugh F. Keedy is Professor of Engineering Science at Vanderbilt University, Nashville, Tennessee. Dr. Keedy's interests in educational methods led in 1971 to the development of freshman courses in engineering principles for engineers, and more recent interests in technical communication have led both to incorporation of more extensive writing practice into the freshman program and to development of a team-taught course in technical communications for junior and seniors in engineering.

Dr. Keedy is Director of the Freshman Year and of the school's media center. Since 1970 he has been active in the American Society for Engineering Education at both section and national levels. His current interests are in student learning styles, expanding the educational use of computers, and technical communications for engineering students.

Dr. Keedy's Ph.D. is in engineering mechanics from the University of Michigan. In 1977 he was presented the Western Electric Award for Excellence in Teaching.

7. Developing Early Awareness of Technical Writing Skills

I feel a little bit out of place here, being a university professor among those who are from industry. But maybe we can come to a better understanding of each other's positions. I know that I have profited from being here in that I better understand some of the viewpoints of industry. I hope that after my presentation you will have a somewhat better appreciation of some of the problems and attempts to solve them that are being made at the university level.

First, since the title of my paper involves awareness, I'd like to look at some things that I became aware of for some reason and that evidently somebody else did not. The following slides show the misunderstandings and humor that can result from imprecise phrasing and slack grammar.

This first example is from a brochure for Christus Gardens.

> The design for Christus Gardens was constructed from fine Tennessee and Georgia marble.

Slide 7.1

I thought the building was constructed of marble, not the design.

Next, look at these instructions from a Nestle Souptime package.

1. Empty this Souptime envelope into cup or mug.
2. Add ¾ cup (6 oz.) of boiling water all at once. Fills large mug half full.
3. While pouring water, stir thoroughly and enjoy.

Slide 7.2

After following the first two instructions, you look at the third and find that you've missed the time to "stir thoroughly and enjoy" because the water has already been poured. Obviously, someone slipped up. It would be nice if we could get our students to be aware of these kinds of mistakes; then they would be less likely to make them. That is the point of what I am trying to do.

This is a Planter's corn chip advertisement:

> Our bag:
> Packed in resealable, crushproof cans . . . to stay fresher, crispier, tastier, longer!
>
> Their bag:
> Gets crushed, broken, squeezed, torn, spilled and goes stale when opened.

Slide 7.3

The bag is doing all of this?

This advertisement is from a shampoo:

> So gentle, you can use it everyday.

Slide 7.4

Not every day, but everyday.

This next slide appeared as a description in *TV Guide.*

> While away from home on a buying trip, Charles runs into a lonely wife of a wealthy, alcoholic rancher who turns to him for affection.

Slide 7.5

In this day and age, you don't know what is going on.

I once saw a presentation, about 40 minutes long, of about 150 or 200 slides taken in a grocery store of labels that had incorrect specifications of SI. This next slide is from such a label.

> NET WT. 7½ OZS. (212 G.)

Slide 7.6

That is not the SI way to present grams. First, you don't put a period after it, and, second, *G* is giga. So, we've got 212 gigas—whatever that is—in the can.

I have a lot of fun with these, but I also have a lot of fun with my students. I use these mistakes as examples to say, "Okay, here is what your fellow students have done in the past. Don't you do this. Maybe you can understand these things, but there may just as well be another situation in which you find that the wording is completely ambiguous." I know that I am not telling you editors anything new. But I'm telling you what my approach is as I try to instruct my students.

I like this example:

> A podium will be provided for a speaker, and a screen for the showing of movies.
>
> *Slide 7.7*

This appeared in a report; it was a factual report about a meeting, and there it is.

Here is another example from a report.

> A DC-10, which is powered by a GE engine, was landing in one of Boston's airports which is near the sea when a flock of twelve seagulls were swallowed up by one of the engines after crossing in front of the jet.
>
> *Slide 7.8*

Engines are crossing all over the place, and airports are by the sea when seagulls are around—there are all sorts of things you can conjure up. Obviously, whoever turned it in did not edit or reread, and this kind of oversight is one of the hardest things that we have to fight in our instructions. If the author had reread it, especially if he had reread it aloud, he would have certainly seen that something was wrong.

I'll continue this a bit longer. Here are more; I'm sure none of you has ever seen anything quite like these.

> The high pressure vacuum pump vertical mounting bracket bolt threads were stripped.
>
> Both the design and construction contributed to the collapse and the trial that arose from a debate of who was at fault will declare who actually is in October of 1977.
>
> There was a slab of concrete connected to a rock cliff which chipped away easily.
>
> *Slide 7.9*

Of course, threads are what were stripped, but look at that string of nouns modifying threads. The second part is an example from the types of reports we get. Let me say one thing: I don't want to give you the impression that this is the quality typical of Vanderbilt. These are obviously examples chosen to point out that careful editing is necessary. The third part is very interesting. The question is—and this is a very pertinent question—what chipped away? Did the concreete slab chip away (which is actually what they were trying to say), or did the rock cliff chip away? If someone based a decision on that type of sentence, he could be in trouble.

I must show you one more.

> The first time the silo came close to being filled, it collapsed. An inspection crew was sent to examine the remains, one of which was Dr. Wilson.
>
> *Slide 7.10*

Enough of the frivolity—I couldn't resist showing you these things because we've had so much fun with them. Here's what we've tried to tell our students, though. This next slide is a quotation from a vice-president of General Motors Corporation, simply saying that graduates, if they want to progress, are going to have to become more aware or be aware of the technical communications skills they have.

Paul Chena -- Vice President, General Motors Corporation

. . . Graduates will be far better prepared for professional research work if they can speak articulately and write effectively about their field of expertise. Don't under estimate the importance of this skill. Effective communication is required before, during and after every research project that industry undertakes. Unless the graduate student has been prepared for communicating . . . he will be at a distinct disadvantage in research, assuming he is hired at all.

One of our departments asks each job candidate to present a seminar on his thesis work. . . . in some cases, it represents a tremendous hurdle to the applicant . . . (many) have trouble because they simply do not know how to convey information, in particular, results and conclusions.

Effective communications presupposes knowing how to organize background material, rationales, conclusions and recommendations for easy understanding and maximum impact. Are your students up to this challenge? If not, consider integrating courses in oral reporting of scientific results and in technical report writing.

Slide 7.11

We really read this type of thing to our students and try to impress them with it.

According to a study made by the Air Force in Cleveland (Wright-Patterson, I guess it was), 55% of the time of executives who have been out of school an average of 10 to 15 years is spent in either writing or reading. These executives are engineers, not writers and editors. So, we find that there is a very great need for developing an awareness of being able to use communication skills. A quotation that, to me, defines the purpose of a college is this: "All that a college can actually provide students is roots and wings. The development of roots involves a strong academic emphasis in preparation for living in today's changing world. The development of wings involves teaching the satisfaction of achievement through service."

Let me tell you a little bit about how we have tried to develop awareness during the freshman year. I think that the typical writing background of freshman engineering students has been of a creative nature. They have gone through standard high school English courses and have had very little exposure, if any, to the technical approach. Maybe some of them have participated in a science fair or something similar and have had some instruction, but these are special cases. Their writing has primarily been a form of self-expression, rather than for purposes of description. Students generally understand very little of the nature of the writing that is expected by industry. They know that letters and reports have to be written, but they don't really know what principles are involved. They have had few assignments that relate to what they are going to be expected to do when they graduate and become engineers. I think that quite frequently they come to us in engineering to avoid taking English; then they discover that they are expected to be good communicators. So, sometimes the need for communications skills is a shock to them.

Now, how do you go about developing this early awareness? At this point, I would like to make a pitch to those of you who are from industry: We in education are attempting to provide graduates who fit with a minimum of disturbance into what you are trying to do. I think that if there is more cooperation between industry and education, we are both going to be winners. Personally, I would like to know more about what industry requires and desires. More educators should attend conferences such as this one; it has been an eye-opener for me.

Basically, what we as educators need to do is to distinguish between the type of writing that develops in-school skills and the type that develops out-of-school or postgraduation skills that will be required in a job. These are two distinct types of writing. We also need to find out exactly what kinds of writing will be required of our graduates. As an instructor, I need to pass this information on to my students. What will they be expected to do and upon what principles are these types of writing to be based—or are they based in actuality in the field? Then I need to design some assignments that reflect those kinds of writing. Finally, we need to evaluate the writing to whatever degree we can on a professional basis.

At Vanderbilt we have incorporated some of this into a freshman course, "Engineering Principles." We try to include in this course some projects that model the types of projects in industry—types that would involve design process and problem solving—and we relate a series of ten writing assignments to these projects. First, we ask for a one-paragraph statement of a problem that the student perceives. Students can look about them and get any problem. But they always give us a solution to the problem instead of the problem; they will write the problem, and then they will immediately give us the solution. That is not what we asked for.

Then we ask for a one-page report on how the design steps were used to arrive at a problem solution that the students have prepared. We ask them, "How did you go about using this process? How did you go about coming up with your solution?" We ask them to write two critiques of problem solutions. After their solution has been evaluated, they should critique it. What made it good? What made it bad? How would you change it? Of what value was it to you? We ask them to prepare an engineering proposal. We also ask them to write a factual report and a critical report about a meeting that they attend. Then they have a team project (composed of five people), which runs for ten weeks; when they finish, they present a final report.

The course requires a lot of writing. The final reports are evaluated by area engineers. This puts fear into the students and allows them to get some very valuable feedback. It lets them know very quickly that the type of writing that they thought was pretty good does not measure up—that it actually has a lot of poorly organized material, for instance, or that it is unclear or wordy.

We also provide a help desk for those who want or need help in the preparation of the proposals and final reports. At the end of the period or after the papers have been graded and handed back, if students want some additional help because of the mistakes that have been marked—they don't know what they mean or this sort of thing—they can go to the help desk.

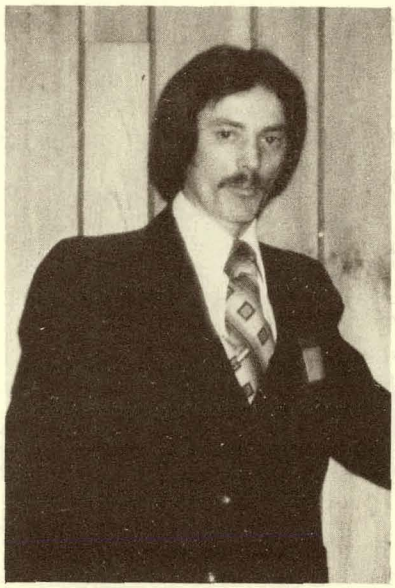
Generally, the instructors grade the papers. At first, content was about all that we worried about. This is the ninth year that this program has been in operation, and at first it concentrated more or less on content. I must say that the instructors are becoming much more aware and interested in grading for the style, organization, and things of this sort than they were previously. There is also a short module of about 6 hours that is offered separately, in which the principles of good technical writing are treated in more detail. Also, we give students additional experience in such things as contextual editing, sentence editing, and so forth. We do not try to teach grammar. Most of them know the grammar; it is just a matter of pointing out to them that they have made a mistake. It is not that they don't know it; they have just overlooked or forgotten it. This experience certainly helps them become aware early, allows them to build during their four years in school, and provides them with a good opportunity for summer jobs.

George Sadowski (Union Carbide Corporation): Mr. Keedy, if I understand you correctly, you seem to imply that professors and instructors are qualified to evaluate a student's writing. We make much light of the student's mistakes, but I have looked over the writings of professors and consultants from universities, and I find that very often they can't even spell the words in their own vocabulary. I wonder if they really are qualified? In my experience, unless they have been through a hard-nosed training program on writing technical reports, very few of these people are qualified to teach students how to write a technical report.

Mr. Keedy: I must agree with you that a lot of the instructors are not English teachers, by any stretch of the imagination; a lot of them do think they can write well, but I don't think they can. I think I can write reasonably well, but you might disagree with me. However, what we have is better than nothing—better than not grading them at all. We do not have the money available to provide instructors trained in technical writing, or even in English. We are using some of our students who have been through our senior course in technical writing as paper graders and that has helped some, but I am sure even that is inadequate. I know it is a drop in the bucket, but previously nothing has been done. For years, there has not been any course on the Vanderbilt campus that involved technical communications at all. Three years ago, we put this one in the upper class level and we are trying to develop some awareness; that's about all I can say about it. I'm basically in sympathy with your objection.

Paul Blakely (Union Carbide Corporation): I believe that technical communication is a relatively new field, and we might perhaps draw a parallel between it and, say, the affirmative action employment program, because it is something that is new, something that is different, something that is starting. We have to start slow. We are building up; as Dr. Keedy says, there are few schools with courses, much less programs, in technical communication, but we are getting there and we will be there in a while.

Mr. Keedy: This semester, we are conducting an experiment to try to incorporate technical writing into the freshman course. Again, this is pure experiment, but by next year we will perhaps have some results to report.



Russell G. Utlak is the Graphic Arts Department supervisor and visual aids coordinator for the Westinghouse Electric Corporation in the Clinch River Breeder Reactor Project. Russ joined Westinghouse in 1972 after graduating from Pittsburgh Technical Institute with a degree in industrial engineering. He attended Penn State University and is now attending the University of Tennessee in pursuit of a B.S. in mechanical engineering.

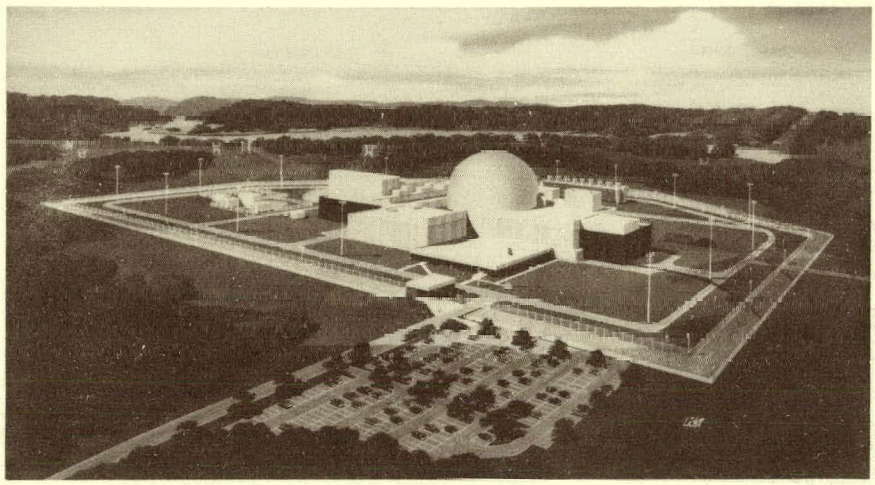
8. Establishing a Visual Aids Data Base on a Program with a Multicompany Organizational Structure

Because of the wide involvement of the corporate structure in its operation and as a result of the influence of the governmental ways of doing things, the nuclear industry has been molded by traditional attitudes and an adherence to the accepted ways of doing business. Although this position is reflected in all facets of the operation of my company, Westinghouse Electric Corporation, it is most noticeable in the communications area.

The Clinch River Breeder Reactor Plant (CRBRP) Project (Slide 8.1), the nation's first large-scale liquid-metal fast breeder reactor program, is a prime example of this position. Its possible national importance by the turn of the century and its high visibility since the early 1970s, combined with a government, utility, and private industry organizational structure, have led to a multitude of presentations and publications.

In the many presentations and publications produced related to the CRBRP Project, visual aids are used extensively because they provide the best means of presenting the state of the project's highly technical, complex, and integrated design of systems, components, and structures. I define a visual aid as an information device, such as a chart, illustration, slide, viewgraph, or photograph, used to supplement verbal or written information. Today, I want to discuss the visual aids data base used by Westinghouse Electric to meet its communications needs related to the CRBRP Project.

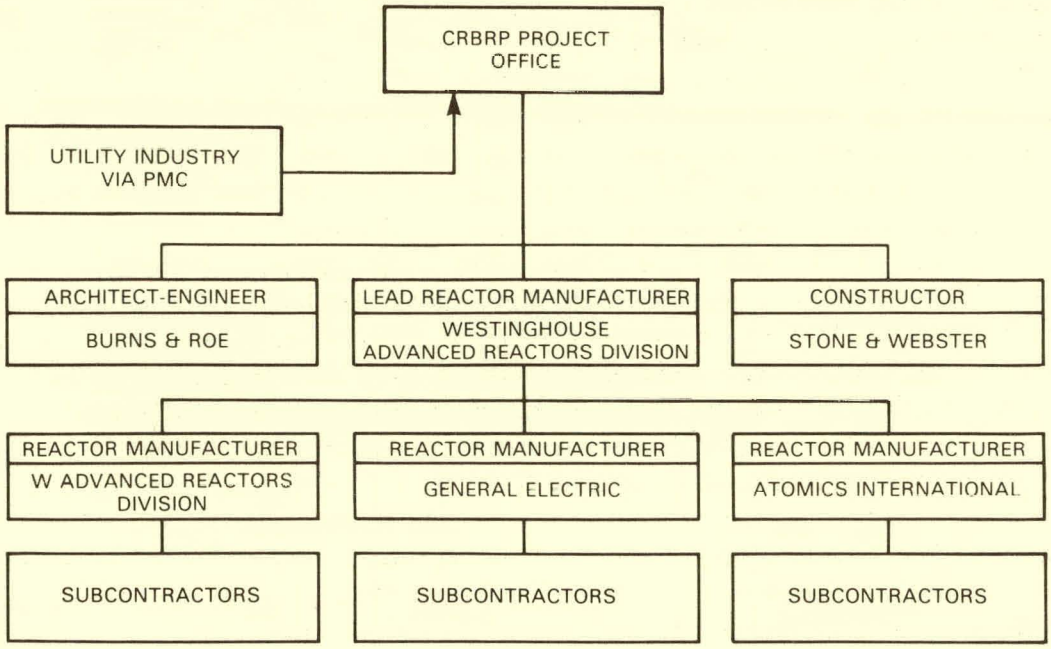
The organizational structure set up to build the CRBRP served as the foundation for the visual aids data base (Slide 8.2). Visual aids representative of all areas of the project are obtained from the participants in the organization. This gives our presentations and publications the cohesiveness needed in addressing both technical and nontechnical audiences.



Slide 8.1

As the lead reactor manufacturer, we rely primarily on the architect-engineer (A-E), our reactor manufacturers (RMs), the RMs' component contractors, and the constructors for the bulk of our visual aids materials. We do have a Graphic Arts Department that contributes to the visual aids data base by supplying the visual aids needed to tie our presentations and publications together.

The A-E, who is responsible for overall plant engineering services and the balance of plant (BOP) structures and equipment, provides line illustrations of the overall plant layout, progress photographs of BOP equipment, and photographs of the color-coded plant model. Model photographs are extremely helpful in quickly informing audiences of the subject matter being addressed.



Slide 8.2

The RMs are responsible for about 45 separate systems that make up the nuclear steam supply system. They provide visual aids such as line illustrations of piping and component conceptual designs and photographs of models, mock-ups, and test programs.

Systems components design and fabrication is another responsibility of the RMs. About $450 million worth of components is needed for the nuclear steam supply system of the CRBRP. Most of these components are being fabricated by subcontractors located throughout the Unites States. For example, the intermediate heat exchangers are being fabricated by the Foster Wheeler Energy Corporation, Mountaintop, Pennsylvania; the reactor vessel by Babcock & Wilcox, Mt. Vernon, Indiana; and the steam generators by Atomics International, El Segundo, California. From these subcontractors, we receive monthly progress photographs of all components in the fabrication cycle. Photographs are taken during fabrication, packaging, shipment, and interim storage.

The constructor is responsible for overall construction of the plant. Photographs of site preparation, building and facilities construction, and component installation will be obtained for presentation and publication once construction begins.

Finally, visual aids are provided by those companies in the organizational structure with marketing and/or information departments. Although complete slide presentations and brochures are provided, we can obtain their reproduction materials if necessary.

Once the visual aids data base foundation was established, we began to strive for consistency in the production of visual aids in two areas: line illustrations and progress photographs. This was done by establishing general guidelines and closely communicating them to the participants' graphic arts and purchasing departments.

Line illustrations drawn by the RMs' graphic arts departments must be clear, simple, legible, and relevant. Line weights must be properly sized, depending on how the illustration is to be used. For viewgraph and slide presentations, the line weights must be heavy enough to remain legible after photographic processing (Slide 8.3); this is true particularly when large reductions are required. To show details, these illustrations are drawn on E- and F-size mylar film.

For our purposes, we request that the RMs submit A-, B-, or C-size washoff Cronaflex mylar copy reproduced from the original mylar drawings. The washoff Cronaflex mylar copy allows us to add, delete, or touch up the drawing with minimum effort. Callouts and other data are added at that time.

Either two- or three-dimensional line illustrations are done depending on which type is appropriate for the subject (Slides 8.4 and 8.5). We use three-dimensional line illustrations for components and systems when an overall perspective and a professional appearance are required. They show minimal detail and are best suited for audiences with little knowledge of the subjects; they should not, however, be used for engineering design purposes.

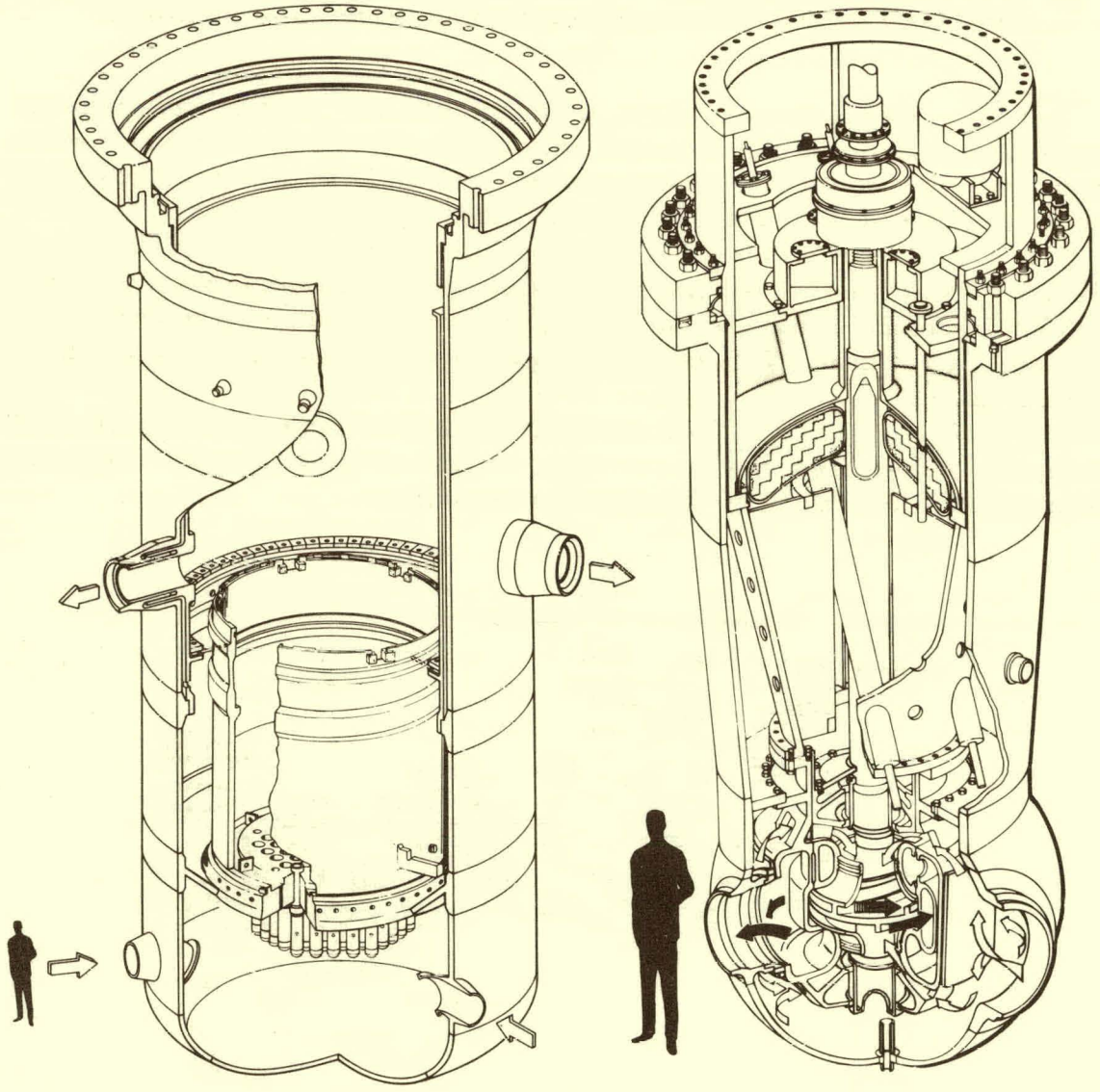
Photographs must have good contrast, be clear and sharp, and clearly show the area of interest (Slide 8.6). To control the quality of photographs, particularly those taken at the component fabrication stage, we require the RMs' purchasing departments to instruct their subcontractors and in-house photographers to provide

1. photographs taken using appropriate and special effects equipment such as wide-angle lenses, floodlights, colored lights, and filters,
2. one original 2¼ by 2¾ inch or 4 by 5 inch color negative and two 8 by 10 inch prints of each negative, and

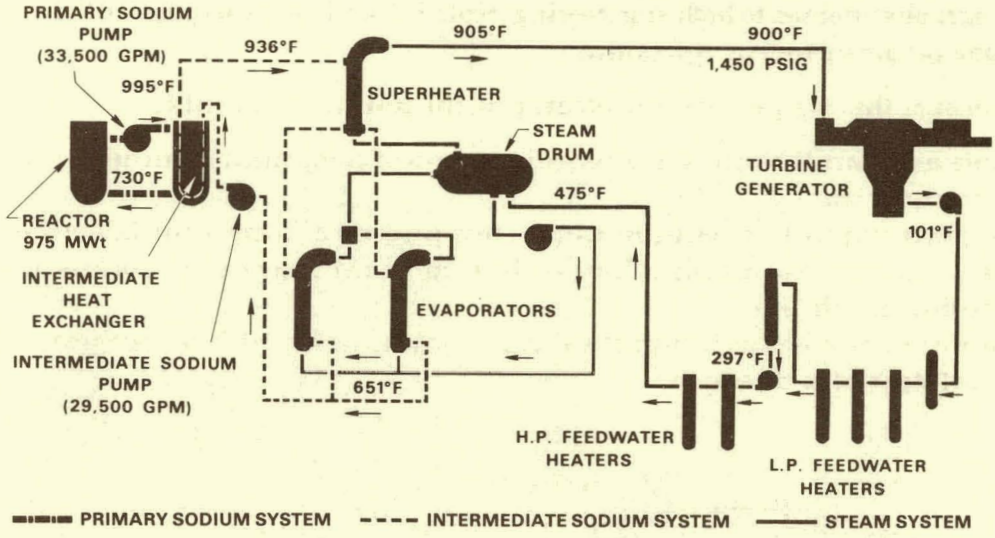
3. photographs oriented to both engineering (Slide 8.7) and public relations (Slide 8.8) that include people as well as equipment.

To ensure that we get timely photographs, the RMs are required to

1. provide a contact for conducting periodic reviews of component fabrication operations for photographing,
2. have photographs of models, mock-ups, test programs, component fabrication, etc., taken on a month-to-month schedule showing added interest or progress from the preceeding month, and
3. transmit in-house and subcontractors' negatives and prints (with captions) to us during the first week of each month.



Slide 8.3

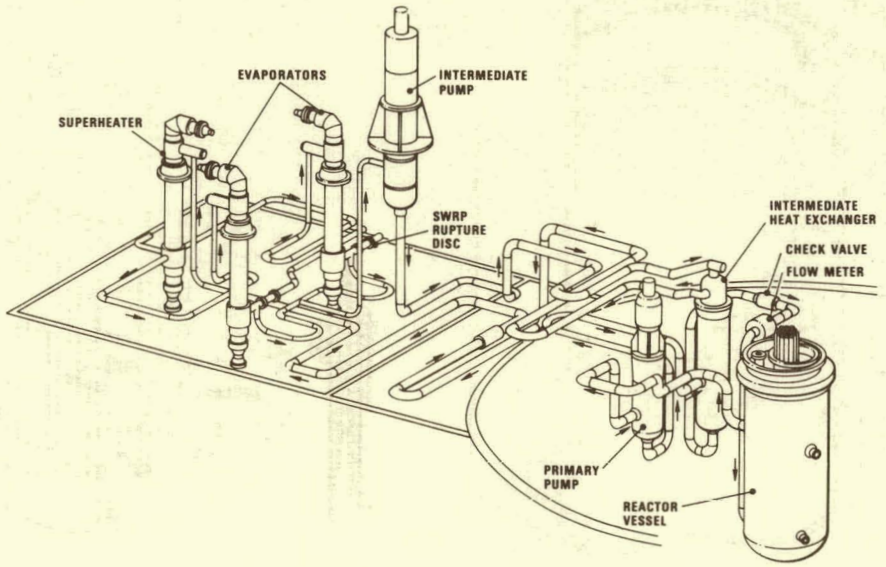


Slide 8.4

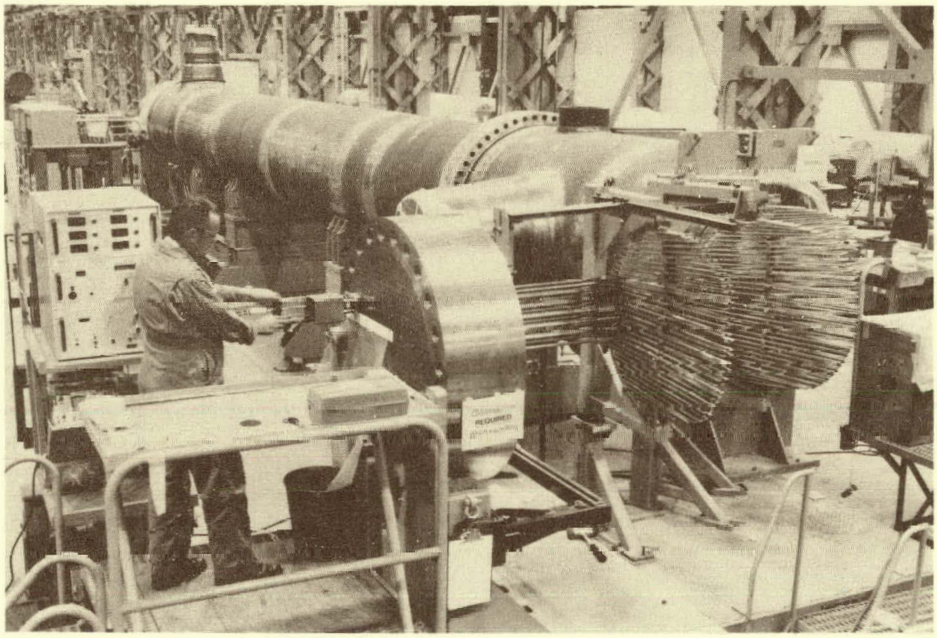
The visual aids are given an alphanumeric identification number, which provides categorization and permits easy filing and retrieval. The identification number is used in conjunction with a set of visual aid books lettered A through H. Each book contains 3 by 3 inch copies of related visual aids and their identification numbers (Slide 8.9).

Book A, for example, covers the project's cost, schedule, organizations, and manpower information. Book D covers the overall plant design and is divided into sections for each of the 45 system design descriptions that make up the plant. Each section is further divided into subsections for general information, concepts and schematics, and major equipment specifications.

Copies of the visual aids books are distributed to the project participants. The participants request visual aids by identifying the type of visual aid (slide, viewgraph, photograph, line illustration) and the identification number.

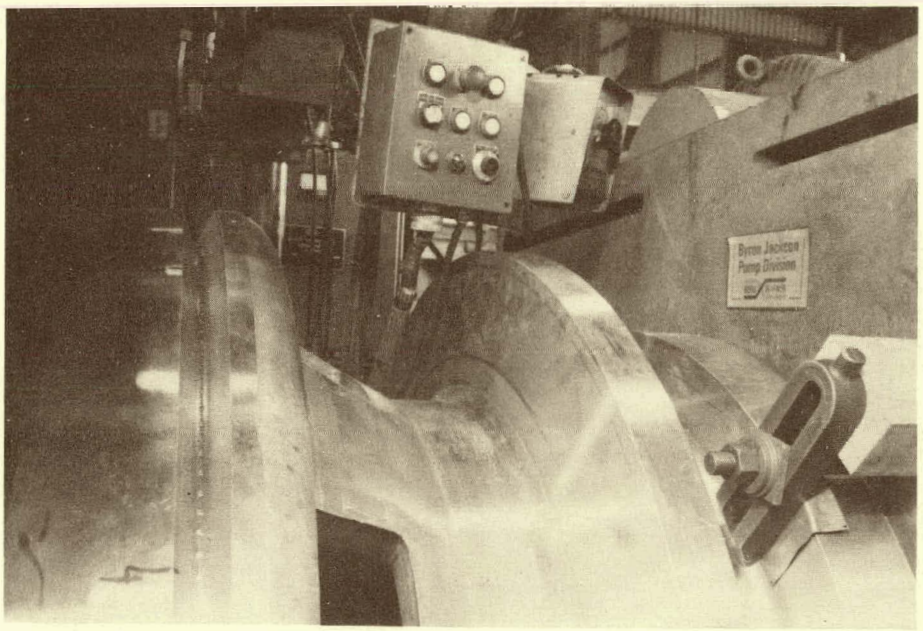


Slide 8.5

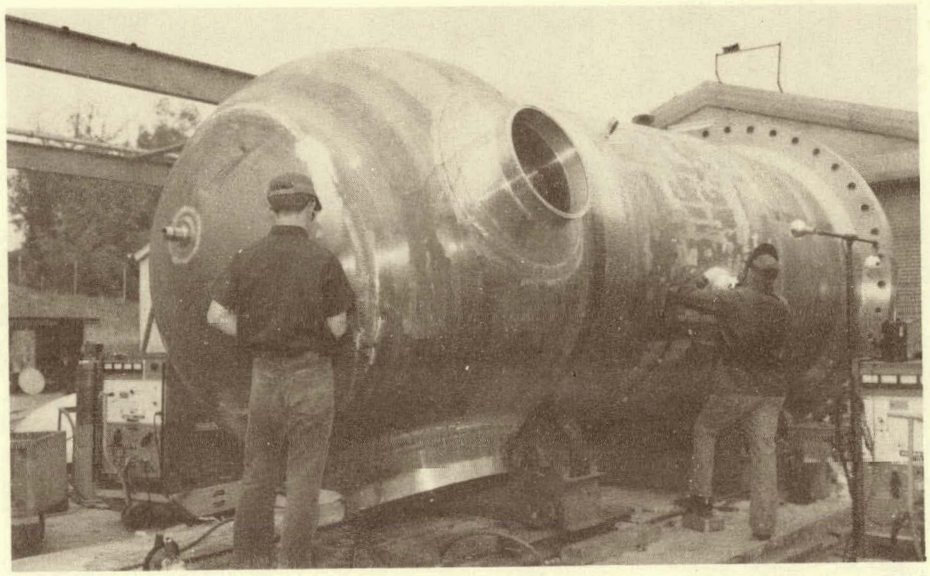


Slide 8.6

Implementing the visual aids books provided a mechanism for project-wide use of our integrated and comprehensive visual aids data base. The primary user of the visual aids data base is the project's Information Division, which approves, publishes, and disseminates most of the presentation and publication material used on the program. The Information Division uses visual aids to supplement verbal and written information (Slide 8.10, CRBRP design description publication; Slide 8.11, *Breeder Briefs,* a monthly publication; and Slide 8.12, design and fabrication progress publication).

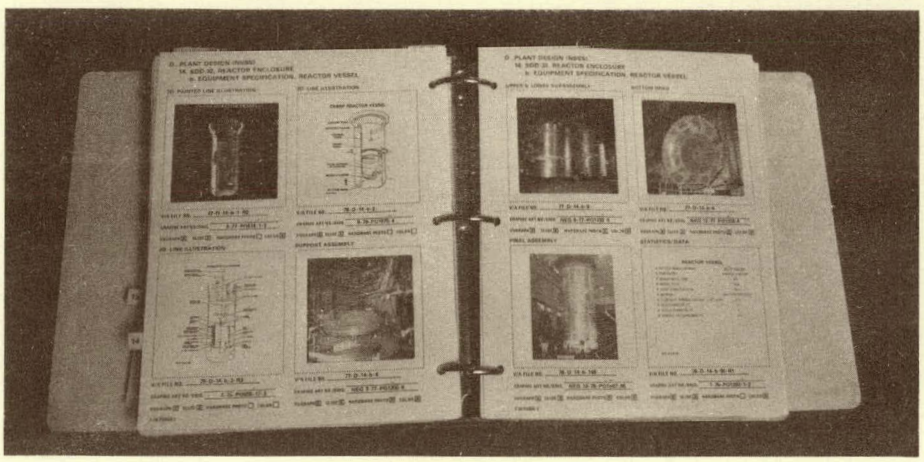


Slide 8.7

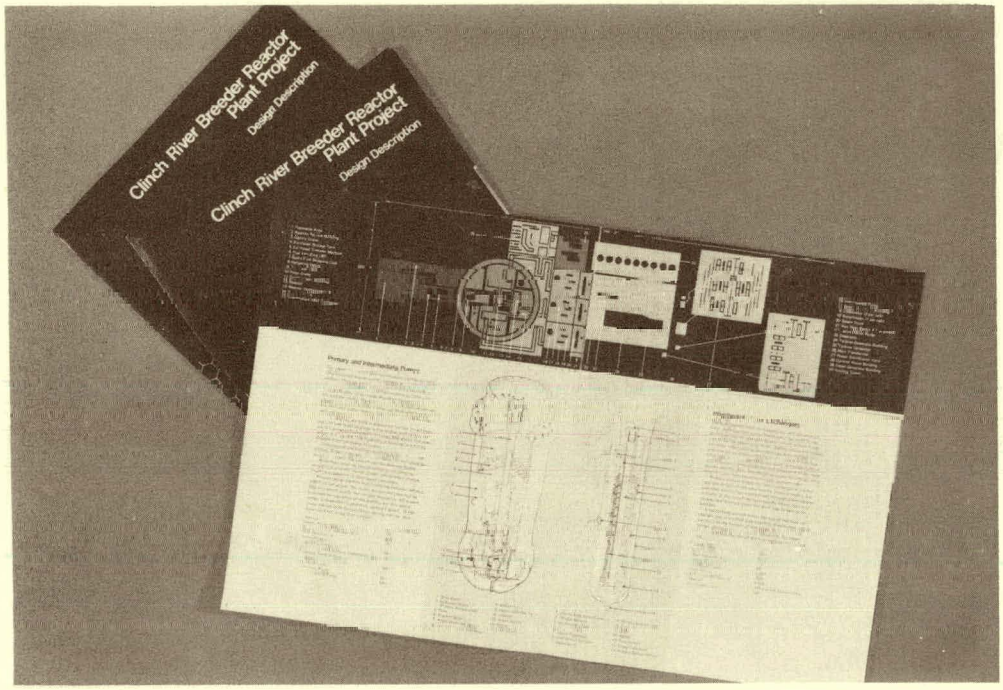


Slide 8.8

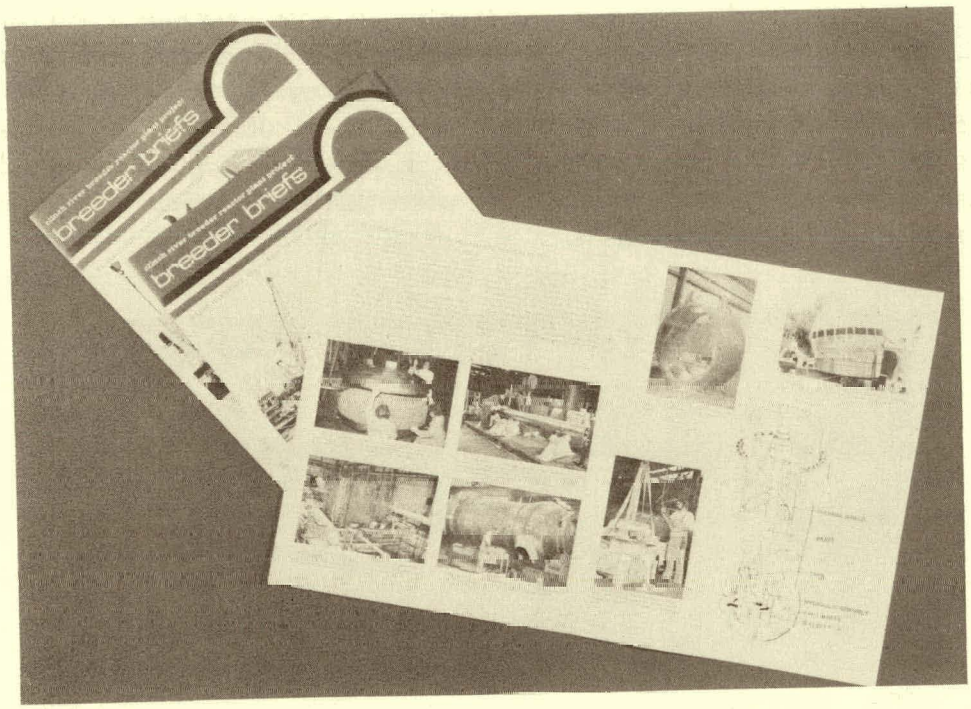
This presentation does not begin to cover every aspect involved in establishing the CRBRP visual aids data base using the project's participants as the foundation. As the managing organization, Westinghouse Electric is responsible for the overall integration of the CRBRP Project. We rely on the participants to design, fabricate, and construct the plant. Quite simply, they have on hand the expertise to do the job we require. The same is true with respect to visual aids. To set up graphic arts and photography departments with expertise comparable to the combined expertise of the participants would be impractical. This would be a duplicative, time-consuming, and expensive effort.



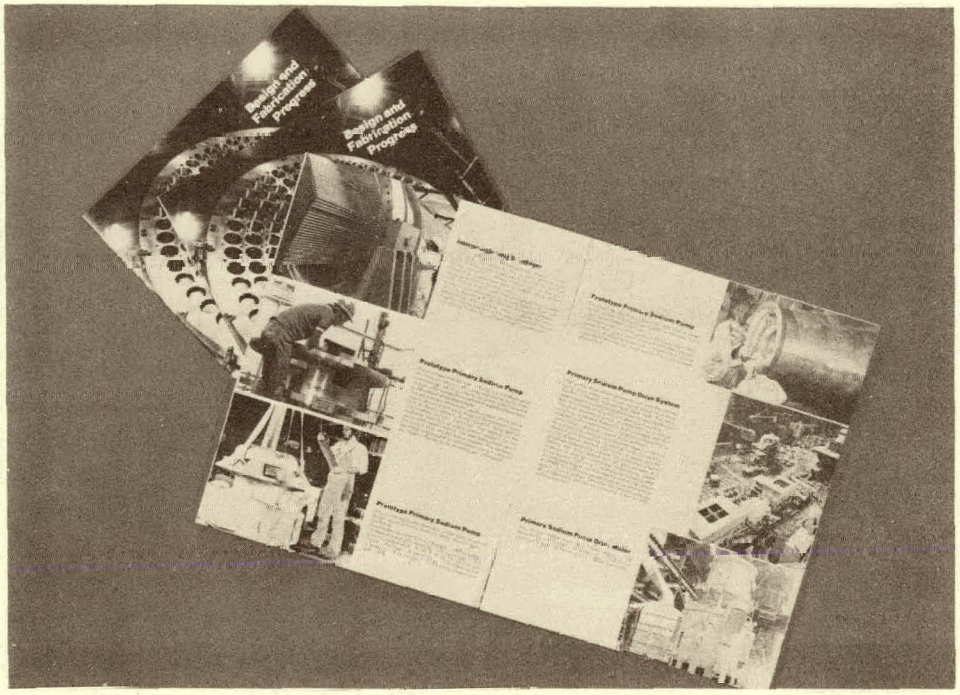
Slide 8.9



Slide 8.10



Slide 8.11

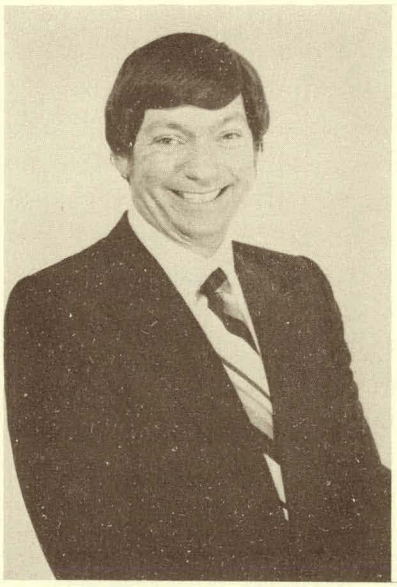


Slide 8.12

Tom Diaz (Digital Equipment Corporation): Can you give me a quick idea of the rejection rate on these photographs? How many do you have to take to get a good one?

Mr. Utlak: Well, I never know how many photographs are taken. Being at the level in the organization that I am, I only get photographs that have been sorted out. There are some 50 or 60 components that I look at every month on the program. I determine which photographs I want and get in touch with the photographer. I ask him to take two or three shots of the same components. In this way, we have, since the beginning of the project, cut the number of photographs being taken by one-third. When we first began, seven years ago, we didn't know what we wanted, so there was no way of relaying that information to a photographer. But, like I said, now that the photographers understand the difference between engineering and public relations photographs, we can specify what type we want and thereby avoid a lot of problems.

THIS PAGE
WAS INTENTIONALLY
LEFT BLANK



Larry Perry was raised in a newspaper family in the middle Tennessee area and has continued that interest, both in publishing and in the communications field in general. Mr. Perry is a nationally recognized authority on telecommunications law; a professor at the University of Tennessee and guest lecturer at many other major universities; author; publisher; a communications attorney specializing in practice before the Federal Communications Commission and the various government agencies relating to communications, including the Post Office; a registered professional engineer; and a member of the American Bar Association Advisory Committee to the Post Office on matters relating to second-class mailings.

9. Trials and Tribulations of a Newsletter Publisher

I am more used to talking to communications broadcasters than to technical communicators, but my experience with newsletters—writing, editing, and printing them—should be a common ground for us. I feel, however, a little nervous—rather like the chauffeur of a friend of mine. This friend, a very learned professor, was on the lecture circuit. He delivered the same lecture for years and years and was getting about $2500 every time he gave it. On the way to Harvard to deliver his lecture, my friend's chauffeur said, "You know, doctor, I've heard you give that talk so many times, I can do it as good as you can." The professor said, "If you think you're so smart, why don't you do it tonight?" The chauffeur and the professor exchanged clothes, and the professor drove to Harvard. The chauffeur delivered the speech, one of a highly technical nature, to an audience of very intelligent people. He did it very well and thought he had made good his boast. But, the master of ceremonies said that since it was rare for them to have someone of the professor's caliber before them, he'd like to open the floor for questions. When a member of the audience asked a complicated question that the chauffeur couldn't possibly answer, he said, "You know, in my years on the lecture circuit, that is the dumbest question I've ever heard. To show you how stupid it is, I'm going to let my driver, who is seated in the back there, answer it." That's rather the way I feel; if you get me into a corner, I'm going to get my driver back there in the back to answer questions for me.

My newsletter, *Broadcasting and the Law*, is geared primarily to the radio and television markets. The subscription price is $48.00 per year, and it goes to over 6000 radio and television stations. I think the success of this newsletter is due to the fact that there is a lot of good information in each issue. Most of you are involved in the production of

institutional type newsletters—plant, office, interoffice, and interplant—and technical society newsletters; the purpose of these is different, but the intent of all of them is the same.

For my newsletter, I do all the writing myself. I do have a staff that does research for me, but I do the writing. I try to keep the style as simple as possible so that it can be understood by a wider audience—I don't want it to be limited to the top management of the stations. I also restrict the newsletter to four pages for the same reason—I want everyone to be able to read it in 15 or 20 minutes and keep abreast of all the current rule changes in broadcasting. If you want your newsletter to be read, you, too, should follow these rules: Make it understandable and keep it short. A newsletter should not be like *Newsweek* or *U.S. News and World Report*. The secret to a newsletter's success is contained in these words: clarity and conciseness. I've tried it both ways. With *Communication Log Digest*, I found that it wasn't very popular because a lot of engineers didn't understand what I was trying to explain to them. So, I revamped it according to the rules I've just emphasized, and it has become very popular.

Many of you may have to deal with articles written by others—the old author-editor problem. How to handle this? I can only tell you what I would do. Convey to the author that your newsletter must be readable and that its tone and style must suit your readership. Tell him that you feel you are the best judge of this. Give him some back issues and ask that he try to follow your established style.

How do I produce my newsletter? First, let's consider the information that goes into it. Of course, a lot of it is based on rulings from the Federal Communications Commission, the Federal Trade Commission, and other government agencies that we normally deal with. But a lot of it is in response to questions people all over the country ask of these government agencies or of me. For instance, someone may call to find out the deadline for selling radio and/or television time to a political candidate. I know that this is a totally different subject area from what you people deal with, but you get the basic idea—a very good source for articles is questions from your readers. To fill in gaps in the layout—when the articles do not quite fill up the page—I use what is called filler material. Fillers are short items of interest that are already typeset. I keep a file of these handy to use when I need them. I'm sure you're all familiar with these—you see them all the time in newspapers.

Now, what about halftones, photographs? Pictures are very important to reader interest; they especially would liven up any publication that is of a technical nature. When I have negatives made of the pages of my newsletter, it doesn't cost a penny more to have a halftone made at the same time the negative is made. If you use a relatively heavy paper, say, 60 or 70 pound, you will want to use something like a 100 screen on your photos. On the other hand, if you use a slicker paper, you want a higher screen—the higher the number of the screen, the smaller the dots and the better the quality of the photograph. When my father and I published the *Nashville Banner*, we used a 60 screen, which is pretty big dots. If you've got a bad picture, you might want to use big dots because it blurs the photo and disguises the fact that it was a bad print to start with. I usually "box" my photographs with 1/32 or 1/16-inch tape. Most artists react in horror to this, but I like it. It really makes a picture bounce out at you. Again, for reader interest, and to spruce up the appearance of your newsletter, you might consider using clip art. You can buy single books of clip art, or you can get a yearly subscription and receive one book every month. These books have all sorts of art in them—people, places, things—that you can just cut out and use to fit in with your theme. This is certainly a time saver. If you have an idea for your layout that requires

an illustration and you can just cut it right out of a book, you don't have to allow the time and money for a graphic artist to produce what you want. Most of the trade magazines, say, *Printer's Ink*, will carry an advertisement for subscribing to the clip art books.

In addition to art and photographs, you want to pay attention to the way your type falls on the page, that is, the interspersing of bold or italic headings to break up the monotony of line after line of straight text. I am not a graphic artist by any stretch of the imagination, but I did learn years ago from an artist friend of mine that the first thing that you see on a page should be the center of interest. The eyes are supposed to focus immediately on the center of interest. Thus, I would put a heading or an intriguing excerpt from an article in an eye-catching type font at that point of center of interest. Don't overdo it—that will defeat your purpose; but, judicious use of this technique will improve the appearance of your newsletter and keep reader interest up. Another way to improve readability is to set the type up in two columns rather than one single, straight-across-the page layout.

Do you want advertising in your newsletters? That's entirely up to you, but if you're going to have ads, make them useful to your readers. Give them something—make it a special deal, such as a coupon offering a special price on your advertiser's product. That way, the advertiser and the reader will benefit—the advertiser in that he will be able to gauge the effectiveness of advertising in your newsletter.

Let's consider now how you can acquire subscribers. A very easy way is to buy mailing lists. You can get them for $35 per thousand, or less than that if you get them from New York. You can get any kind of group you want: people with Ph.D.s in nuclear physics or people involved in newsletter writing or newspaper publishing or whatever. Using these lists, you can solicit subscribers.

How should you mail your newsletters? I send mine in envelopes—that's become a kind of trademark with me. When purchased in lots of 50,000 or 100,000, the envelopes cost about $8.00 per thousand. I think it makes the communication a bit more personal if envelopes are used.

If I am mailing to potential subscribers, I use third-class mail. These envelopes have a third-class bulk mail permit in the upper left-hand corner. I use third class for these mailings because it cost 8½ cents instead of 15 cents—the first-class rate. For regular subscribers I use first- or second-class mail, depending on the part of the country the newsletter is going to. Second-class postage will cost you less than 5 cents per piece of mail, and second-class mail is supposed to be handled the same way first-class mail is. The only difference is supposed to be that, for second-class mail, you separate items as to zip code and, if there are more than six going to the same zip code, you put a rubber band around them. However, I must caution you: I have found, through years of working with the Post Office and working on the Postal Rate Commission in Washington, that second-class mail does not go exactly as first class goes. It is supposed to, but it doesn't. When I started getting complaints about late deliveries, I put a postcard in a selected few newsletters and asked that the recipient let me know when it was received. I found that if you are sending newsletters to people more than three states removed from Tennessee, you had better send them first class if you want them received that month. For any newsletter going east of the Mississippi River, I use second class; for any going west of the Mississippi River, I use first class.

Next, let's consider how to get our drafted articles from manuscript to type. I have my newsletter typeset rather than typed. Of all the different methods of typesetting, I still

prefer the old hot-metal machines. The primary reason for this preference is simply that I think this method produces a cleaner, sharper, more readable printed copy. The computerized phototypesetters, no matter how good, still don't, in my opinion, give you as good a copy—that's because the printing has to be done from a negative made from what is already a photographic print. The type is produced by light flashing on photosensitive paper; when this paper is developed, you have the galleys of type. And, as I said, they're nice looking, but they just don't print up as well as the hot-metal type. The cost of both methods is about the same.

After the typesetting, proofreading, and corrections are done, the next step is making up the pages. We lay the type out on 11 × 7½ × 17 inch sheets. On the first page of *Broadcasting and the Law* (Slide 9.1), notice the masthead. Every year, I change the style of the word "Law." This serves a twofold purpose: (1) It allows a little creativity and variety and (2) it fixes the year a particular issue was printed in. If someone has taken the date off, or someone has copied it, which happens all the time, I can tell the year and sometimes the exact issue it is simply by looking at that one word.

Most of the type for the masthead was not machine set; it was done with Prestype. I'm sure most of you are familiar with Prestype—the large sheets of not just the alphabet and numbers, but also what we call border designs—stars, leaves, etc. It's very easily applied—all you have to do is rub over a character and it will stick to your page. Different tools can be used to do this: A lot of people use a regular burnisher, but I have found that the dental hygienist's tooth-cleaning instrument works best for me. You can buy used ones from dentists very cheaply or get them for free. For any type larger than 16 point, I suggest that you use Prestype.

For the layout of the rest of the newsletter, my staff uses rubber cement. A lot of you probably use a wax machine, but we think rubber cement works better, that it holds better.

After the pages are laid out and I'm satisfied that everything is OK, we want to consider several other things before printing. How about paper? I have *Broadcasting and the Law* published on 70-pound paper. I could have it done on 20-pound paper, which is the type of paper used in most typewriters, but I prefer the heavier paper, primarily for psychological reasons. People are paying for this newsletter, and, in the hand, it feels much more substantial if you use the 70-pound paper. It would be more practical to use 20-pound paper because the ink would dry much faster; but, I think that bit of practicality not worth the advantages afforded by the 70-pound paper. And, while we're talking about paper, I want to recommend that you have the printer three-hole punch your newsletters. This will make it very convenient for your subscribers to keep all the issues in a notebook for future reference. The extra cost for the hole punching is very minimal, and I've found that people appreciate it.

Let me tell you the requirements for using second-class mail. The recipients must be members of your organization and/or paid subscribers to your publications. You must apply to the Post Office for permission, and, since it takes about two years, you should apply right away. While awaiting your permit, you will be paying the full first-class rate, but the mail will be sent second class and a record kept of the postage you pay. When you get your second-class mail permit, you will get back the difference between the second-class rate and what you paid. Another nice thing about second-class mail is the fact that there is no minimum number for the mailings. For bulk rate, or third class, there is a minimum—200

(ISSN: 0161-5123)

Perry's Broadcasting and the LAW

A TWICE-A-MONTH NEWSLETTER THAT REPORTS AND INTERPRETS CURRENT COURT AND FCC RULINGS AFFECTING BROADCASTING PRACTICE AND OPERATIONS

VOLUME 9 NUMBER 11 JUNE 1, 1979

SMALL BUSINESS LOANS FOR BROADCAST STATIONS

(Among the many questions that arise at the various conferences around the country for broadcasters are those for information on SBA loans to broadcasters. Below appear some of the more frequently asked questions that broadcasters ask. Additional information can be obtained from your local SBA office. Ed)

How much money can I get for financing my station?

The Small Business Administration presently has a ceiling of $350,000 for direct loans (hard to get) and $500,000 for guaranteed loans. Two or more small business concerns may form a group corporation under the "Pool Loan Program" for the purpose of obtaining raw materials, equipment, inventory, supplies or for establishing certain facilities. This loan limit is $250,000 multiplied by the number of separate small businesses forming the group concern corporation.

What are the eligibility requirements?

Present and prospective concerns engaging in, or seeking to enter broadcasting (radio or TV) are eligible for financial assistance under SBA's existing business loan program. Generally speaking, SBA financial assistance will be available to qualified applicants to enable small business concerns to finance "plant construction, conversion, or expansion . . . or to finance the acquisition of equipment, facilities, supplies, or materials or to supply such concerns with working capital." (Section 7(a) Small Business Act.) That section conditions extension of a business loan on a reasonable assurance of repayment. SBA has indicated that no such assurance exists unless the applicant has obtained all necessary official approvals for construction, expansion, modernization or transfer of a broadcast facility. Therefore, no financial assistance may be distributed by the SBA or any participating lender until all necessary permits have been obtained.

Will the SBA review the programming aspects of the station operation?

NO . . . the SBA has indicated that it does not intend in any way to infringe on the constitutionally protected First Amendment freedoms and thus program content will not be a grounds for accelerating the maturity of any loan.

How will competing applications be processed?

SBA will process applications for financial assistance from two or more applicants competing against each other for the same facility. The SBA will look to the FCC to decide which application is best qualified to serve the public interest.

Is the SBA program limited to minorities and "disadvantaged" applicants?

NO . . . Although SBA has recognized that its new regulations are expected to further the participation of socially and economically disadvantaged persons in broadcasting, the furtherance of that policy does not require that SBA financial assistance be limited to enterprises owned by such individuals. The SBA states that each application will be considered on its own merits.

How do broadcasters apply?

A. *For Improvement of Existing Facilities*

( ) Prepare a current financial statement or balance sheet listing all assets and liabilities of the business — do not include personal items.

( ) Include an earnings (profit and loss) statement for the previous full year and for the current period to the date of the balance sheet.

( ) Prepare a current personal financial statement of the owner, or each partner or shareholder owning 20 percent or greater share of the business.

( ) List collateral to be offered as security for the loan, with your estimate of the present market value of each item.

( ) State the amount of the loan requested and explain the exact purposes for which it will be used.

( ) Take this material with you and see YOUR BANKER. Ask for a bank loan from the bank

 Larry Perry, Publisher; Eloise Boughner, Business Manager; Robert Stone, Research. Subscription Dept: Box 8357, Knoxville, Tennessee 37916. Price $48 yearly. Published twice monthly. Annual Index. Telephone 615-483-8474.

Slide 9.1 (used by permission)

pieces of mail. But, you don't want to use third class for your regular subscribers because second class is cheaper and faster.

One last thing I'd like to mention is copyright. The only thing you have to do to protect your material is this: Put a small "c" in a circle, give your group or society name, and list the year. That's all—now, it's all yours, protected by law. You do not have to fill out a form and send $10.00 and three copies to the Library of Congress. That's one of the little loopholes in the latest copyright law. I do send two copies of the newsletter to the Library of Congress so that they have legal notice that my publication is copyrighted. And you have up to a year after printing to send those two copies. (A bit of free legal advice.)

I hope that I have helped you by sharing with you my trials and tribulations. Good luck with your newsletters.

Sharon McConathy (Union Carbide Corporation): Is there any difference in the time that it takes to set type with the computer as compared with the time it takes to set type with Linotype?

Mr. Perry: Generally, no. Of course, there are a lot of variables, a lot of things to take into account—the speed and accuracy of the typesetter, the difficulty of the material, and the condition and reliability of the machines. All things equal, though, I would say that there's no time difference.

Lincoln Sootoo (Western Electric): You mentioned second- and third-class mail; what about United Parcel?

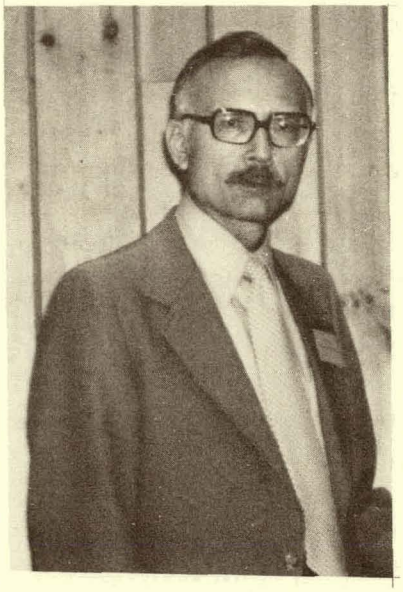
Mr. Perry: UPS would cost between 1.2 and 3.2 cents; you would certainly qualify for it if you're a nonprofit organization.

Lincoln Sootoo: You pay a deposit and mailings are charged against that?

Mr. Perry: That's correct. Typically, what you do is put up a deposit. Let's say, for example, that you're going to mail $15.00 worth. You pay a $15.00 deposit, and they charge against it when you make a mailing. I always keep about a $400.00 deposit on hand all the time so that if I don't have enough money at a particular time, I've got enough blanket to cover it. So, you do make a deposit before you mail. But, by the same token, for 1.2 to 3.2 cents, you still get to mail first class, so that's even better. And the nice thing about it is that nonprofit second class is supposed to go the same as first class and should, therefore, arrive almost as fast. So, if you are a nonprofit organization, a second-class mailing permit will save you a lot of money.

Fred O'Hara (Union Carbide Corporation): We have a national organization of the Society for Technical Communication. Should the local chapters use the national chapter's second-class mail permit?

Mr. Perry: Yes; that's what you call additional office mailings. All you have to do is give the Oak Ridge postmaster a letter from the national office that authorizes him to accept your mailing on their permit. That's the way magazines do it. For example, when you get *Newsweek*, do you think that's been mailed out of Washington or wherever the printer is? No. The magazines are flown to the post office in Knoxville and then dispensed to you. If it wasn't done this way, it would take two months for you to get your copy.



Oliver A. Nelson is a technical editor for Westinghouse Electric Corporation in the Clinch River Breeder Reactor Plant Project at Oak Ridge, Tennessee. Mr. Nelson has produced technical communications for a trade journal, a research organization, a book publisher, and an external house organ. He is a graduate of Iowa State University with a B.S. in technical journalism.

10. Producing and Implementing a Style Guide for a Project Management Organization

Managing a large engineering project requires a great deal of communication. Some of that communication is within the managing organization, some is with the other participants in the project, and some is with people outside the project. The clearer those communications are, the easier and more effective is the work of the managing organization.

Three important steps in improving clarity of communication are preparation, adoption, and use of a style guide. Many good style guides are on the market. They are useful, but for most organizations they are not adequate: an organization usually requires a style guide tailored to its own particular needs and practices.

A style guide, as I define it here, is a set of guidelines and standards adopted by an organization to help that organization communicate consistently and effectively. This definition describes a broader approach than style guides that only provide rules for the construction of written matter—mainly authorized forms of spelling, capitalization, punctuation, and typographic arrangement. I believe that the broader approach is better, because the style guide then serves the users more fundamentally by helping them improve their habits of English composition and usage in written, oral, and graphic communications.

The style guide I will talk to you about is an example of that broader approach in that it covers oral, graphic, and written communication. It was adopted by my employer, Westinghouse Electric Corporation, for use in its role as Lead Reactor Manufacturer (LRM) in the Clinch River Breeder Reactor Plant (CRBRP) Project. The *LRM Style Guide* was written for use by all members of the project—from top management to secretaries and technicians—and copies were distributed to everyone.

Although the approach is broad, I kept the guide brief to make it easy to use and thereby encourage our personnel to use it. It is not intended as a composition textbook. It is intended as a guide to good practices, a reminder of communication principles that we know but don't always practice, and a reference for some arbitrary standards. The arbitrary standards promote consistency of usage and promote use of the most effective alternatives where there are several "correct" ones.

The guide is tailored to the nuclear industry and, specifically, to the CRBRP Project. The tailoring is achieved partly by choice of the subject matter and partly by use of examples from actual project letters, documents, and illustrations.

Chapter 1 of the guide is a very brief discussion of the purpose and scope of the book.

Chapter 2, "Style in Writing," has two main sections—usage and composition. I defined usage as the elements of style that are either generally accepted practice or adopted by the organization for the sake of consistency. Composition is defined as the general way in which words, phrases, and sentences are used.

The section on usage covers punctuation, capitalization, spelling, compounding, plural and possessive forms, and mathematical and chemical expressions. It stresses reference to Webster's *New Collegiate Dictionary* for word spellings and for information on usage that is not included in the guide. This dictionary was chosen because it is the one most commonly used at the Project. The instructions are simple, are related to concepts that we deal with, and do not rely on knowledge of the terms used in style and grammar. (Avoidance of such terms helps keep personnel from ignoring the guide in despair of comprehending it.) Slide 10.1 is an example of the instructions for using punctuation.

The section on composition develops the idea that good consistent usage is of little use in sentences that are so poorly constructed that they don't make sense or have to be figured out. It includes sections on simplicity, brevity, order, sentence structure, grammar, misused and abused words and expressions, and ambiguity. Again, I avoided the use of terms that are likely to be unfamiliar. If I used such terms, I defined them simply, as in the example shown in Slide 10.2.

Chapter 3, "Abbreviations and Symbols," distinguishes between abbreviations and symbols and gives guidance for using them. We use a great many abbreviations and symbols in our line of work, but they are useful only if the reader understands what the writer intends them to mean. The guide helps our people communicate by showing them how to use abbreviations and symbols correctly and consistently.

The chapter includes a glossary of abbreviations used in the CRBRP Project. Such a glossary can never be complete and up to date, but it can at least list and define most of the abbreviations used and show the accepted forms of those abbreviations.

Chapter 3 also includes some Westinghouse corporate standards for symbols. Use of these standards helps standardize communications within the corporation. Moreover, the standards are consistent with those of the American National Standards Institute, thus providing another dimension of standardization. Slide 10.3 is part of an example page from the corporate standard on letter symbols. Any organization that has such standards can either include them or refer to them in its style guide.

Chapter 4, "Illustrations," gives standards and guidance for producing and using illustrations. We use illustrations mainly in reports, as attachments to letters, and as slides and viewgraphs. The objective of this chapter is to help our people produce and use illustrations that convey information effectively. The chapter also encourages people to use the services of our Graphics Department.

2.2.1.3 Semicolon (;).

A. Use a semicolon to link main clauses (those that could be separate sentences) that are not joined by a conjunction (a connecting word). Example: "Energy is vital to our economy; we must expand our resources."

B. Use a semicolon to link main clauses joined by such words as "consequently," "however," and "furthermore." Example: "Energy is available for present needs; however, we must change and expand our resources."

C. Use semicolons as substitutes for commas between series elements that themselves contain commas. Example: "The documents affected are SDD-31, which is being revised; SDD-91, which will be revised; and drawing 1182E31." Semicolons are not always needed in such series, but they are useful when the sentence would otherwise contain too many commas to be easily understood.

2.2.1.4 Dash (--). The most important thing to learn about a dash is that it is not the same as a hyphen. Instead, the two are direct opposites: a dash is a dividing symbol, while a hyphen is primarily a connecting symbol.

Slide 10.1

Chapter 5, "Presentations," discusses the illustrated talks that our personnel often give to describe planning, work, project status, the plant and its equipment, and so on. Presentations are made to customer representatives, division management, corporate executives, legislators, community organizations, and others whose understanding and support are essential to us. Consequently, the presentations must be well planned and well executed.

The first topic in the chapter is planning, because that is the key element of an effective presentation. Other topics are visual aids, equipment, dry runs, and actual presentation.

The sixth and final chapter in the guide, "Letters," discusses such basics of letter composition as relevance, completeness, directness, simplicity, brevity, and quality. It also

2.3.4 Sentence Structure. Build your sentences with care. A few principles follow.

2.3.4.1 Write Mainly with Nouns and Verbs. Nouns are the names of things, qualities, ideas, actions; verbs tell what the nouns are or do. Therefore, nouns and verbs are the framework of the language. The other parts of speech are needed, but don't let them substitute for, or obstruct the view of, the framework.

A. Preserve the Verbs! Don't subvert the natural verb of a sentence by converting it to a noun, as in: "Removal of the temperature gradients results in a reversal of the direction of bow." Here the natural verb ("reverses") has been changed to a noun ("reversal") and, to take its place, a much weaker verb ("results") has had to be devised. Better: "Removing the temperature gradients reverses the direction of bow." That is more direct and is six words shorter. Another example: "A state of reasonably uniform compression loading exists." Better: "Compression loading is reasonably uniform." That gets rid of the gutless verb "exists" and also establishes the true subject of the sentence ("compression loading," not "state"). As a bonus, it is three words shorter.

B. Don't Use Too Many Modifiers Before a Noun. The nouns tell the reader what you are writing about, and they are hard to find if

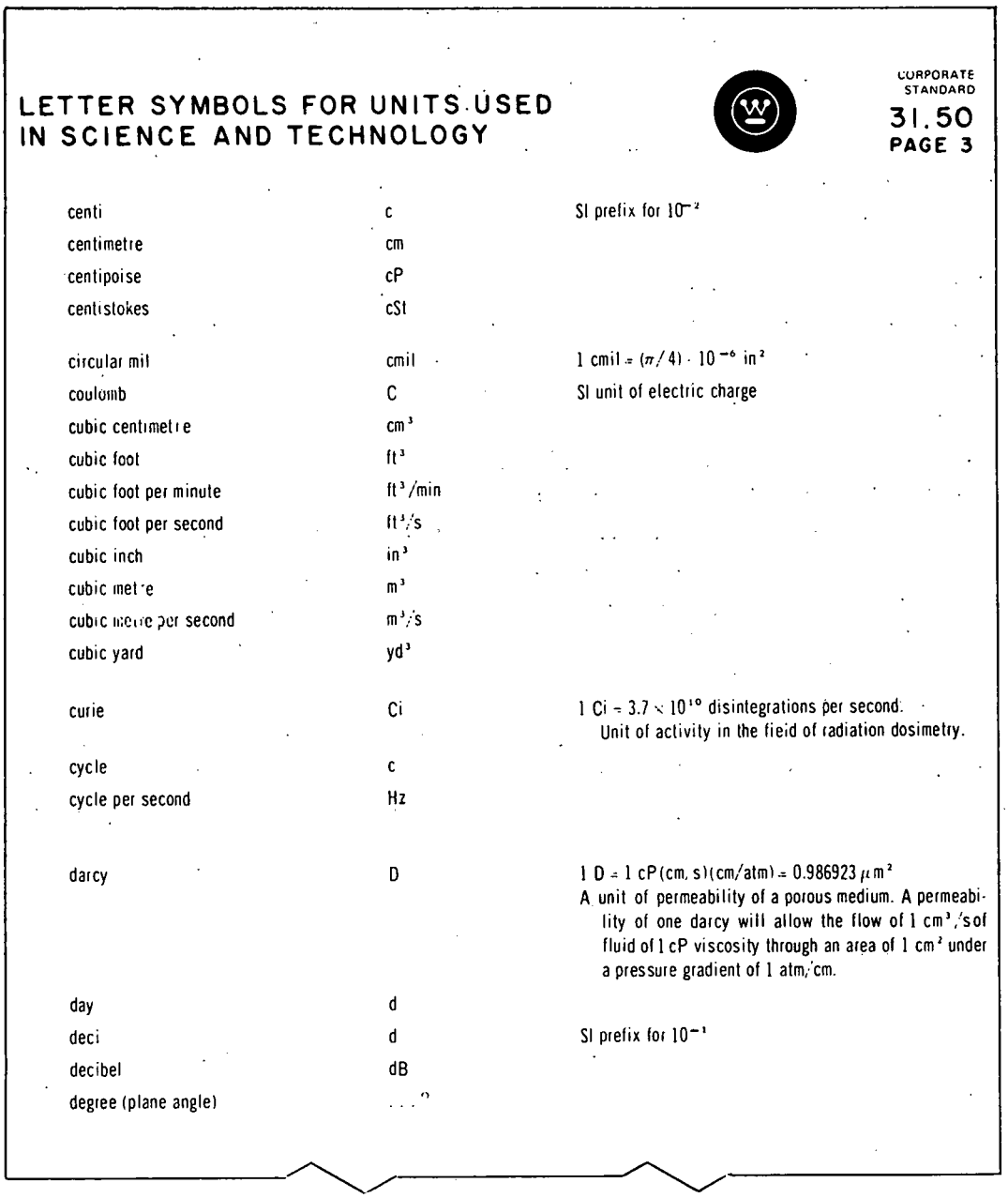
Slide 10.2

illustrates the required format and includes an example of a letter that is well written and correct in format.

The *LRM Style Guide* is typed double space for readability and to provide space for users to make notes. The pages are printed on one side only so that blank left-hand pages may be used for notes. Chapter index tabs facilitate use of the guide.

The guide is in looseleaf form, bound in a ring binder, so that it can be revised easily by substitution of new pages for superseded pages. The title of the guide is silk-screened on the binder to help make the book attractive and professional in appearance.

If the effort of producing a style guide for an organization is to be worthwhile, the guide must be used by the people in the organization. Probably the best way to encourage its use is



LETTER SYMBOLS FOR UNITS USED IN SCIENCE AND TECHNOLOGY

CORPORATE STANDARD
31.50
PAGE 3

centi	c	SI prefix for 10^{-2}
centimetre	cm	
centipoise	cP	
centistokes	cSt	
circular mil	cmil	1 cmil = $(\pi/4) \cdot 10^{-6}$ in^2
coulomb	C	SI unit of electric charge
cubic centimetre	cm^3	
cubic foot	ft^3	
cubic foot per minute	ft^3/min	
cubic foot per second	ft^3/s	
cubic inch	in^3	
cubic metre	m^3	
cubic metre per second	m^3/s	
cubic yard	yd^3	
curie	Ci	1 Ci = 3.7×10^{10} disintegrations per second. Unit of activity in the field of radiation dosimetry.
cycle	c	
cycle per second	Hz	
darcy	D	1 D = 1 cP(cm^3/s)(cm/atm) = 0.986923 μm^2 A unit of permeability of a porous medium. A permeability of one darcy will allow the flow of 1 cm^3/s of fluid of 1 cP viscosity through an area of 1 cm^2 under a pressure gradient of 1 atm/cm.
day	d	
deci	d	SI prefix for 10^{-1}
decibel	dB	
degree (plane angle)	... °	

Slide 10.3

for management to strongly and unequivocally instruct the personnel to use the guide to improve their communications.

I worked with my immediate supervisor to draft the *LRM Style Guide.* Together, we determined the topics to include, and he suggested revisions through several drafts. He then recommended the resulting draft to his supervisor, who recommended it to the project manager (our top manager).

The project manager agreed that we needed a style guide and accepted the draft as written. He added a Foreword, signed by him, instructing all personnel to familiarize themselves with the guide and to follow it in preparing their communications.

Instead of just distributing the guide, we introduced it at meetings for all personnel. The project manager participated in the meetings, emphasizing the importance of effective communication. I described the contents of the guide, using viewgraphs to illustrate parts of it, and answered questions about it. We distributed copies of the guide at the meetings.

That manner of introducing the guide distinguished it from the more routine paperwork that reaches our desks and sometimes gets buried there. Reaction to the meetings and to the guide has been positive. People are using the guide and are suggesting additions and revisions.

Most important, our people are now paying more attention to the quality of their communications. That, in the end, is the purpose of producing a style guide.

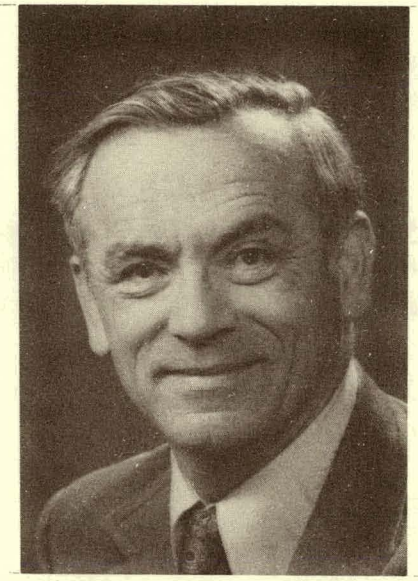
Natalie Millemann (Union Carbide Corporation): While you were preparing your guide, did you get any input from secretaries or from anyone else in the Clinch River Breeder Project?

Mr. Nelson: Yes, I did. I distributed copies of chapters in draft form to several secretaries and engineers and got constructive comments from them.

George Sadowski (Union Carbide Corporation): After several years, I've found that most engineers I've dealt with would not read anything more than two pages long concerning the preparation of reports, and I've found from experience that even after five years of circulating the same two pages, many of these people had not read them. I was wondering how that compares with your experience? Have you proof that your style guide is being read and used?

Mr. Nelson: It is too early for me to tell how well the guide is being used. I do know that some people are using it, but I would surmise that some people will never use it. That would probably be true in any organization. The guide is not a panacea, but it is better than nothing.

Dup



Richard Crawford began his professional career as a technical supervisor at the Y-12 Plant in Oak Ridge, Tennessee. He started technical writing as a sideline 20 years ago while employed at the University of California's Berkeley Laboratory. Since 1976 he has been an editor for the Lawrence Livermore Laboratory's *Research Monthly* and *Energy and Technology Review.*

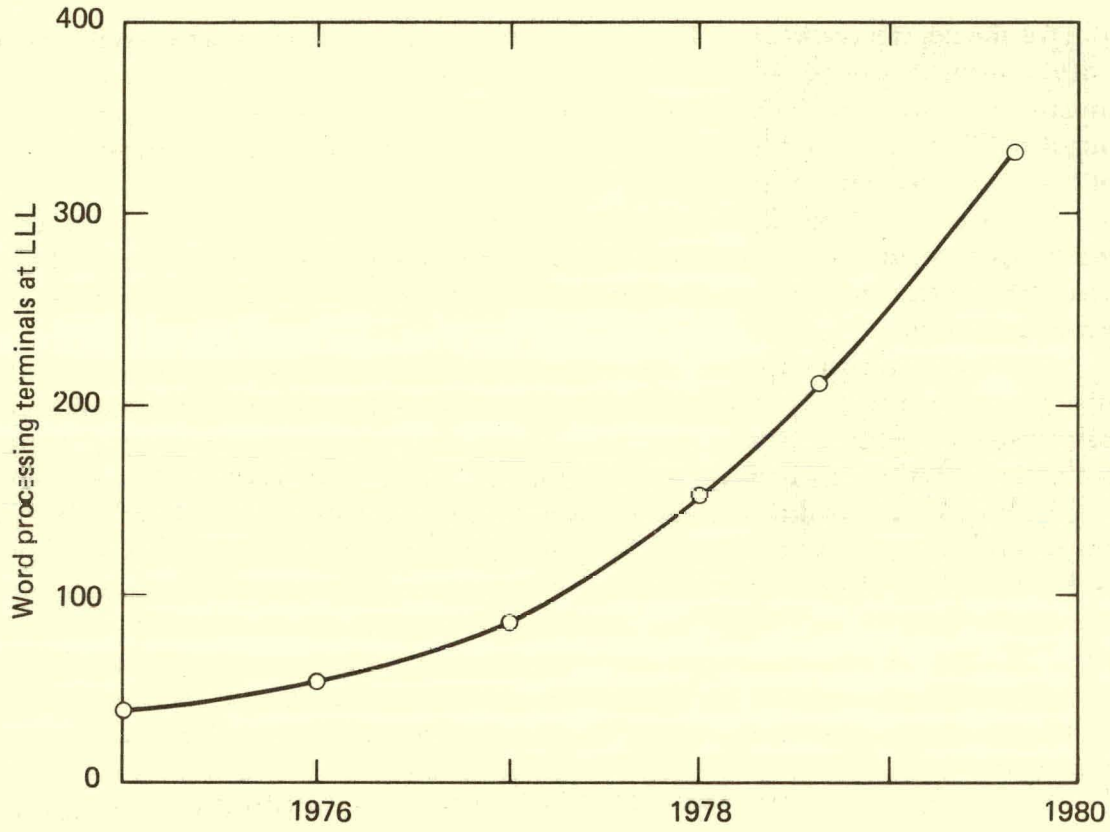
11. Trauma of Conversion to Word Processing

Presented by Wallace Clements

There's a quiet revolution going on in editorial and technical writing offices all over this country—a revolution as sweeping and unpredictable as the one that gave us typewriters a couple of generations ago—a revolution that applies the power of the computer to the problems of putting words on paper. As in most revolutions, there are the radicals, who enthusiastically proclaim the millennium, and the conservatives, who make up the vast majority and stand, teeth gritted and heels dug in, stoutly resisting change. In between, precariously balanced, stand the few who can still talk to both sides, including many former skeptics, whose pleasant experiences with the new technology have convinced them of its utility.

As a member of the third group, let me tell those who haven't tried word processing that you don't know what you're missing. This thing is no fad. It won't be going away if we just ignore it. It's a booming business, and it can only get bigger.

Slide 11.1 shows how the use of word processing equipment has increased over the past few years at Lawrence Livermore Laboratory (LLL). In January 1975, we had only 35 word processing terminals at LLL; a year later, we had 54. Two years later, we had 81. We don't know exactly how many we had in January 1978; they were coming in so fast that no one stopped to count. By January 1979, we had over 200 terminals, a 50% annual growth rate over the past four years at this one installation. At last count (September 1979), we had about 350, and there is still no sign of saturation. Well over half the 40 technical writers in our group are using word processing equipment.



Slide 11.1

Not all these word processing terminals are being used by writers and editors, of course. Most of them are going into typing pools and secretarial offices. In many ways, this trend resembles the way typewriters first came into use, by speeding up the work of clerks and office workers who formerly had to copy letters by hand. Just as with typewriters, sooner or later the speed and efficiency of the new machines will become so attractive that writers and editors will discard their quill pens and join the enthusiasts.

These terminals are not standing idle. They may not be used as effectively as they could be, but they are being used. In some offices, the throughput hasn't increased: They just put everything through more revision cycles than before. That's not necessarily bad—the improved quality of the end product may justify the extra revisions.

One of the objections most frequently heard in connection with the change to word processing is that there must be a big drop in productivity during the training period. It sounds logical, and that's what I worried about when we got our equipment. It didn't work out that way though. Learning to use this equipment isn't hard, and it doesn't take that long.

Perhaps it would interest you to know that the word processor we borrowed got an ideal test. It arrived in our group at the worst possible time, we thought—just when we were snowed under with work and there was no relief in sight. There sat three terminals, a central processor, and a printer. None of us had any previous computer experience, and we were all skeptical. The four of us had been doing technical writing and editing for years with pencil and paper. Who needs a $35,000 machine? But we agreed to give it a try. We took a half-day cram course in word processing, and then we were on our own.

We shouldn't have worried. From the second day, the machine started saving us time. Within about two weeks, it was indispensable. When we had to give it back about three months later, we all had withdrawal symptoms and immediately set about getting one of our own. By that time we had fought our way out from under our work log, largely as a result of the time saved with our machine.

It makes sense, actually. Word processing manufacturers don't make any money on machines they can't sell. There aren't enough computer-oriented secretaries and editors to constitute much of a market, so they have to keep it simple and concentrate, above all, on making it useful.

Our word processor helps us in lots of little ways. The first thing we noticed was that our typing speed nearly doubled. Why? Because we could just type straight ahead at full speed, never using the carriage return, except at the end of a paragraph; never stopping to figure out an end-of-line hyphen; never worrying about making mistakes.

Even making mistakes is never a problem because it is so easy to correct them. If it's one wrong letter, you just strike over. The wrong letter disappears forever, and all you have is the clean copy. If you leave something out, such as a letter, a word, a line, or an entire paragraph, just hit the INSERT key and type it in. Have you ever typed the same word twice? Maybe you like to reach for your bottle of correction fluid, unscrew the cap, dab it on, recap the bottle, and wait for the "goo" to dry. I prefer to just hit the DELETE key and wipe it out. But doesn't that leave a gap? No, the machine takes care of this problem also, rearranging the rest of the paragraph to compensate for the insertions and deletions.

Want to center a heading? No need to count characters, divide by two, and backspace from the center of the page to find out where to start typing. Just touch the CENTER button and type. The screen display starts in the middle of the line and automatically adjusts as you go along, keeping the line centered all the time.

To me, the best part is when the printer takes off at 40 characters per second, and that nice clean copy comes pouring out, letter perfect. We're using continuous paper, so we don't even have to feed in fresh sheets. We just start it into the output bin and watch it neatly fold itself up.

Aside from the mechanics of typing, the word processor is a big help in editing. I've already mentioned how easy it is to use the INSERT and DELETE functions. I don't know how you work, but that covers about two-thirds of my editorial changes.

We also have REPLACE and MOVE, when you want to revise the wording or rearrange the text. Neither of these operations is a complicated procedure or burdensome to remember. When you touch the MOVE key, for example, the screen lights up with the question "Move what?" You indicate the beginning and end of the passage to be moved, and then it asks "Move to?" Just show it where, and the machine does the rest. Of course, we could have done the same thing by striking INSERT and retyping the passage. There are a couple of things wrong with doing it that way, however. It would have taken many more keystrokes, and minimizing keystrokes is what word processing is all about. Besides, this means you also have to remember to delete the passage from its original location, and if someone interrupts you in the middle of the job, you might forget.

Let's take something more complicated—the sort of thing that used to send me up the wall. Suppose I've just finished editing a 100-page manuscript with 29 figures, 17 tables, and 48 references. I phone the author to tell him it's ready and he says, "Oh, I meant to tell you, I've decided not to use the first illustration, but I'm going to need another table to

supplement Fig. 3 (that'll now be Fig. 2), and I have some references I want to add here and there, if it's not too much trouble." "No trouble at all," I say, gritting my teeth. You know what that means. I'll have to go through the entire manuscript and locate every mention of a figure, table, or reference, rewording the ones that need it and renumbering most of them.

Ah, but wait. The word processor has the manuscript in its memory. I just touch SEARCH and tell it to look for "Fig," for example. It will run through the text from the beginning and stop at the first place those three characters appear. If the word it stops at is "Figment" or "Figuratively," I tell it to keep searching. (It won't stop at "fig" or "configuration," incidentally, because of the lowercase "f.") If the word is "Figure," "Figs.," or "Fig.," I make the necessary change and send it on to the next one. When I reach the end of the manuscript, I start over with "Table" and again with the symbol for superscript. The elapsed time is 5 or 10 minutes, with none of the usual aggravation.

Suppose I have a rough draft that keeps using such long expressions as "magnetohydrodynamic equilibrium" or "aerodynamic characteristics." That's a lot of extra typing, especially if the phrase occurs 20 times in the same paper. Instead of typing the term every time, I just substitute a convenient acronym such as MHE or even MMM. After the manuscript has been typed, I tell the word processor what to substitute for the acronym, and it does so, from beginning to end.

Some editors dislike the idea of working on the word processor screen exclusively, one page at a time. They like to spread the whole manuscript out and leaf back and forth through the pages. They feel the word processor would require them to keep the whole thing in their heads, and they would much rather be able to see it in its entirety.

Actually, this is not a problem. When you need to see a clean copy, at any stage of the process, just print one out. Some editors like to have the rough draft keyboarded as is and then printed out so they can do all their editing on the hard copy. They then go back and enter the changes when the copy gets so messed up they can't read it any more. One of the big advantages of the word processor is its flexibility; it helps you work the way you want to, rather than dictating the way you must.

Another big advantage to using word processors comes during author review. Few authors can follow all the editorial change notations with any confidence, and seeing a manuscript all covered with pencil scrawls is traumatic, anyway. With the word processor, I can give the author a clean revised copy that is easy to read and easy to change if necessary. At the very least, this gets the author to read the revised version without constantly referring back to his precious original words. I find it reduces the number of arguments with authors and makes last-minute revisions more constructive. Necessary changes are also easier to handle, and I am able to project to the author a spirit of cooperation. I just call the manuscript up on the screen and take care of the corrections immediately. That eliminates the author's lingering doubts about whether the changes will get into the final version.

The best situation of all, of course, is when someone has already entered the rough draft on a compatible word processor. In this case, most of the work has already been done, and the editor needs to key in only the changes. Whatever is already acceptable can just stay. Think how much time this can save or, alternatively, how much more attention we can afford to give the manuscript. This is happening more and more frequently, now that we have so many terminals.

Some editors have never learned to type and consider it rather beneath them. How could one of them use a word processor?

Well, such editors and writers are already at a distinct disadvantage, having to rely on someone else to type whatever they produce. Since they already have someone else doing their typing, however, the word processor introduces no new complications, and the typist will love it, especially when revisions and corrections have to be made.

Furthermore, the word processor keyboard is the ideal place to learn to type. Children pick it up readily. It is so simple, compared with all the mechanical operations of typing—getting the paper in straight, setting margins and spacings, going slowly to avoid mistakes, remembering not to type past the end of the paper, etc. The word processor separates the keyboarding from the printout functions, thus allowing us to concentrate on each operation separately.

It is easy to envision advantages that will materialize as prices come down and terminals become more common. Even now, there are writers who have terminals installed in their homes, thus enabling them to work for distant employers without commuting. The terminal can communicate with the central processing unit by phone, at an enormous saving in time and energy. The obvious advantages of such an arrangement could easily induce even the most reluctant nontypist to convert to word processing.

To me, the major current attraction of word processing is the sheer fun of it. Word processing, besides being a fantastic time and effort saver, is also a great toy. There are games that can be called up on the screen, for example, hockey and a kind of extended tick-tack-toe, in which you compete against the machine. But, even the daily work routine takes on some play aspects as you begin to program your own commands to make your work easier.

"Programming?" you ask, recoiling in horror. "You mean I have to program the beast, too?" No, you don't have to. It comes preprogrammed, and it works just fine on those instructions. But you can add more instructions if you want to, which can save you even more work.

How? By making it possible to perform complicated routines with just one or two keystrokes. For instance, instead of the acronym scheme I mentioned earlier, you could store a frequently used name, address, or even a long paragraph in the machine's memory and command it to be inserted merely by touching two keys. Take my word for it; if I can figure out how to write these instructions, you can too.

In summary, I just want to say to the skeptics: "Try it; you'll like it." I have spoken with dozens of word processors, and I have yet to find one who wants to go back to the old electric typewriter. Word processing and on-line editing are here to stay, and none too soon if you ask me. As far as I'm concerned, the word processor is the best thing to hit our office since colored pencils, and if I had to choose between the two, I'd stick with the word processor. humanity. And now that word processing systems are coming out, it seems like we're going

George Sadowski (Union Carbide Corporation): I don't have a question exactly, but this talk sort of reminds me of arguments I had when I was a child—for example, "My father is stronger than your father." I remember when computers came out a few years ago, and I had to try to restrain our editors from going overboard about these almost humanlike machines. I argued with them that when these machines could demonstrate to me a few human characteristics and ideas that they hadn't thought of, I might accept their

overboard once again. I'm amazed that you have so much money for this equipment and then can play games and songs, Christmas carols, I suppose, and do all kinds of little fancy tricks with these machines. I think that we've got to get down to basics if we are going to be communicators. As the football coach says, we've got to get back to learning to block and tackle all over again so that the guy carrying the ball can get through the opposition. I don't think fancy tricks and fancy machines are necessarily the answer to getting the ball across the line and scoring. I'd like to see editors take a harder line with writers and tell them that they really don't have a message, that they really don't know what they are talking about, that they have to cut down from 100 pages to 10 pages and get their message across in as concise a form as possible, thus making their reports more tractable and easier and faster to read. People simply don't have time to read all the material being produced, and I think we certainly would improve our communications if we took this approach. I am aware that there is a role for the new technology, but I don't think we have to go overboard and sacrifice the basics of learning—that is, how to block and tackle so that the ball carrier can score.

Mr. Clements: Those are very good points you make, and I couldn't disagree with any of them; nor would I want to. I think there is a danger of going overboard, of jumping into the new technology before it is completely developed. You might buy a system one year that will seem quite inferior to one you could get the next year.

Tom Diaz (Digital Equipment Corporation): This is more a comment than it is a question. I support the idea of computerized word processing and text processing. With a certain amount of acquired skill, I believe that writers and editors can learn to use these tools and do things that are absolutely impossible with other media. We at Digital have gotten into word processing very heavily. One liability or one weakness is perhaps in the security and longevity of what you are writing. Accidents will happen that you would swear couldn't possibly happen. Most people who use word processing systems as their main writing tool have to develop their own methods to very carefully guard the security of this material. So, I'm really very much in favor of the idea, but the security question is one that has to be addressed.

Mr. Clements: That is true. I'm sorry I don't have the knowledge, as I'm sure Dick does, to give you specifics on how to deal with this problem. There are safeguards that can be used, things the word processor can do, to avoid the loss of stored material.

Ellen Williams is a member of the Technical Publications Department of the Information Division of the Oak Ridge National Laboratory (ORNL), Oak Ridge, Tennessee. During the past three years, Ellen, a text-management specialist, has been involved in numerous studies on the use of text-management equipment at ORNL. She is responsible for providing advice, assistance, and control to ORNL divisions for the justification and acquisition of word-processing systems and is responsible for the development and implementation of the Technical Publications Department's computerized text-management system.

12. Approach to Text Management for Technical Documentation at the Oak Ridge National Laboratory

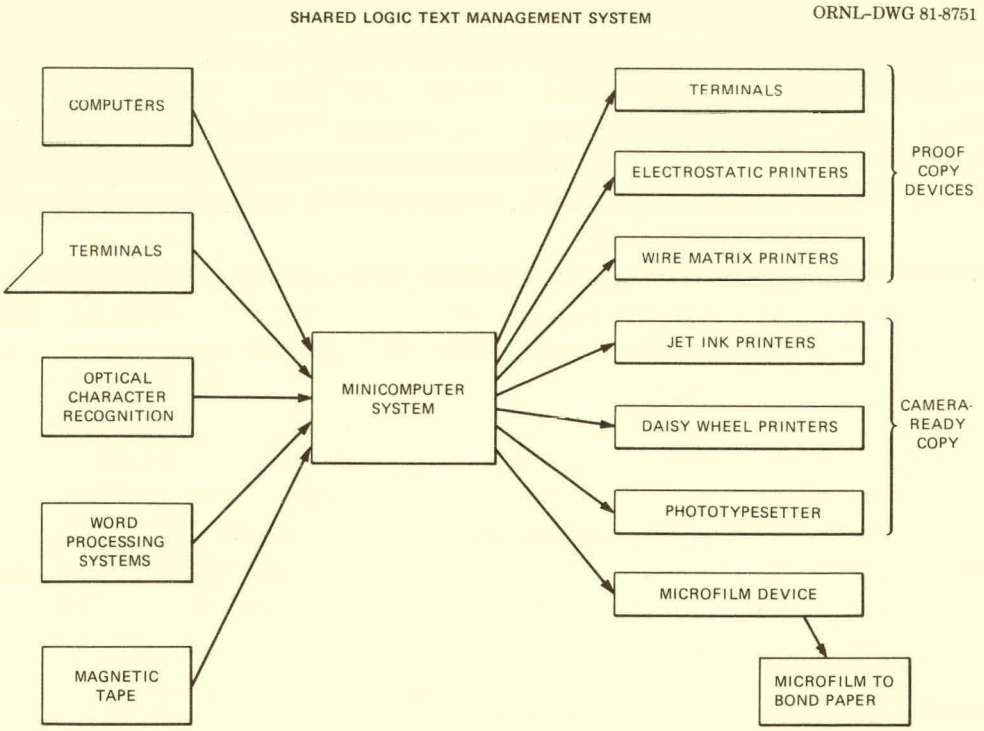
The Oak Ridge National Laboratory (ORNL), operated by Union Carbide Corporation's Nuclear Division, is one of the largest scientific and technological multiprogram laboratories in the world. It is owned by the federal government, controlled by the U.S. Department of Energy, and supported almost completely by government funds. Its main objective is research and development in support of the major national problems that concern the laboratory's sponsoring agencies, and, as a result, ORNL's 5100 staff members produce more than 800,000 pages of documentation per year for reproduction and distribution. More than 335,000 documents are distributed throughout the world each year.

To aid in the production of these documents, the Information Division's Technical Publications Department, which provides for the flow of technical information from the originator to the user and processes publications from conceptual and manuscript stages through production of reproducible copy for printing, is implementing a centralized text-management system (CTMS).

The CTMS is a large shared-logic system that runs on Digital Equipment Corporation's PDP-11 computers. Besides the computer, the main components of the system are (1) Interactive System/One, an enhanced version of Bell Laboratory's UNIX operating system; (2) an optical character reader (OCR) for original keystroke capture from ORNL's 1250 typewriters and from contributing authors throughout the world; (3) video-display terminals for editing, proofreading, etc.; (4) high-speed printers for draft hard copy; (5) correspondence-quality printers; (6) a third-generation phototypesetter; and (7) computer output to microfilm.

My colleague, Dick McCulloch, who has been working with us on this project for about two years, is a member of Union Carbide Nuclear Division's Computer Sciences Division. When the effort was begun about four years ago, we faced several problems. In addition to the facility where Dick and I work—ORNL—we have on two separate sides of us, about 10 to 12 miles away, the Y-12 Plant and the Oak Ridge Gaseous Diffusion Plant (ORGDP), both of which are also operated by Union Carbide for the Department of Energy. At these two locations and throughout ORNL, we have twelve divisional publications offices, which are located within different research divisions to assist the scientists in those divisions by working closely with them. Thus, we had a logistics problem in getting documents from one place to another. Also, we had a work load that has increased very rapidly during the past few years. One of the main problems we had is the difficulty of typesetting scientific documentation, which often includes multilevel mathematical equations and very complex tables. We also had a lot of rekeyboarding being done. The secretary in the author's office would often type and retype his manuscript because the document being prepared for publication goes through many reviews—peers and managers have to review the document before it comes to the editor. When a manuscript came to the Technical Publications Department it had usually been prepared on a typewriter that had no magnetic storage media; so, after editing, it had to be keyboarded again. We also had an undesirable quality of computer line-printer output. The alternative of using subcontractors' services was inadequate mainly because of the time required. Another problem, one we still have, is with our AM748 phototypesetter, a second-generation photomechanical device, which needs to be replaced.

On Slide 12.1 I can point out the major components of our shared-logic text-management system, with which we hope to solve these problems I have just described. We



Slide 12.1

have a Digital Equipment Corporation PDP-1170 minicomputer, which has 1 megabit of memory, two 176-megabit disk drives, and 64 user ports. These ports can be multiplexed to allow many more users to access the system at one time. We have an optical character reader (OCR) that enables us to accept input from the 2100 typewriters in the Oak Ridge area, as well as from contributing authors all over the world. We can accept input from word processing systems that have the correct communication protocol. We have video-display terminals and software aids for our editors and proofreaders. In addition, we can accept magnetic tapes from other laboratories and electronic transmission from computers all over the world.

On the output side of the system, we currently have more than 500 terminals in the Oak Ridge area, each of which can be used for output of proof copy. We have electrostatic printers that produce copy at about 1000 lines per minute for very fast draft copies. We have wire matrix printers that can simulate photocomposed output. For camera-ready copy, we're looking at several alternatives, for example, IBM's ink jet printer, which will give us access to several different type fonts, and daisy wheel printers such as Diablos and Qumes. (The ultimate output device is a third-generation phototypesetter, which I'll tell you more about later.) We also have access to a computer-output-to-microfilm device, the III (Information International, Inc.) FR80, which is located at ORGDP; from the microfilm we can go to bond paper for another form of draft copy.

The software we are using is called UNIX, which was developed by Bell Laboratories to provide technical document preparation capability, program software and development tools, and computer networking facilities. We chose it particularly for ease in preparing technical documents. We're buying the software as enhanced by Interactive Systems Corporation; they have modified the original software to include formatting programs for many different phototypesetters and other output devices; a two-dimensional screen editor, which is very much like the stand-alone word processors on the market today; and a message sending and receiving system, or electronic mail. The original software only drove one phototypesetter—the Graphic Systems Incorporated CAT machine, which gives good quality output but is extremely slow. Interactive Systems Corporation is writing drivers for, in addition to third-generation phototypesetters, many different output devices, such as the ink jet printer, the IBM laser printer 6670, and the Xerox 9700 laser printer.

If you will look at Slide 12.2 as artwork and don't try to read it, you'll see that it is a page from *Physical Review Letters;* this copy was produced by the UNIX system. In fact, the American Institute of Physics produces each month the *Solid State Journal,* which is *Physical Review B,* entirely with the UNIX system. Notice the different segments of the paper: title, author, author's affiliation, abstract, and text. I want to give you an idea of the coding required for these parts of the paper. It is somewhat of a generic coding, and individual typesetting commands are not required. The text elements are simply identified so that an operator or whoever is preparing the copy has only to say "I have a title," and the next line will be the title; then the operator says "I have an author," and the next line will be the author's name; and so forth. The coding requirements are very simple—you don't have to learn a lot of keyboard configurations, pica widths, point sizes, etc., to operate it. Also, the mathematical elements of the paper are very simply set. The benefit in this generic coding concept is that once the material has been keyboarded, there are many different formatting options available. Thus, if an author is submitting his paper to *Physical Review Letters,* he can simply state this, and the system will put it in that format. Or, the author could say it is

ORNL-DWG 81-8752

Appendix 5. Article by Tidman, set at Bell Laboratories with justified margins

VOLUME 00, NUMBER 0 PHYSICAL REVIEW LETTERS 25 FEBRUARY 1976

Seeded Megagauss Turbulence in Dense Fusion-Target Plasmas*

D. A. Tidman

Institute for Fluid Dynamics and Applied Mathematics, University of Maryland, College Park, Maryland 20742

(Received 8 September 1975)

A collision-dominated inhomogeneous plasma seeded with a distribution of impurity grains is calculated to fill out rapidly with random megagauss fields for temperatures of about a kilovolt. Possible applications of this phenomenon (i) to enhance relativistic-electron-beam coupling to low-Z target plasmas, (ii) to influence transport coefficients, or (iii) to localize α-particle deposition in a reacting DT plasma are discussed.

It was recently shown[1,2] that spatial fluctuations in the chemical composition of a dense plasma give rise to "frozen-in" electron density fluctuations, δN_e, which in turn are expected to produce megagauss field fluctuations, $\delta\vec{B}$. These fields derive from a source term[3] $\nabla\delta N_e \times \nabla T$, where ∇T is the background temperature gradient.[4,5] This phenomenon may provide a controlled way of seeding magnetic turbulence with a predetermined k spectrum in plasmas in the solid-state density range produced by relativistic electron beams (REB's), ion beams, or lasers. In this Letter I first derive a more general solution for the development of a seeded-turbulence spectrum and then discuss several applications.

Consider a rapidly heated grainy plasma for which $T(t)$ is a given function of time [$T(t)$ derives either from local heating or from traversal by a thermal wave, etc.]. As T increases, magnetic flux is produced and diffuses within the plasma. Simultaneously (once T exceeds a few keV) ion diffusive mixing occurs and removes the source, after which the field tends to persist because of the high plasma conductivity. The Fourier component, $\delta\vec{B}_k$, of the field is derived from δN_{ek} by a generalization of Eq. (1) in Ref. 1,

$$\left(\frac{\partial}{\partial t}+\frac{1}{\tau_B}\right)\delta\vec{B}_k = \left(\frac{icK}{e}\right)\vec{k}\times\nabla T\left(\frac{\delta N_{ek}}{\langle N_e\rangle}\right)\exp\left[-\int_0^t\frac{dt'}{\tau_M}\right], \quad (1)$$

where the characteristic field growth (or decay) time, τ_B, and grain mixing time,[6] τ_M, are

$$\tau_B = 4\pi\sigma/c^2k^2 \simeq 7.8\times10^{-2}T^{3/2}/\bar{Z}k^2\ln\Lambda,$$

$$\tau_M = 5\pi^2 10^{-5}\left(\frac{N_h}{N_s}\right)\frac{Z_h^2Z_l^2}{T^{5/2}}\frac{\ln\Lambda}{k^2}\left(\frac{m_l}{m_p}\right)^{1/2}, \quad (2)$$

where $N_s = 4.5\times10^{22}\ \mathrm{cm}^{-3}$, T is in keV, Z_h and Z_l are the heavy- and light-ion charges, N_h is the heavy-ion number density in the heavy-ion regions in the unmixed plasma state, $\langle N_e\rangle$ is the space-averaged electron density, and ∇T is the locally constant temperature gradient. On the composition fluctuation scale, local pressure equilibrium is assumed between unmixed regions, i.e., $N_l(1+Z_l) = N_h(1+Z_h)$.

Now assuming that $\delta B_k(t=0) = 0$, and choosing for example a heating model

$$T = T_0(t/t_0)^{2/3}, \quad (3)$$

Eq. (1) gives

$$\delta\vec{B}_k = \frac{icK}{e}\left(\frac{\delta N_{ek}}{\langle N_e\rangle}\right)\vec{k}\times\nabla T_0\left(\frac{t_0}{t}\right)^R\int_0^{t/t_0}t_0\,dx\,x^{2/3+R}\exp\left[-\frac{3t_0}{8\tau_{M0}}x^{8/3}\right], \quad (4)$$

where $R = t_0/\tau_{B0}$ with $\tau_{B0} = \tau_B(T_0)$, and $\tau_{M0} = \tau_M(T_0)$.

The behavior of $\delta B_k = |\delta\vec{B}_k|$ is shown in Fig. 1. It increases as $t^{5/3}$ until reaching a maximum (by which time the source has mixed away), after which it decays slowly as t^{-R}. This maximum is approximately

$$\delta B_{k,\max} \simeq 10^6\left|\frac{\delta N_{ek}}{\langle N_e\rangle}\right|\frac{t^{1/4}t_0^{3/8}Z_h^{5/4}Z_l^{5/4}}{T_0^{9/16}l_T}\left(\frac{m_l}{m_p}\right)^{5/16}\left(\frac{N_h}{N_s}\right)^{5/8}\left(\frac{\ln\Lambda}{7}\right)^{5/8}\left[1+\frac{5.32\times10^{-7}\bar{Z}t_0}{T_0^{3/2}t^2}\left(\frac{\ln\Lambda}{7}\right)\right]^{-1}, \quad (5)$$

and is reached in a time

$$t_m \simeq 173\,t_0^{5/8}\left(\frac{N_h}{N_s}\right)^{3/8}\frac{Z_h^{3/4}Z_l^{3/4}l^{3/4}}{T_0^{15/16}}\left(\frac{m_l}{m_p}\right)^{3/16}\left(\frac{\ln\Lambda}{7}\right)^{3/8}\ \mathrm{nsec}, \quad (6)$$

where t_0 and t_m are in nanoseconds, $\ln\Lambda/7 \simeq 1$, T_0 is in keV, and I have introduced a characteristic grain-size

Slide 12.2 (used by permission)

an ORNL document, and, without any additional coding or keystroking, unless revisions are necessary, the paper will automatically be formatted according to ORNL style specifications.

Slide 12.3 is a sample of the coding required for a mathematical equation. I'll read the coding to give you a basic idea of what the keyboarder would input for the equation. The first thing is ".EQ (5.6)." This tells the system that we're doing an equation. The equation will automatically be centered on the page; the equation number will be put on the right-hand side. If the format needs to be different, these specifications can be overridden. The next instructions are Pr "{" i vec sub D "}" ~ =, sum from {m=2,4,..., left floor D right floor sub e}, (i sub m -1) N sup D-m, etc. I think you get the idea; what we do is actually describe the equation. Someone who may not be familiar with the compositor's language or who may not be familiar with mathematics can simply look at the equation and describe it in our language. The system has proven to be very easy to learn and to use. Another thing about the coding required for equations: All the keystrokes found here are also found on a single element, the OCR element, and thus the coding is completely readable by the OCR device.

ORNL-DWG 81-8753

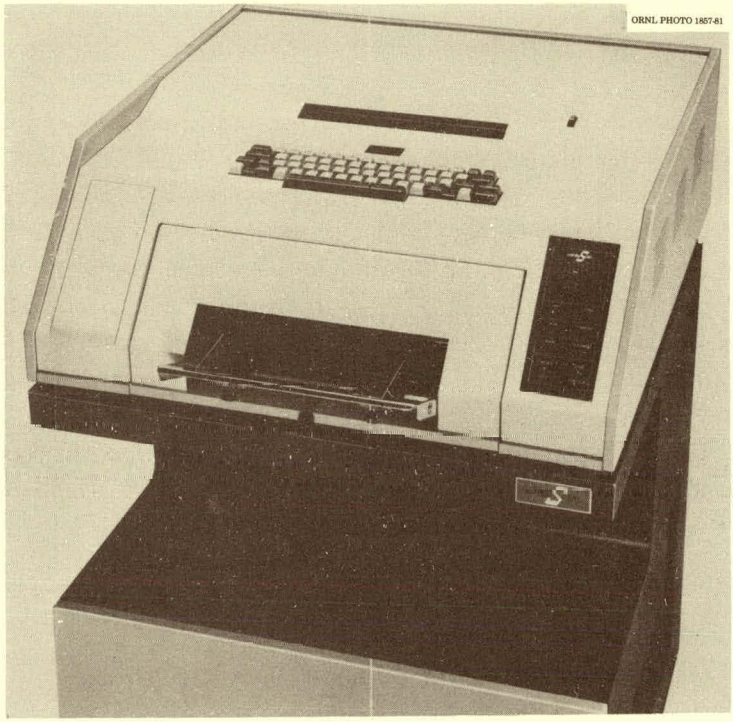
$$Pr(\vec{i}_D) = \sum_{m=2,4,\ldots,\lfloor D \rfloor_e} (i_m - 1) N^{D-m} \int_0^1 \prod_{k=0}^{D-1} T^{P_k(m)}(u,k)\, du \qquad (5.6)$$

```
.EQ (5.6)
Pr "{" i vec sub D  "}" ~ =
sum from {m=2,4,..., left floor D right floor sub e}
(i sub m -1) N sup D-m
int sub 0 sup 1 ~
prod from k=0 to D-1 T sup {P sub K (m)} (u,k)~du
.EN
```

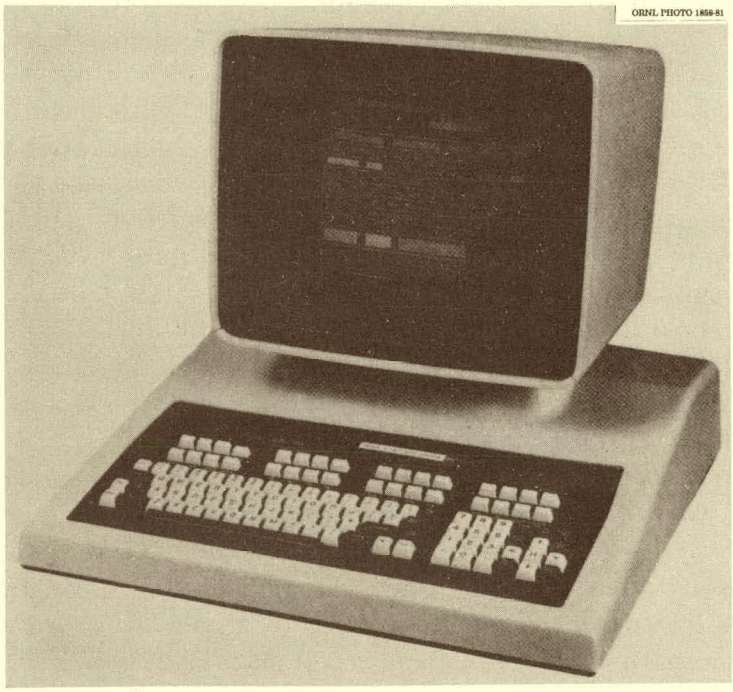
Slide 12.3

Slide 12.4 shows the OCR device we've acquired; it is marketed by Compuscan. All the OCR devices are good now, and the price is coming down rapidly. However, we probably will use the OCR only as an interim measure. The Compuscan device is programmable by means of typewritten header sheets so that the input and output can be changed as our requirements change. A stack of about fifty sheets can be loaded, and the system's rollers and belts will pull the paper through one sheet at a time. There is a window that allows the operator to see the page being read, and there is a three-character LED display. There are several different modes: One mode allows the operator to make revisions or skip over text that cannot be identified by the OCR. If there is a character that the machine cannot recognize, for example, if the character is skewed or if the character is broken, the machine will sound a beep; the operator can then look through the window and see the character in question. If the machine has guessed correctly and the character is okay, the operator can push the carriage return. If the character is not okay, the operator can insert the correct key. This feature can be turned off, and the system will flag unrecognized characters by whatever coding we want it to recognize. The error rate of this machine with the operator-assisted mode turned on is 1 character out of 1 million.

Slide 12.5 is a picture of the terminal we're using. This OWL-1200 terminal was originally manufactured by Perkin-Elmer; Interactive Systems Corporation has modified it to allow many more of the editing functions to take place in the terminal so that many more terminals can run at one time. It has a two-dimensional screen editor; it has function keys very similar to the Wang system that Wallace Clements told us about; and it's very easy to



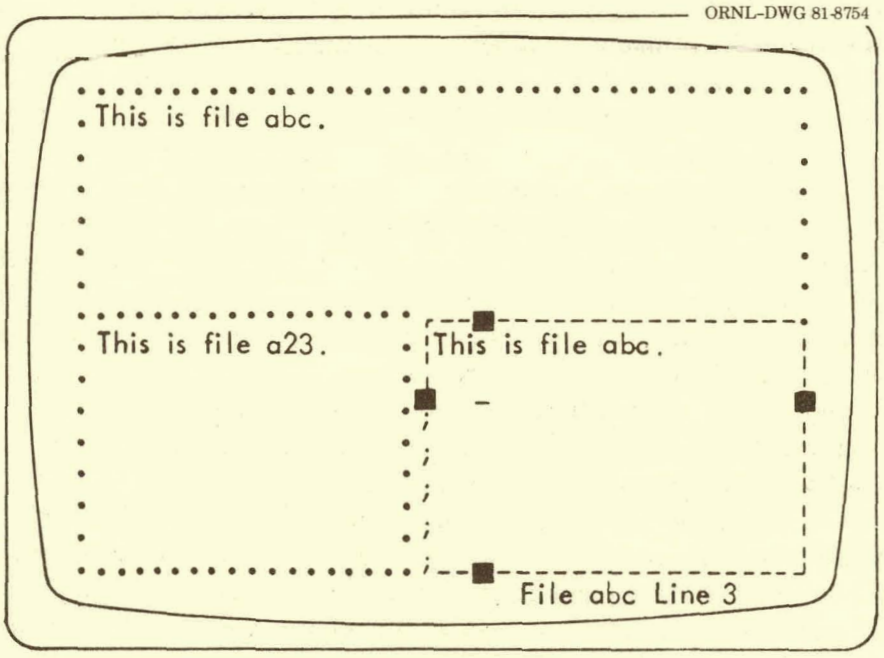
Slide 12.4



Slide 12.5

learn to use. The function buttons say such things as insert, delete characters, move the window to the right to get a horizontal scroll, move the page forward, move the page backward, tab forward, tab backward, and enter an argument. "Enter an argument" allows you to enter a character string and search forward or backward for the character string. It also is a cursor-oriented machine with buttons for moving the cursor anywhere on the screen to make changes.

Editors and proofreaders especially like the fact that the screen can be divided into many different windows so that different parts of the same document or different documents can be seen simultaneously (Slide 12.6). You can, in fact, get up to ten windows on the screen. Obviously, when you get ten, they are going to be very small. But our editors and proofreaders like this because they are able to get the original document, for instance, at the top of the screen, run this document through the dictionary, have all the words that are not found in the dictionary displayed in another file, and put the output from the dictionary file into another document. There is a program called TYPO that is an algorithm based on the way English characters are supposed to fit together, and the file could be run through that program to find all the words that did not meet the specifications.



Slide 12.6

Thus, a misspelled word that has been found in the dictionary can be found in the original file—automatically pointed out—and the editor or proofreader can correct it. In addition to the system dictionary, which is resident on the system, each person operating the system could have his own separate dictionary—for instance, one containing terms specific to neutron physics, solid state physics, fusion energy, or chemical technology. So, it is a very flexible and enhanceable system. It can be tailored to the individual's needs.

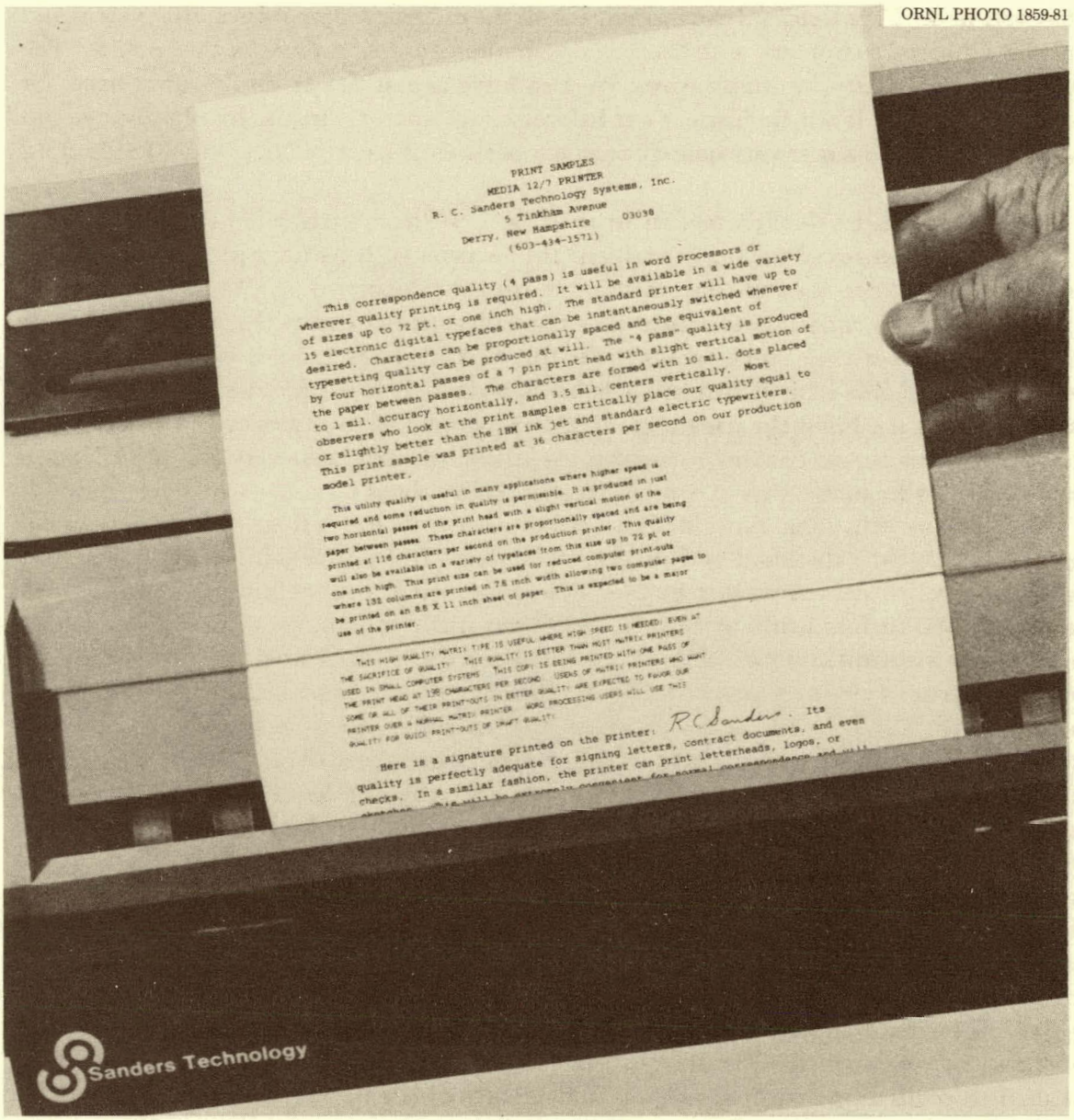
The OWL terminal is not a word processing terminal, per se, but it is a multifunctional terminal that allows the author or the editor to use it not only for revising the document or comparing versions of the document, but also to compare the original document with the edited version. He can say "Run this file through a program and show me all the differences

that you find." This terminal can also access all the different computers in the system and all the different computers with the same communications protocol in the country. The terminal can be used in many ways: We can have access to our library data base, for example, or to the latest findings of our Information Center Complex. In addition, we can send electronic messages very quickly from our central office at ORNL to the Y-12 Plant, 12 miles away.

We have three levels of protection for our files: (1) We have a password so that only those who know the password can log in and read the document. (2) We have protection allowing whoever we want to read the document or change the document. (3) We have encryption programs that we can run a document through so that no one except the person who knows the decryption code can have access to the file. No two characters are ever encrypted the same way, and it is almost impossible to decrypt a file. If someone tries to log into a user area and does not know the password, after three times a system message is beeped to the operator: "This person does not remember the password. This looks very strange." Thus, if someone tries to access your file, you will soon know about it.

We are investigating many different output devices. One of them (Slide 12.7) is a dot matrix printer manufactured by Sanders Technology. The unique thing about this printer is that it can hold up to seventeen fonts on line at one time. If you are familiar with the daisy wheel printer, such as Qume and Diablo, you know that changing fonts is time consuming and that this is something we can't afford. There are very few documents that don't require at least two fonts on line at one time. The Sanders dot matrix printer has a 7-pin printhead, which moves forward and backward across the paper at a rate of 36 to 200 characters per second, depending on the fonts being used and the quality desired. You can get a very fast draft-quality copy on a one-pass print. You can get correspondence quality, which is not quite as good as the ink jet printer, but is acceptable to many for letters, etc. The plot mode can be used to simulate photocomposed output: Notice the signature at the bottom of the page in Slide 12.7. As I said before, we are also looking at the new laser-beam printers because we have to have many different fonts. Neither the daisy wheel printer nor the ink jet printer—although the ink jet printer can provide four fonts at once—can give us the oversized symbols we need, such as summation and integral signs. We find that a third-generation phototypesetter offers significant advantages: speed and flexibility for high volume and quick turnaround of technical work; important benefits from computer-aided document preparation; staff savings from increased productivity; and paper savings and thus reduced printing costs. The output rate of this phototypesetter is about 3000 lines per minute as opposed to the 50 lines per minute from our second-generation phototypesetter. All the fonts in the third-generation phototypesetter are stored electronically in the system, which means that the fonts don't have to be changed by human hands. The system is almost totally electronic, so there are very few moving parts, thus cutting down on maintenance. The equation-setting program and the table-setting program are formatted to output only on phototypeset documents because of the lack of different point sizes and fonts on most of the word processing systems.

Slide 12.8 is a printout of one page of a document that was produced on a Diablo daisy wheel; currently, a lot of our publications are produced on correspondence quality, either in double space or space and a half to make allowances for superscripts and subscripts. Slide 12.9 shows the same text, but it has been photocomposed. You can see that photocomposition greatly compacts the amount of text on a page. In fact, it is an industry



Slide 12.7

standard that 2½ double-spaced, typewritten manuscript pages equal 1 photocomposed page. Our top-level managers and others are very excited about the fact that we're going to be saving a lot on printing costs because the fewer pages will, of course, require less paper. We will also save on storage space and mailing costs.

Slide 12.10 shows some of the characters available on the third-generation phototypesetter; we can easily have all the fonts we could ever hope to need, all electronically stored. Another advantage is that jobs don't have to be grouped according to the type fonts used—jobs using many different fonts can be run through at the same time. We can also store many different types of logos in the machine; and, in addition to text and logos, the machine can output computerized graphics. (Betsy Clark, next on the program, will tell you about computerized graphics.)

2.1.2.3.4 Thermal Characteristics of Surface Water ORNL-DWG 81-8755

Monitoring of the thermal characteristics of surface water depends on the results of the synoptic survey. If historical or measured data show that a thermocline exists, the monitoring program must be extensive enough to define the motion and formation of the thermocline. In addition to monitoring thermocline motion, the program should strive towards measuring the ambient thermal characteristics of the surface waters. An accurate baseline monitoring of temperature is necessary to analyze the environmental impacts of the coal conversion plant on water quality, aquatic ecology, and hydrology. The physical and chemical properties that are temperature dependent and the environmental roles they play are described in refs. 12 and 13. As with stream-flow measurement, the techniques used for temperature monitoring of rivers differ from those used for regulated lakes.

Rivers

Rivers are generally turbulent. As a result of turbulence the temperature profile is uniform with depth except for sloughs and backwater areas. Temperatures do vary along any transect. The amount of variation depends on the source of supply (groundwater, snow, precipitation, runoff), the amount of incident radiation, and the energy loss (evaporation, convection, conduction, radiation). A

Slide 12.8

ORNL-DWG 81-8756

2.1.2.3.4 Thermal Characteristics of Surface Water

Monitoring of the thermal characteristics of surface water depends on the results of the synoptic survey. If historical or measured data show that a thermocline exists, the monitoring program must be extensive enough to define the motion and formation of the thermocline. In addition to monitoring thermocline motion, the program should strive towards measuring the ambient thermal characteristics of the surface waters. An accurate baseline monitoring of temperature is necessary to analyze the environmental impacts of the coal conversion plant on water quality, aquatic ecology, and hydrology. The physical and chemical properties that are temperature dependent and the environmental roles they play are described in refs. 12 and 13. As with stream-flow measurement, the techniques used for temperature monitoring of rivers differ from those used for regulated lakes.

Rivers

Rivers are generally turbulent. As a result of turbulence the temperature profile is uniform with depth except for sloughs and backwater areas. Temperatures do vary along any transect. The amount of variation depends on the source of supply (groundwater, snow, precipitation, runoff), the amount of incident radiation, and the energy loss (evaporation, convection, conduction, radiation). A major source of downstream variation in temperature is due to inflow of nearby upstream tributaries.

Temperature measurements in rivers can be made by numerous techniques.[5,14] The most common technique uses a continuous thermograph with a magnetic tape recorder making hourly readings. These instruments need periodic calibration checks to ensure accuracy.

Selection of the thermal monitoring site should take into consideration the results of the synoptic survey, the needs of other aspects of the monitoring program, and the placement of current monitoring stations. The temperature monitoring transects should be located where the river water has been well mixed by diffusion from upstream influences. Sites should be located upstream and downstream of the study area (Fig. 2.1.3), in addition to one location at the site. Initial data should be taken from the grid points shown in Fig. 2.1.3. Should the data show that there is little variation in temperature along the transect, the number of sampling locations could be reduced. However, one detailed transect should be made during the late summer to ascertain any thermocline that might develop. Vertical profiles do not need to be considered unless a thermocline is noted. In the event of a temperature gradient of more than 3°C, detailed observations along the vertical axis should be made. Additional monitoring locations will be necessary if suitable ones cannot be established. Detailed procedures for sensor placement are contained in ref. 5.

Lakes

Temperature monitoring in lakes is much more difficult than in rivers. Large littoral areas or deep regions will generate large areal and vertical variations in temperature. Withdrawals from and discharges to lakes are, therefore, capable of causing serious impacts to the system. For lakes, surface and depth measurements are needed; the number of required sampling points for depth are determined by the synoptic survey, needs of other aspects of the monitoring program, and the nature of the lake's structure.

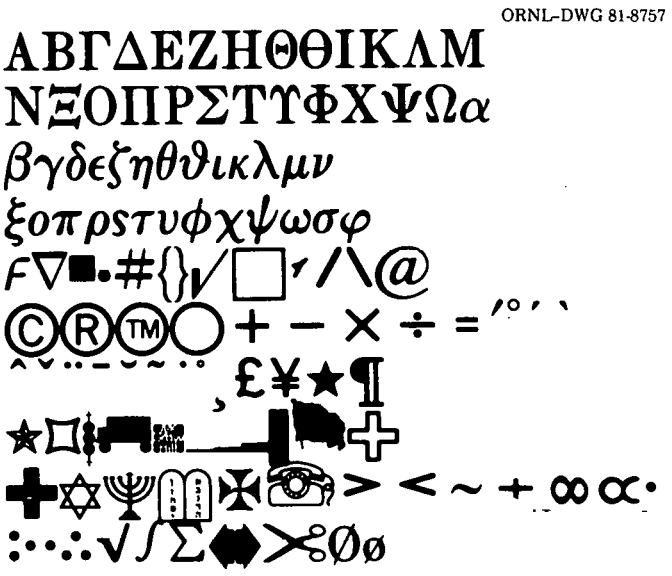
Temperature measurements on regulated lakes can be made with the same instrumentation used for rivers. The location of sampling stations, however, is more difficult to determine. A suggested grid for a uniform lake is shown in Fig. 2.1.4. Site-specific conditions (inflow-outflow patterns, unusual bathymetry, inflowing tributaries, large littoral zones) would, of course, modify this grid. When depth measurements are necessary, a sufficient number of monitoring locations should be established in the vertical to portray the thermocline to within 1°C. It is important that the calibration of the thermographs be periodically checked.

For unevenly heated lakes, it may be necessary to measure the sediment temperature profile. with thermistors attached are used for this purpose. Sediment temperature does not change as quickly as water temperature and so need not be monitored as often.

Measurements of water and air temperature, wind direction and speed, and relative humidity are necessary for proper interpretation of data. In density-stratified lakes, there is always the possibility of sinking effluent plumes and selective withdrawal of water. Special care should be taken in measuring temperature so that adequate information to predict and prevent such undesirable phenomena is provided.

Data analysis

Historical data should be compared with monitoring data to determine the nature and significance of the monitoring year's data. The important historical data are the records of ambient water temperature, from which



Slide 12.10

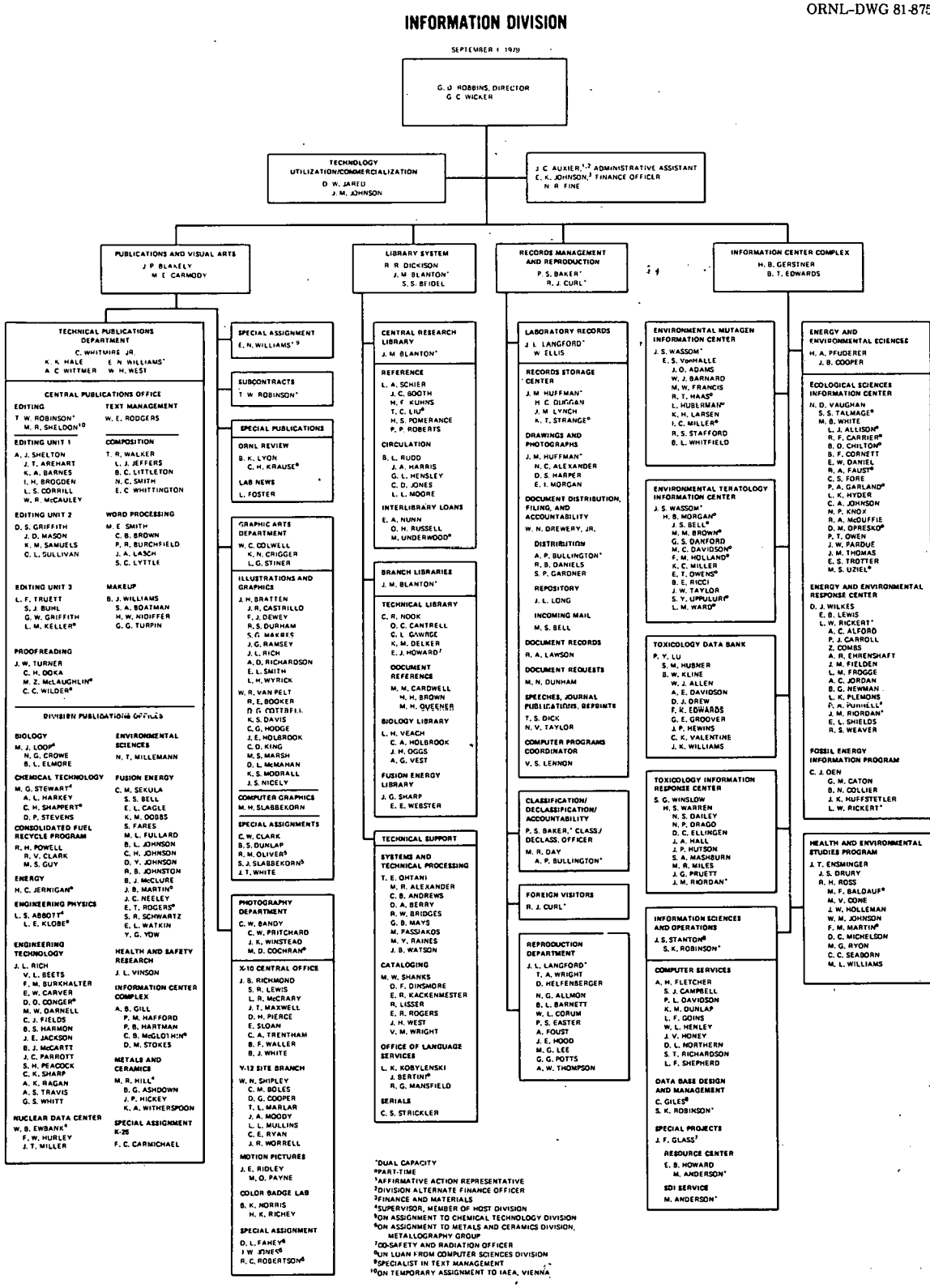
Slide 12.11 is an organization chart; these charts are required twice a year for each division. Currently, the Graphic Arts Department prepares these charts—the artists draw the lines by hand, type the names on a strike-on composition machine, and paste the names into the boxes. The format is very simple, but you can imagine the difficulty of preparing these charts. That is why we want to use our computerized system to issue these charts. A secretary can use an OCR font, which costs $15, to type the names of all the people in her section; some kind of numbering sequence can be used to key the names to the appropriate boxes and the titles of the boxes. From this easy effort we can have an up-to-date organization chart through the phototypesetter within 24 hours. That would be a vast improvement and would relieve the graphic artists of a time-consuming effort.

We feel that a computer-aided system through photocomposition offers important benefits: keystroke capture with an optical character recognition device, speedy revisions with video-display terminals, draft copies from high-speed printers and plotters, valuable software tools, easy revision and manipulation of computerized graphics with many output options, and an alternative to incompatible word processing equipment.

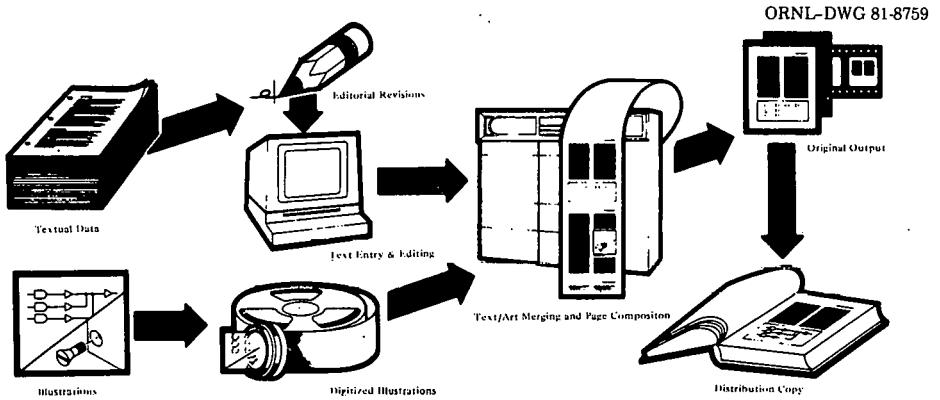
During the past few years—about four years—the word processing industry has been moving extremely fast in technology; every month we have updates to word processing equipment that are software based. As a result, there were, six months ago, 150 word processing systems on the market. Because different groups have purchased or leased different word processing systems, we do not have compatibility among systems. The communications protocol is not compatible: the speed requirements, the language they speak, the code configurations that they transmit. In addition, the storage media—floppy disks, magnetic cards, magnetic tapes—are not compatible. Thus, it is very difficult to transfer documents that have been recorded on one storage medium to another medium. This problem will be solved by the computer-aided system with its large base of networking facilities and communications compatibility.

What we hope to do is to come up with a totally integrated publications system (Slide 12.12). We have the "top" part: text is input, editing and revisions are done, and the text is input to the system. At the same time, illustrations can be digitized or illustrations that

ORNL-DWG 81-8758



Slide 12.11



Slide 12.12

have already been coded into the computer can be output through the phototypesetter, for a completely made-up page. Makeup artists who currently use scissors and wax or paste will, three to five years from now, be using video-display terminals to lay out pages; the made-up pages will then come off the phototypesetter ready for printing.

Shirley Thorne (Western Electric): The system we are developing is also based on UNIX, mainly because it's free to us as part of the Bell system. I believe that it is not free, but that there is a nominal fee of $1 for educational institutions. I'm not sure about government institutions.

Ms. Williams: Argonne Laboratory is the codistribution center for government institutions. The cost, I believe, is about $6700.

Shirley Thorne: Anyone from an educational institution who is interested can call Bell Laboratories at Piscataway, New Jersey.

Our big problem with UNIX is the lack of a full cursor control editing feature. Whoever is entering material at the terminal does not see the material as it will be output. Does the system you have, UNIX as modified by Interactive Systems Corporation, have this full cursor control?

Ms. Williams: Yes, it does. If the operator of the terminal makes a mistake, he can move the cursor, make the correction, and actually see what the correction is. This is one of the features we felt we had to have, and it was provided.

Shirley Thorne: Is this corporation that bought UNIX located in California?

Ms. Williams: Yes, the Interactive Systems Corporation has its main office in Santa Monica, California; there is also an office in Washington, D.C.

Shirley Thorne: What functions do your editors provide?

Ms. Williams: When I mentioned editors, I meant people dedicated to the task of technically editing reports. But, authors can also be editors in the sense that they make changes in the text. Anyone inputting changes could, in a narrow sense, be considered an editor. I hope I didn't mislead anyone—I meant to limit the use of the word to those whose defined job it is.

Shirley Thorne: Do you have active participation by your writers in this system? I mean, do they actually develop a document while sitting at a terminal?

Ms. Williams: Many authors would like to input their own documents because they find this method as fast as writing them out by hand. The authors usually do not do the coding: The coding is usually done by secretaries or word processors. In the Technical Publications Department, the coding will be done by our composition group.

George Sadowski (Union Carbide Corporation): What is the price of the OCR device?

Ms. Williams: Our machine has a lot of features on it—it is programmable; it also selectively scans preprinted forms—it's what you might call the Cadillac of the OCRs, and it sells for $63,000.

George Sadowski: How many pages per day will it read?

Ms. Williams: One page is read in about 20 seconds. I don't have the figure for pages per day.

I have said that this is an interim technology. Publications people are particular about quality, but authors are very particular, and understandably so. They want to see their document as it is going to be output; they don't want to read all this coding. They want to see their text and equations as they are going to look in the finished product, so they don't want their secretaries to put in the coding. In those cases, if we have a document with a lot of mathematics, we probably won't use the OCR device except for the straight text; the coding would then be done by our composition group.

George Sadowski: Say an engineer comes in early in the morning, and he's ready to write. Can he turn on his terminal and start inputting?

Ms. Williams: The system I'm telling you about is the Technical Publications Department system, which is absolutely dedicated to text management and is controlled by the Information Division to ensure that the people who are doing the publications have ready access to the system.

In addition to this system, ORNL is implementing a much larger integrated system so that researchers can have access. Researchers who want to keyboard their own documents will be connected to the laboratory system, which will be readily available to them. When these documents are ready for the publications process, they will come to our system. This is the ultimate goal of our planning—that the system that the Information Division is implementing will also be implemented throughout ORNL.

THIS PAGE

WAS INTENTIONALLY

LEFT BLANK

Betsy Clark is Graphics Coordinator for the Union Carbide Nuclear Division's Computer Sciences Division, Oak Ridge, Tennessee. She is physically located at the Oak Ridge National Laboratory (ORNL) but organizes and teaches classes in computer graphics for all three Oak Ridge facilities, including the Y-12 Plant and the Oak Ridge Gaseous Diffusion Plant. Ms. Clark also works with the ORNL Graphic Arts Department to develop software to meet new needs in publication-quality drawings. Her B.A. in mathematics and computer science is from Murray State University, Kentucky.

13. Computer Graphics

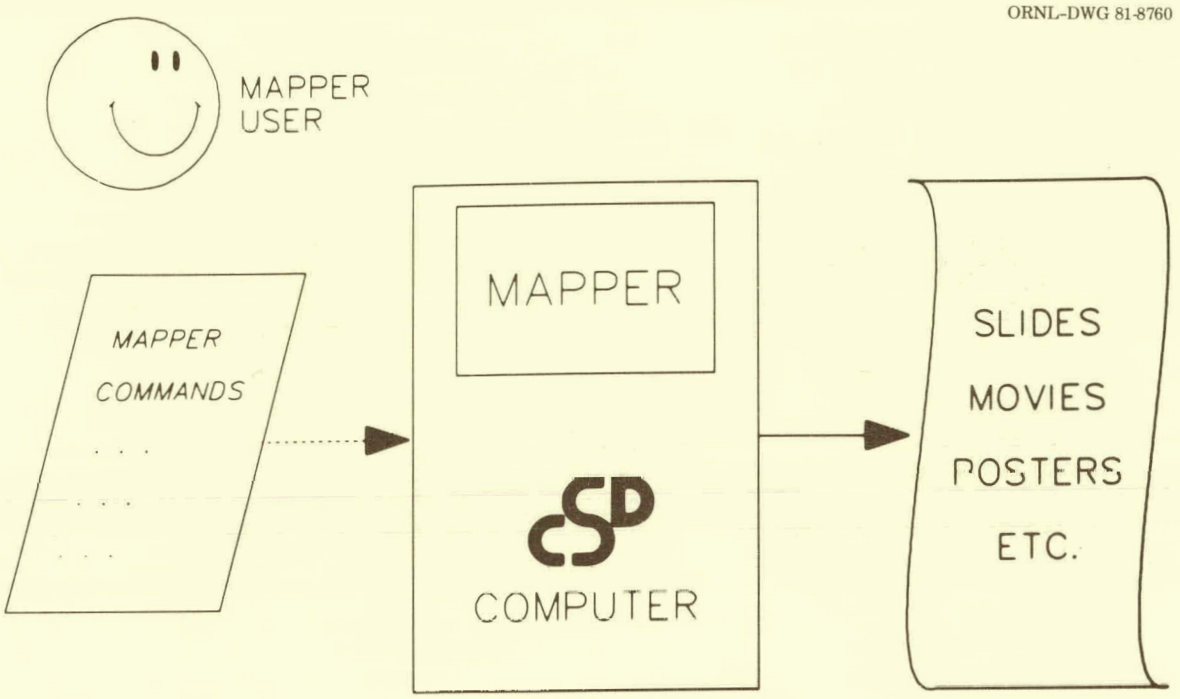
The use of computer graphics at the three Oak Ridge installations of Union Carbide Corporation has increased in recent years for several reasons. Two of the major reasons are the higher quality devices and the more versatile software that have become available. Except for the four photographs, all the slides I will show you are computer generated.

Slide 13.1 illustrates a computer graphics package called MAPPER. A user of computer graphics starts with an idea of what he would like to produce as graphics output. Then, he has to write some form of command or instruction to the computer to explain what he wants done. These instructions are input to a computer which, in this case, uses the program MAPPER. The output from the graphics device may be slides, motion pictures, posters, or other forms of output.

It is the output quality of graphics devices that must first be improved if we are to get people to use computer graphics more often, because, no matter how easy it may be to produce output or how complicated a plot you may be able to produce, if the final quality is lousy, nobody is going to be interested.

One of the areas that has been improved is the variety of graphics devices that are available. We have four basic types of graphics devices: (1) direct-fuse CRT (most are Tektronix brand), on which graphics can be displayed on a terminal screen; (2) the pen-and-ink plotter (we have two Calcomp models), which is the type most people are familiar with—it has been around the longest; (3) a Versatec electrostatic plotter; and (4) an FR80 microfilm recorder.

Slide 13.2 is a photograph of the Calcomp pen-and-ink plotter. The pen-and-ink plotter has a continuous roll of paper that rolls back and forth on a drum. A mounted pen moves



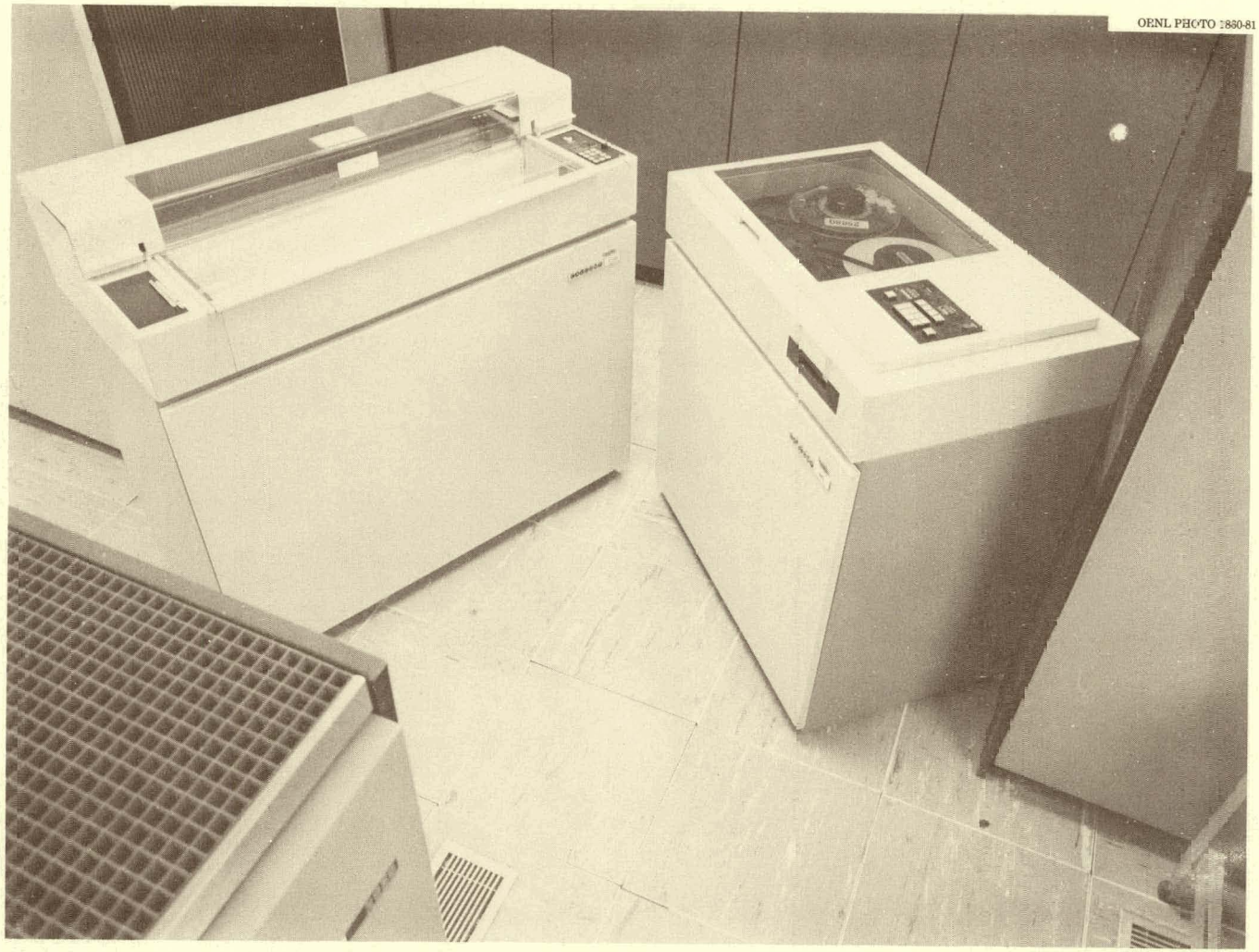
Slide 13.1

back and forth across the drum to produce line drawings on the paper. There are three different pens the user can ask for—pen 1, pen 2, or pen 3. Normally, these pens are loaded with black, red, and green ink, but it is also possible to load all of them with black ink and use different pen point sizes to get a high-quality effect. The resolution on a plotter like this is about $\frac{1}{5000}$ of an inch; in other words, that's the smallest distance the pen can move, so the curves have to be made up of short line segments that are $\frac{1}{5000}$ of an inch long.

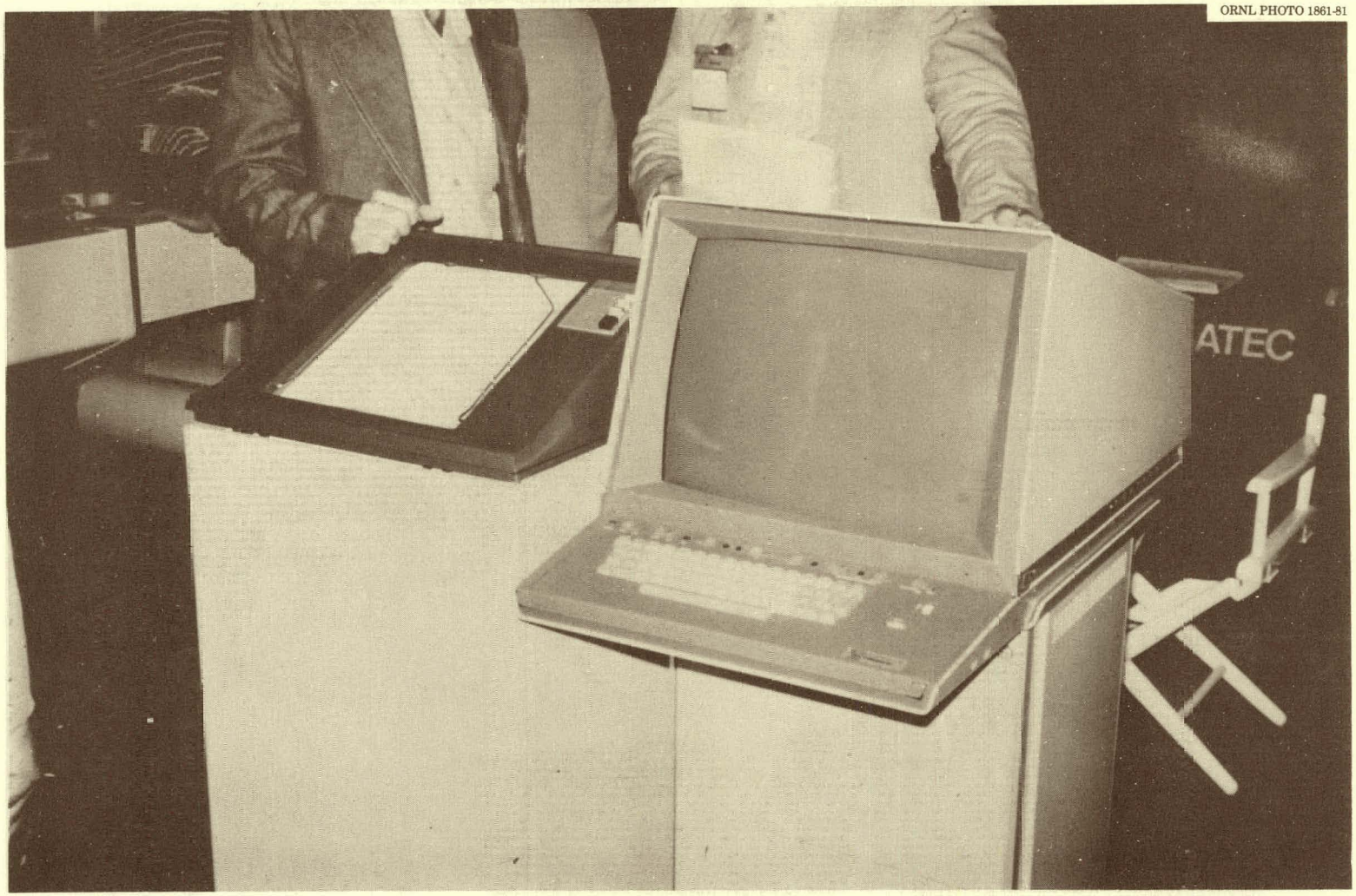
The next type of graphics device is the graphics terminal. Slide 13.3 shows a Tektronix large-screen graphics terminal. The user can use it as a computer terminal to enter data, which can be displayed on the video screen. The terminal is also set up to supply a paper copy of the plot. The resolution on these terminals, about $\frac{1}{100}$ of an inch, is not as high as that of the Calcomp; thus, the quality of the copies is not high, but it will suffice for working copies. This type of graphics terminal makes it possible to watch the progress of the drawing for error detection.

One of the newer devices we have is the Versatec electrostatic plotter (Slide 13.4), which uses a continuous roll of paper. Instead of moving the paper back and forth and drawing with a pen, the electrostatic plotter scans all the commands before it draws. The plotter sprays dots back and forth across the paper as it comes out, producing the entire drawing. The Versatec plotter is very good for shading; it has 200 dots per inch, which is $\frac{1}{5000}$ of an inch resolution. The Versatec plotter has produced very small lettering that is readable and, for the most part, of a good enough quality for technical reports.

The highest quality graphics device that we have is the FR80 microfilm recorder (Slide 13.5), which is located at the Oak Ridge Gaseous Diffusion Plant. It has a PDP 15 computer, which controls the plotting operation. There is a mounted camera trained on a precision CRT terminal where the drawing takes place. Computer-generated drawing instructions are activated on the screen and recorded on film by camera. After the film has been produced, the operator can take the film transport out of the camera, put it on a black and white



Slide 13.2



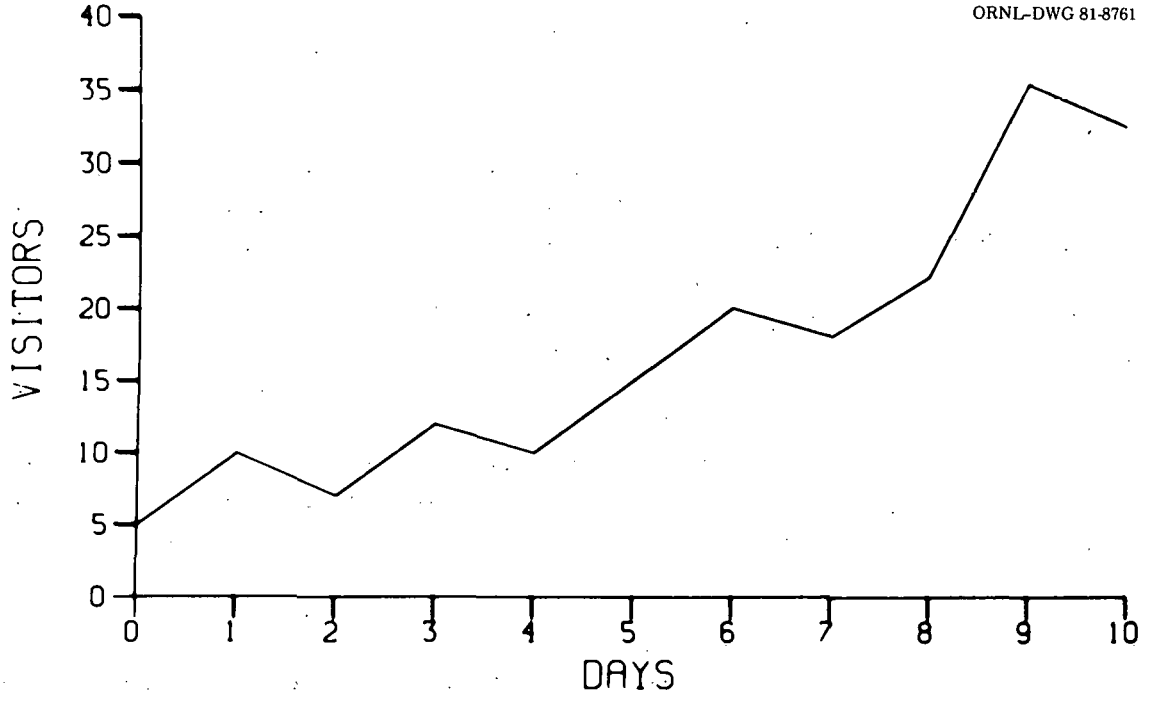
Slide 13.3

Slide 13.4

Slide 15.5

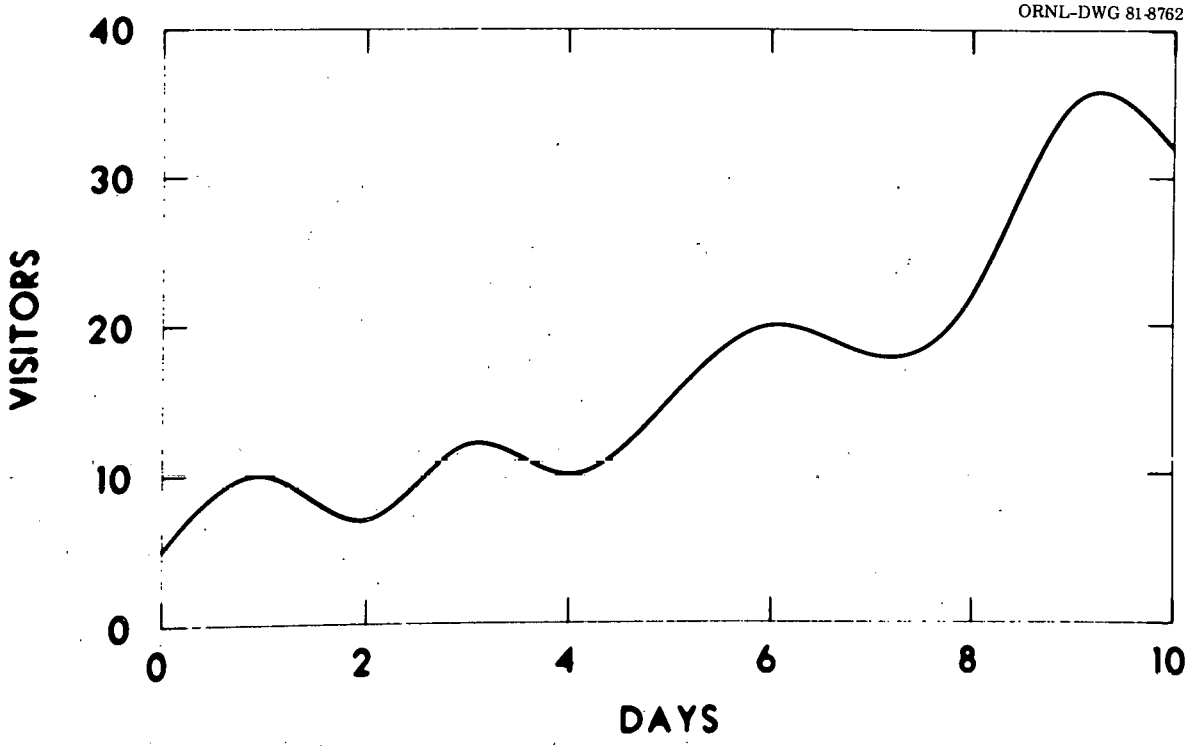
processor, and, in about 10 or 15 minutes, the developed film is ready to be mounted as slides or ready to be used as microfiche. There are several types of FR80 outputs available: 35-mm black and white slides; 16- and 35-mm black and white motion pictures, which are made by using the sprocketed camera that is available for the FR80; and 105-mm black and white microfiche. In addition to graphics, text printing can be done on the FR80. The latest capability that has been added is 16- and 35-mm color motion pictures. This is a new capability that has not yet been released to all users, but we are anticipating doing so very soon. By mounting a single frame of a 35-mm color motion picture, it is possible to get a smaller size color slide. The resolution of the FR80 is over 16,000 points across the screen, and normally this is on a 35-mm-size slide mat. This means that if you blow it up to a 16-inch-wide drawing, the resolution would be 1/1000 of an inch, which is about five times that of the Calcomp and the Versatec. We have not, as yet, had a problem with resolution on the FR80.

The next step in making computer graphics more satisfactory for the user is to improve the operation and versatility of the software. Slide 13.6 illustrates what most people think of when they think of a computer plot—particularly if it is a slide. The slide is very dim, the letters are very skinny—they are stick letters that do not look very good. The plot is a plain curve, and the axes don't look very good either.



Slide 13.6

If you are seeking publication-quality graphics, something like Slide 13.7 would be better. It is not perfect, but it does illustrate some of the progress that has been made in computer graphics. Before the default plot, you would get something like Slide 13.6. Now, with a little more effort, you can get something like Slide 13.7—thicker lines, better letters, and fewer tick marks. You can now put the tick marks inside and the numbers outside, which has been a complaint for a long time. Other options, like logos, are also possible. We have made improvements in computer software that provide more types of charts, more fonts or lettering styles, and other user options.



Slide 13.7

Slide 13.8, a basic line chart, illustrates several ways that curves can be displayed. You can use curve markers, symbols with error bars, lines, or shading under the curve. If you are plotting lines, the lines can be different thicknesses and they can be dashed or solid. The curve markers can be filled in solid and drawn with no line connecting them. Also, you can add a block of text, as shown in Slide 13.9.

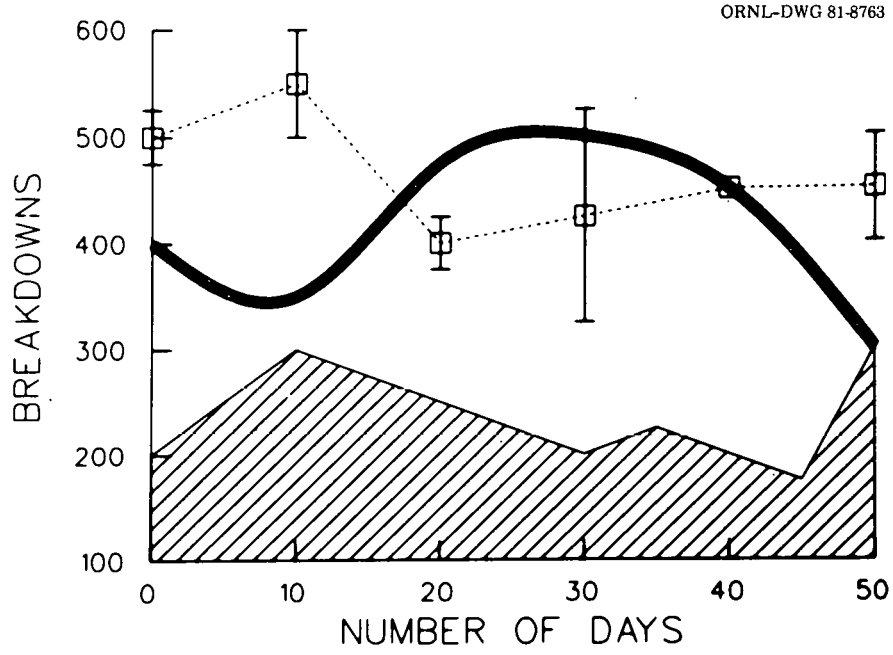
Pie charts can be done in various styles. Slide 13.10 illustrates shading of the pie segments and entering of the actual percentages. Bar charts of different types and styles can be made with computer graphics. Slide 13.11 illustrates a logarithmic axis. It is also possible to use different shading on the bars.

Contour plots and vector plots can be generated with computer graphics. Slide 13.12 is a collision of two particles; it is a segment from an animation sequence. In this case, all the data were generated on the computer. Therefore, it saved the user many steps to have the computer also draw the plots.

Three-dimensional surfaces is another area that's being heavily used now. This is a very much appreciated feature of the graphics software we have. Different color patterns can be used to distinguish the three surfaces of a plot, or, instead of using different colors to represent the different surfaces, if you just want to get the composite surface, the area where the surfaces cross each other can be blanked out.

In addition to having more types of charts available, another thing that has been done recently in computer graphics is to make available more fonts or letter styles (Slide 13.13). This was made possible by adding DISPLA, a software package we purchased from Integrated Software Systems Corporation. DISPLA is a proprietary package that has a wide variety of fonts—from the standard stick font to more complicated fonts, such as Gothic and four shaded fonts. A shaded font is defined initially as an outline and then

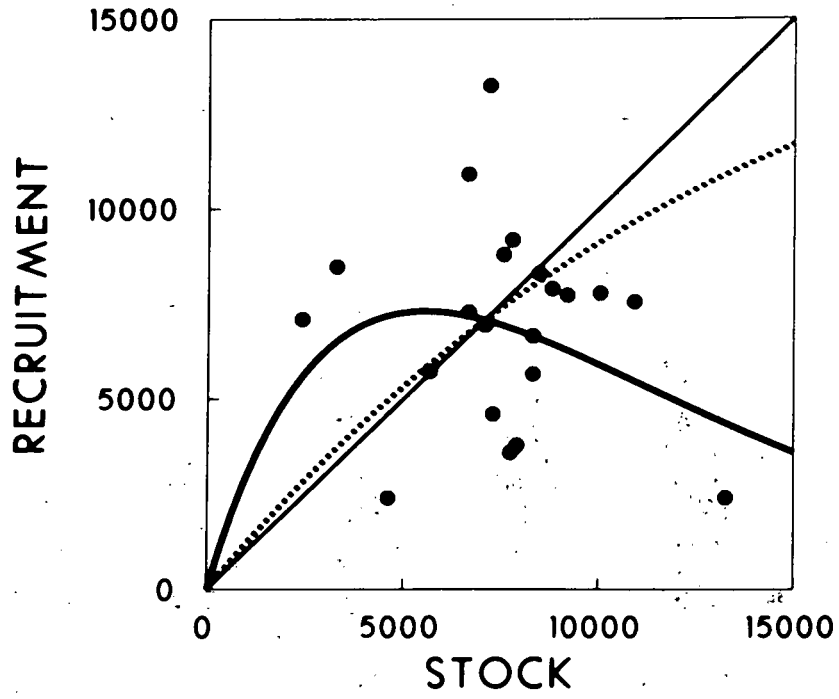
ORNL-DWG 81-8763



Slide 13.8

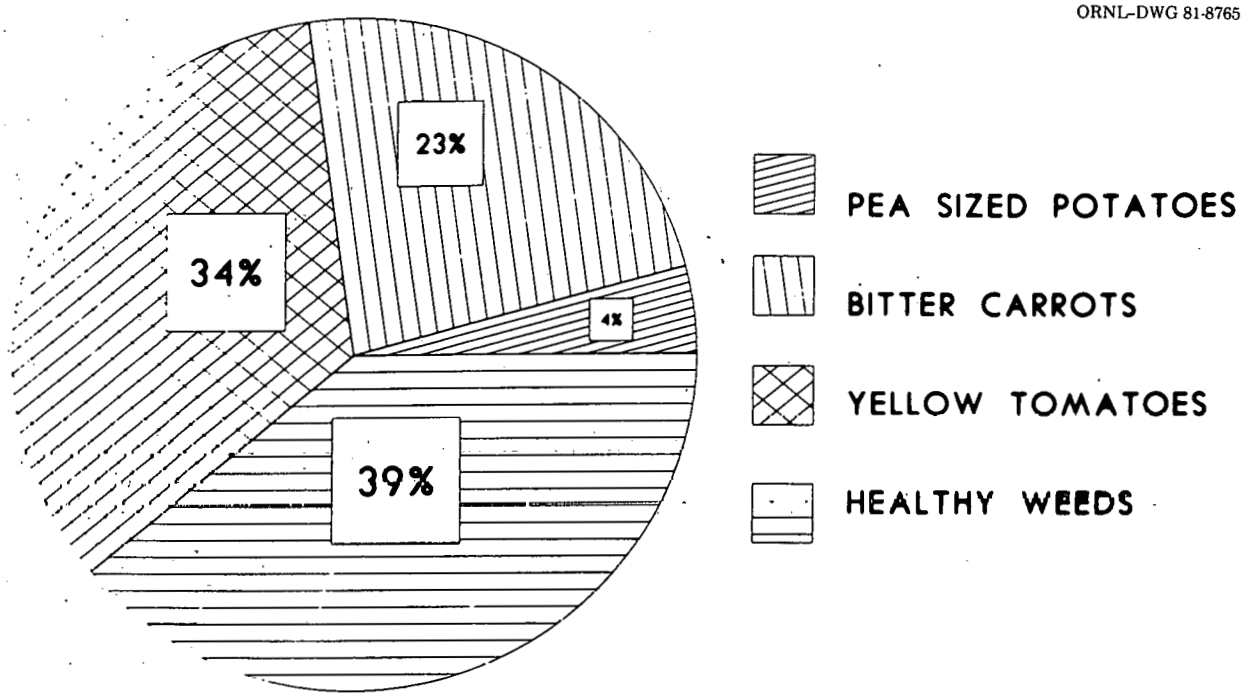
ORNL-DWG 81-8764

BY COMPARING FITTED CURVE (SOLID) WITH TRUE CURVE (DASHED), RELIABILITY OF ESTIMATES OF FITTED PARAMETERS CAN BE TESTED



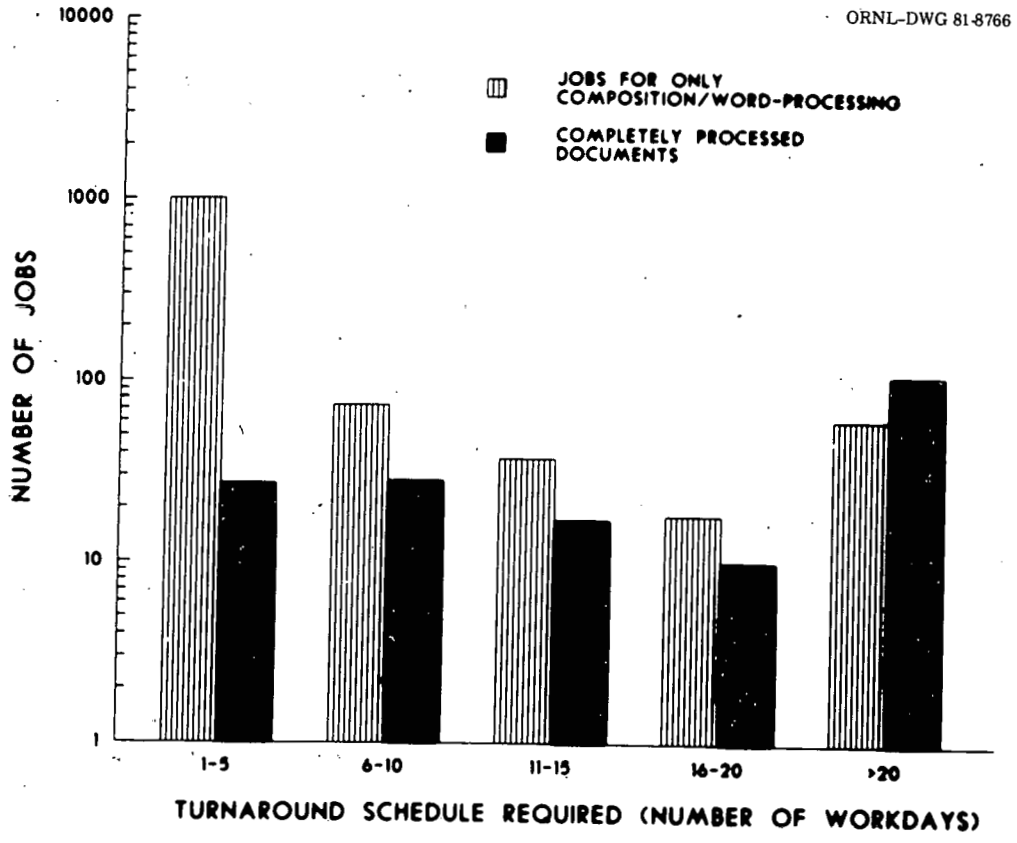
Slide 13.9

ORNL-DWG 81-8765

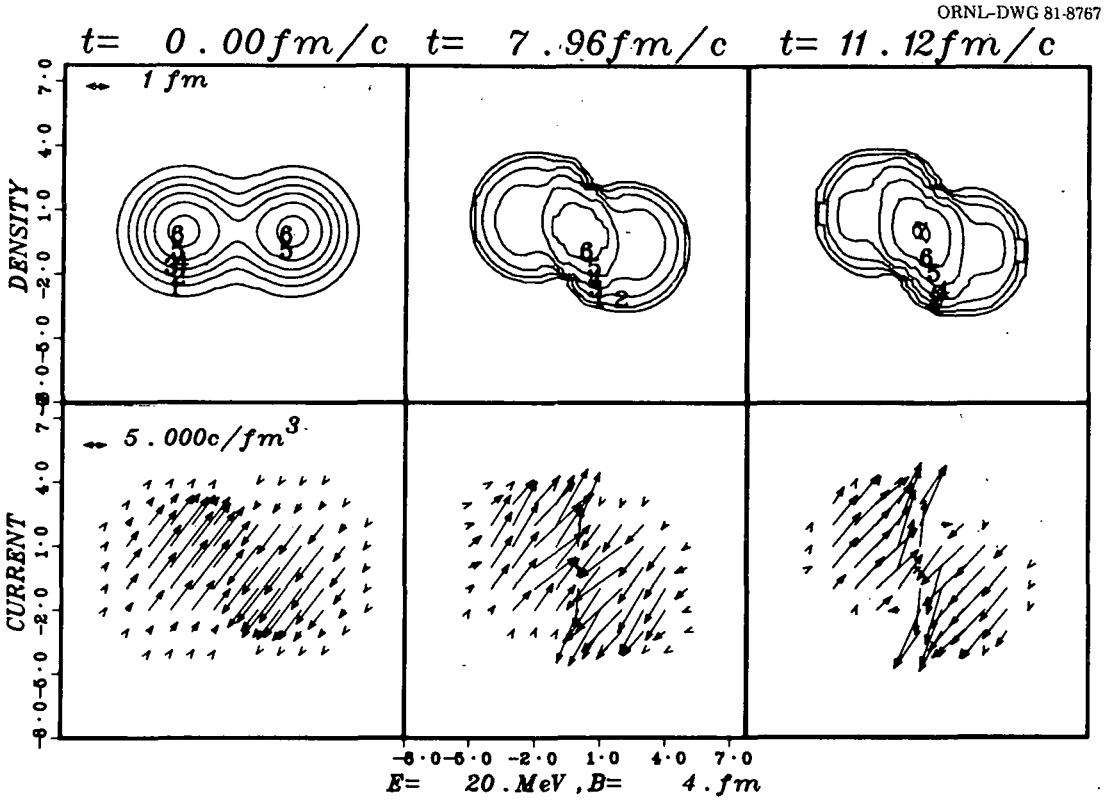


Slide 13.10

ORNL-DWG 81-8766



Slide 13.11



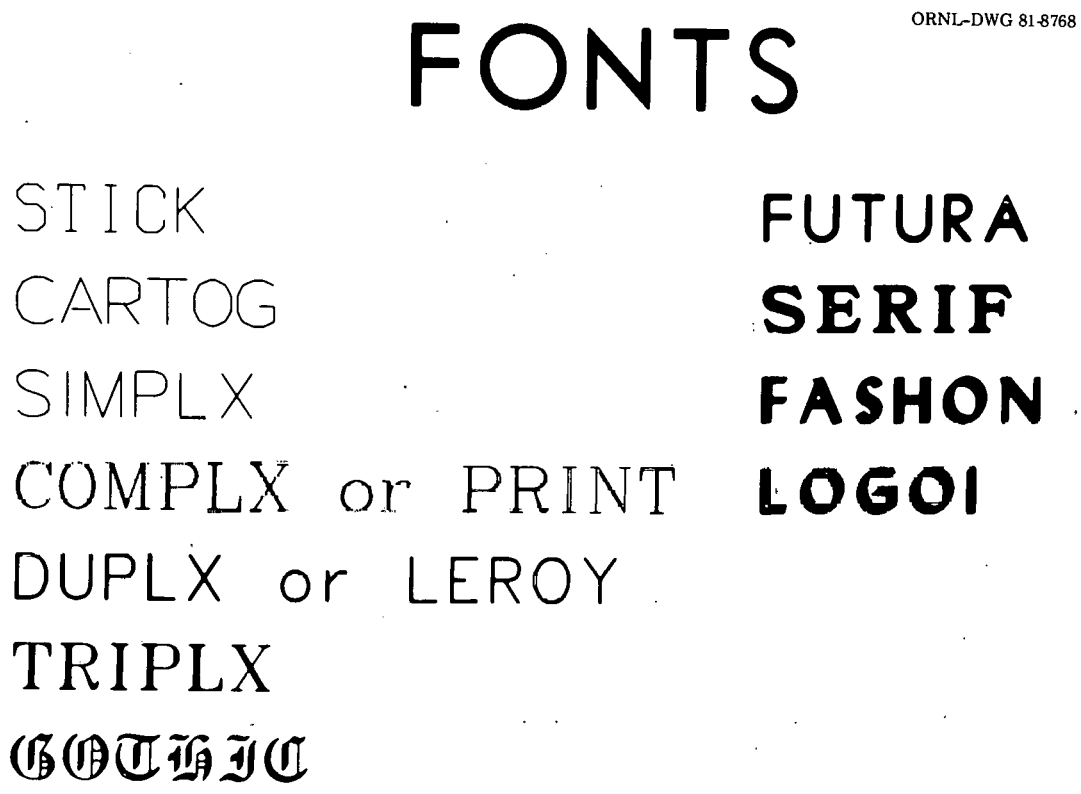
Slide 13.12

shaded (or left solid) by the user to any desired pattern. This technique is very useful in producing slides, viewgraphs, and posters. The letters in Slide 13.13 are defined by equations rather than being defined as a number of line segments, thereby enabling the user to achieve a smooth curve on all letters. For example, letters that are defined by an equation can be enlarged to 3 feet high and the curve will still be smooth; you won't see the individual strokes that make up the character.

In addition to different letter styles, there are also different alphabets (Slide 13.14). Most of the alphabets are not available in boldface because that is a recent addition. However, the user can choose capital and lowercase roman (the standard alphabet), capital and lowercase italic, script, Greek, Russian, or a special alphabet that has other symbols in it, including mathematical symbols. In addition to the five mathematical symbols shown in Slide 13.14, there are integrals, summations, products, and partial derivatives, many of the special symbols that are needed in doing mathematical equations. Also available is a very simplified Hebrew alphabet. I have heard rumors that a font of the Chinese alphabet is under development.

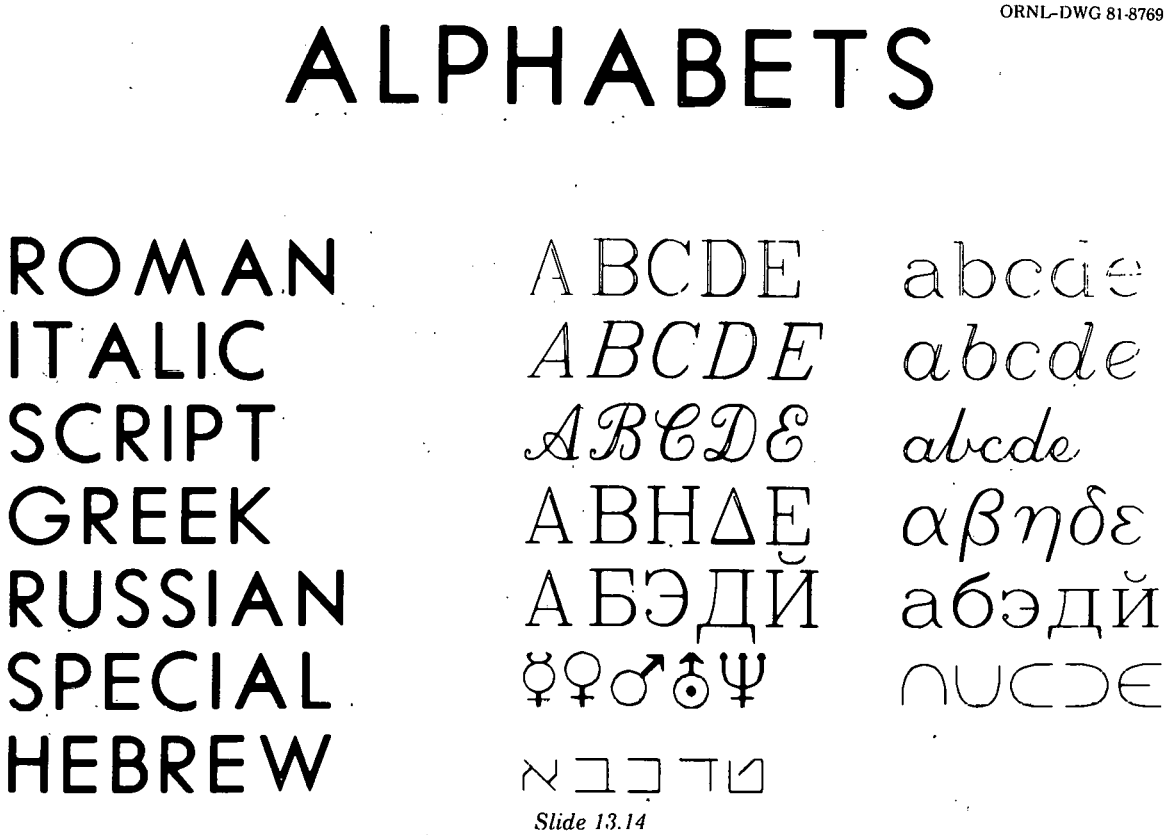
Having all these fonts available has created as many problems as it has solved. For example, if Slide 13.14 were shown to a group of computer programmers or scientists, they would judge it as really fantastic. However, if you showed it to a group of graphic artists, they would not have the same reaction; as a matter of fact, they would reject it. Currently, a problem with computer graphics is that fonts are being designed by computer programmers and not by graphic artists. Computer programmers think they know what looks good, but, unfortunately, they are usually wrong. Computer programmers—and I am a computer programmer—tend to pick the fanciest font available.

ORNL-DWG 81-8768



Slide 13.13

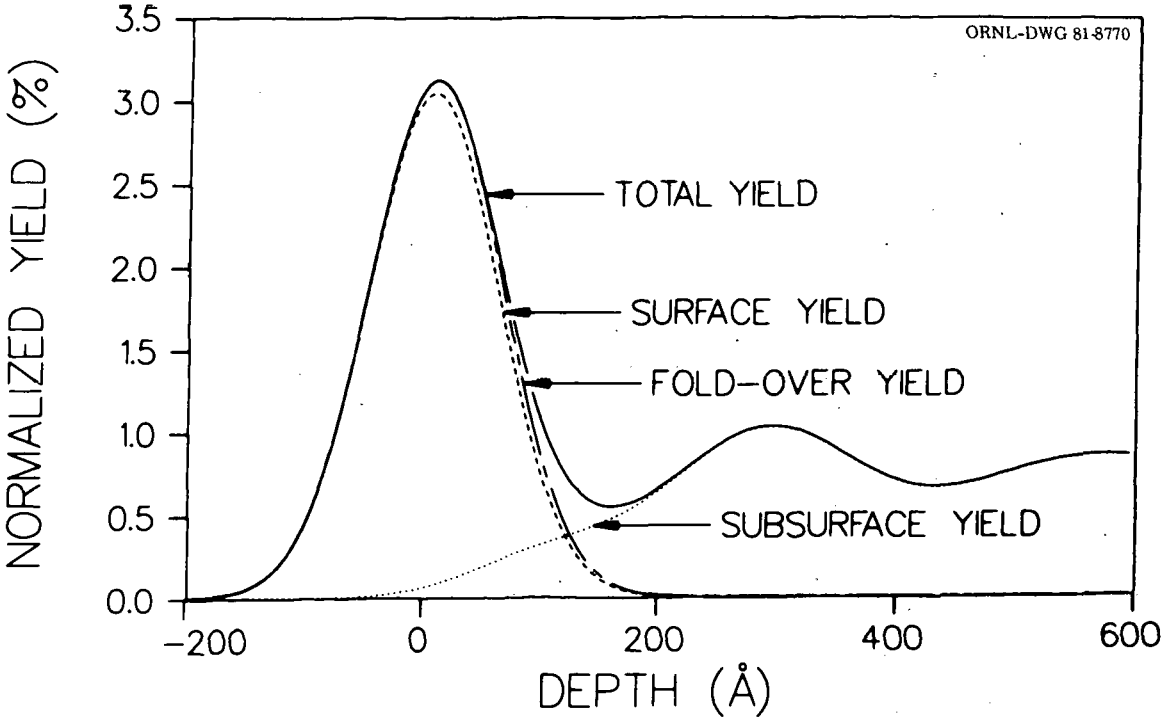
ORNL-DWG 81-8769



Slide 13.14

For the plot shown in Slide 13.15, we're lucky that the user did not choose Gothic type; a lot of people choose that to label their plots. Users select a very fancy font and add lots of labels, which usually are too small to read. The serifs on the characters make them very hard to read, and when you consider that the drawing has to be reduced to about 3 by 2 inches for journal publication, you can understand that it would be impossible to use. If you want a publication-quality plot, you want something that looks more like Slide 13.15—a simpler lettering style, taller letters, and fewer tick marks on the axes.

The user has to specify lettering style and letter height. Our problem right now is that our users are choosing the wrong things; it is a problem of education, of teaching them what they need to use and the fact that characters have to be made larger if they are to be reduced. This is one area in which we are working. We are getting a lot of help from the Graphic Arts Department at the Oak Ridge National Laboratory in determining what our users should choose. We are hopeful of making some progress in this area.



Slide 13.15

Another area in which graphics software has become more versatile is in providing more options to the user, more control over what the plot looks like. One of the options that has become available is the ability to draw almost anything the user wants instead of just picking the basic types of line charts, bar charts, pie charts, and three-dimensional surfaces. The user now has the option of generating something similar to what an engineering draftsman would draw; he can use different shading patterns.

Another option that has been made available is the use of company logos. Logos can be used to make more interesting title slides. Shapes and patterns of different proportions can be achieved easily with computer graphics.

The next user-controlled option that has been made available (on a limited basis) is the addition of color for slides. The user can add background color to an existing black and

white slide. There is not really much difference between a black and white slide and a color-background slide except that the color-background slide is, for example, white on blue instead of white on black. However, some people find color more pleasing. Monochromatic slides are easily made with the aid of computer graphics, for example, a title slide in one color hue and a background company logo in a lighter or darker hue—again, making a more interesting slide than the use of only basic text on a black background. Users can also select different colors as information-carrying variables on their plot. For example, red can be used on a periodic table to indicate elements that are naturally radioactive and green can be used to indicate elements that are naturally stable. However, red and green are not good choices for very small letters. Incorrect color selection is a problem with users of computer graphics. Users quickly learn that the brighter colors (e.g., yellow) are more readable. Color selection is the first step in using color in slides. Color choice is one of the reasons why computer programmers need to work more closely with graphic artists—to learn which colors project well. Color variation is made simple with computer graphics. The user does not have to redefine the plot to change a color; he has only to select a substitute color and then rerun the program.

The Calcomp plotter was used in our initial computer graphics attempts. The Calcomp plotter is restricted to two colors—red and green, both of which project very poorly. The "red-green" habit carried over into the FR80 program, even though the FR80 has many colors to choose from.

Another option available with our MAPPER software is selective rotation of a part of a plot. The MAPPER program "sits" on top of our other graphic software and allows the user to forego writing a computer program. Instead, the user writes a series of English language commands that describe what the plot looks like. It's very easy for the user to change options, such as rotating a part of the plot. As the user becomes more familiar with what is available, he can do such things as alter color and change the spacing on the shade lines to have the plot printed solid. Two good MAPPER color choices are cyan and yellow. Orange is a little dim but it is better than red or green.

As our users become more sophisticated in the use of color we hope to produce some guidelines for them, which should increase the use of computer graphics. We also hope to get higher quality plots.

Basically, what we have done is provide higher quality graphics devices and more versatile software. This combination should make it easier for people to access computers for graphics display purposes.

Jack Rich (Union Carbide Corporation): Is the Computer Sciences Division interested in getting into graphics at the Oak Ridge National Laboratory or is the Information Division to control the graphics?

Ms. Clark: The Computer Sciences Division is not interested in producing plots; we would much prefer to provide the tools and let the graphic artists and other people do it. We have had many requests from other divisions to do slides and drawings for them, but we don't want to honor these requests because we are not trained in layout. We do not know what looks good. We just know how to get the program to do what we want. What we are working toward is trying to provide tools for everyone else. We would like to see the Graphic Arts Department take over the computer graphics.

Jack Rich: Will on-the-job training be sufficient for teaching graphic artists, or will classroom instruction be necessary?

Ms. Clark: On-the-job training would be sufficient. We have several people already, who have no computer background at all, that we have taken in, and in less than one week they are becoming proficient; there are no prerequisites. It does help if you know how to use the text editor on a terminal; that is simple, but we also have people who just punch it out on keypunch cards. We teach three classes of about 1½ to 2 hours each, and by the end of one week's training, people are able to produce the things that they want. The new package called MAPPER simplifies the training—it was written at Los Alamos Scientific Laboratory and it is very easy to learn to use.

Dan Robbins (Union Carbide Corporation): I work in the Information Division at the Oak Ridge National Laboratory. One of our graphic artists is setting up a small computer graphics group so that employees can get this type of service.

Ms. Clark: We have also been working with a graphic artist from the Fusion Energy Division Publications Office; he has been learning how to use MAPPER. We have also given classes at Y-12 (Development Division) and we are getting ready to set up a group there. We have also had inquiries about it from the Y-12 graphic arts people—they are interested in MAPPER.

Sig Peterson (Union Carbide Corporation): One problem we have had with computer-drawn graphs in our publications is lack of editorial input. Unsuitable lettering is also a problem; to remedy this, we have used the very nice drawings and just stripped on new legends. Of course, you are now getting the capability to do very good lettering with the computer, but there is still a need for editorial input. I might say the same thing about our human illustrators. Sometimes, editorial input is needed before the drawing is made so that we achieve not only an attractive drawing but also compatible editorial styles and proper units of measurement.

Ms. Clark: That is one of the areas we are working on. We are trying to come up with a style guide for computer graphics. We are trying to find out what is required by the various journals and come up with a guideline on lettering style and character height. We hope to develop a publication-quality program.

Russell Utlak (Westinghouse Electric Corporation): What would a system like this cost to produce color visuals?

Ms. Clark: The system we have cost about $400,000. It was not bought for making color visuals, but now that we have it available we can use it for that purpose. There are other systems available that you can get color visuals from by making a hard copy from a color terminal; the cost is about $40,000.

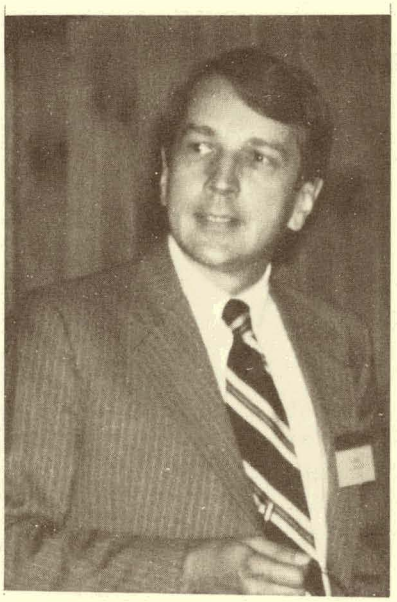
Russell Utlak: Is that a color print?

Ms. Clark: Yes. There is a device that has come out recently—the Dunn Instruments camera—which hooks up to a color terminal. You can get an 8 by 10 Polaroid glossy print from it, or, for about $4,000 more, there are options for 5-mm color negatives or 8 by 10 negatives from which you can make viewgraphs. Probably, your fastest option for a color viewgraph would be to use the 8 by 10 print and a color POS machine.

THIS PAGE

WAS INTENTIONALLY

LEFT BLANK



After graduating from Case Institute of Technology, **Don Hollo** joined the IBM Corporation as a systems engineer. He has held various positions with IBM: project leader of Computer Graphics Development, Systems Engineering Manager, and National Marketing to the Department of the Navy. Mr. Hollo is currently a Federal Senior Marketing Representative for IBM in Knoxville.

14. Justification and Evaluation of a Word Processing System

I'm with the Data Processing Division of IBM, which is located in Knoxville. We have several other IBM divisions represented in Knoxville: Office Products, Field Engineering, and the General Products Division. I would like to address how word processing fits into the overall data processing system.

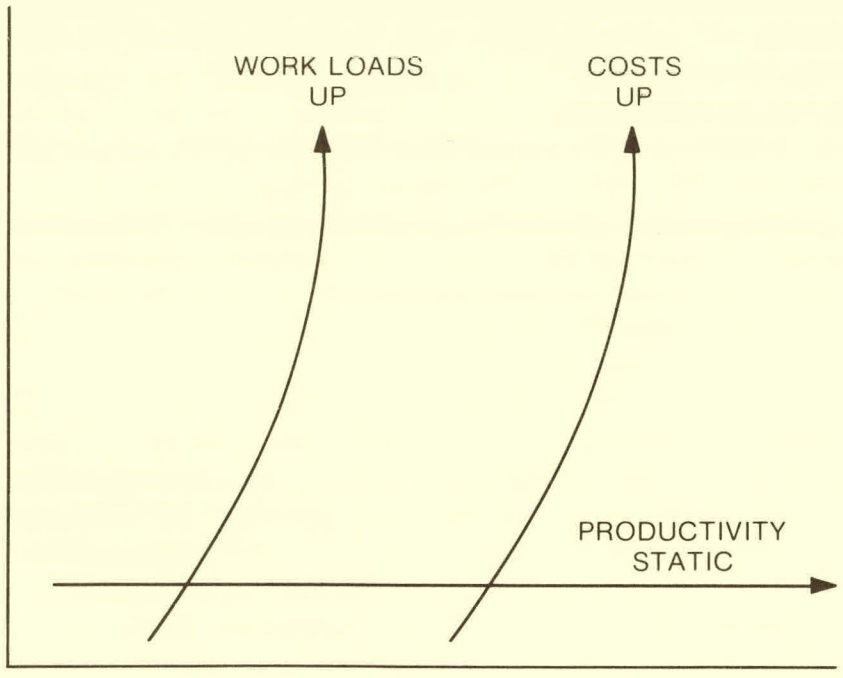
We have heard several speakers talk about the proliferation of word processing equipment, the number of devices, and the number of manufacturers. IBM's Data Processing Division offers the large centralized computer that costs from $1 million on up. We've seen technology develop small centralized systems that now cost in the area of $25,000. Therefore, the Division has become very interested in the office systems area. Why should we be interested? One reason is because the trade journals are predicting a growth in office systems. *Business Week,* for example, has indicated that office systems could very well be bigger than data processing in ten years. According to the U.S. Bureau of Labor, clerical employment will reach 20 million by 1985. Text-editing equipment purchases will equal $1.4 billion in 1980—a quote from *Quantum Science.* A prediction of 10 to 20 million interactive work stations by 1990 has been made. It is evident that the office systems area is going to grow dramatically. Advanced technology has been a significant part of the growth pattern. For example, a few years ago, computer terminals cost from $20,000 to $50,000 each. The current purchase price of a terminal is about $1000. Therefore, we are swinging closer and getting deeper into the office environment, in which normally we have not been too capital intensive.

What is an office? Simply stated, an office is nothing more than people: principals, managers, professionals, secretaries, and clerks, who are aided by equipment such as typewriters, copiers, and telephones. These people handle information such as text, graphics, data, voice, and many other different kinds of devices in order to complete a process: billing, reports, etc. Basically, this is all there is to an office.

Offices have realized a very low level in productivity—about 4% (Slide 14.1). Compare this with what has happened on the factory floor. Automation and miracle control machines have been responsible for increases of 40% in the manufacturing facility. However, extensive outlays of capital were made to provide these devices. Basically, the only automation we've seen in the office is the typewriter. Recently, we've seen the word processing machines, which have improved productivity in the office.

The cost of an office is increasing substantially. An office is about 70% labor and 30% equipment, for example, buildings, typewriters, etc. Contrast this with a production floor—a lot of the expense is devoted to the plant itself. Actually, the trend is moving more toward the office worker. For example, most people think of IBM as a manufacturing firm. But, about 51% of IBM's employees are office workers. We see the office-worker trend increasing from a 22 to a 40% national average. There are some technological trends also: product costs will probably be reduced by 10 to 20% per year and the cost of labor increased by 6 to 8% per year. For example, some large-scale systems that sold for about $2 million a few years ago are now available for about $100,000. That's a very dramatic increase.

Now, let me address some ongoing and potential activities that can occur in an office environment: reservations, funding requests, doing an appraisal, control guidelines, and various kinds of training programs—for example, to be able to sit down at a computer terminal and go through a training exercise. The expense that IBM incurs



Slide 14.1

for sending its employees to school has become prohibitive. In our Data Processing Division, there are 50 to 100 courses we can take within our building; we can study the most current machines, the most recent software advancement, and new branch office procedures. Still, there are many times we have training sessions at remote education centers. Short courses, however, can be conducted within the office.

Another office problem is inefficient distribution of mail; we still use the same mailbox technique whereby you send a memo from one department to another (perhaps three buildings over). The memo may take as much as four days to arrive.

Security is another issue we need to address. The need for gaining access only to your own information on a computer system with security codes—the use of crypto-type techniques for security purposes. The office is probably one of the poorest areas for an audit trail. It is basically impossible to audit in an office. The increasing amount of paper work and paper flow are beginning to burden the office.

The Data Processing Division has conducted office systems studies, both within the division and also in cooperation with many large companies. We've studied organizations to determine what an office is and how it operates. Some of the study findings reveal an unequal administrative work load, certainly an excess of information flow: the inability to move information from department A to department B expeditiously. Redundancy and duplication of files are a problem. Not all secretaries file in the same way; therefore, one can't find information because of the other's setup of the filing system. Cross indexing by subject matter and author has been a problem; for example, a single copy of a letter may be filed in six different places to expedite access.

The functions that occur in an office are many. I will just mention some of the functions and tasks: keeping calendars, filing, proofreading, and reading. These are tasks that an office assistant would have to provide for the principals, managers, and secretaries.

There are many data bases that exist in the office, some of which are organization charts, appraisals, schedules, supplies, and inventories. Lack of automation has necessitated that these types of data be kept in file cabinets and through manual procedures (the use of typewriters).

Several things determined in a work-flow efficiency study are how people actually perform a task, how they allocate their time, and whether a particular feature or function is to be automated. Secretaries, for example, spend 20 to 40% of their time typing (Table 14.1). Primarily, word processing devices address the typing activity; therefore, it's only a very small portion of a small job that has to be done to automate the office and thereby maximize its productivity. Other tasks performed in the office are mail handling and making copies.

As the secretary serves more people, the more the task of typing increases—perhaps as high as 48% (Table 14.1). But, again, typing is only a small portion of the overall task to be automated. Managers and professionals spend a good portion of their time in planned and unplanned meetings (Table 14.2). File searching and retrieval consumes a moderate amount of time—just looking for past letters or a piece of documentation. The reason Table 14.2 was compiled was primarily to get a feeling for how people spend their time

What kind of system should we develop to provide assistance in the office area? Some of the key assumptions that we have made are, first, you have to provide a work station for everyone. There are terminals located in the lobby [conference equipment exhibit—Ed.] that are specifically single-task oriented—primarily toward word processing. Some sort

Table 14.1. Secretarial activities

	Staffing ratio, secretary:staff supported (%)				
	All	1:1	1:2 to 3	1:4 to 9	1:10+
Typing	37	20	35	45	48
Mail handling	11	13	10	10	10
Conferring with professionals	4	7	5	3	2
Keeping calendars	3	4	3	1	1
Taking shorthand	6	8	6	4	5
Telephone	11	12	11	10	9
Copying	6	6	6	6	10
Filing and retrieval	7	7	8	7	4
Proofreading	4	5	4	4	4
Writing	4	3	4	2	2
All other	7	9	8	8	5
	100	100	100	100	100

of device or station would have to be provided to the individual to make it effective. For example, how effective would a telephone be if only one out of ten people had a telephone and you had to walk X amount of distance to get to a telephone? The reason the telephone is such a convenience is that it is positioned for immediate access. So we're really envisioning a very low cost work station, which would have multiple kinds of devices attached to it. This station must interface with the data processing system. In other words, for this device to be effective, it has to communicate not only within the office but with the office next door, with the next plant, and even, perhaps, with other companies. One of the keys of this device is its having to be a broad communications device, to serve purposes other than the task of word processing. The device will have to be able to assist managers and workers in their daily activities. I'm talking really about office systems; I'm not talking about specific problems. Many of them don't even exist at

Table 14.2. Professional activities

	Percentage of time devoted to activity by:			
	All	Upper management	Other management	Non-management
Meetings	12	22	12	7
Travel	6	13	6	2
File search and retrieval	11	6	12	13
Writing	16	10	17	18
Telephone	12	14	12	11
Reading	7	9	7	6
Planning	4	5	6	3
Mail handling	4	6	5	3
Using equipment	4	0	2	10
Dictating	3	6	2	0
Calculating	7	2	6	10
Other	14	7	13	17
	100	100	100	100

this time. But we have to provide a rate of return to improve the productivity of the secretary, the principals, and the managers to make such a system pay off.

Let me now address some of the equipment design objectives at IBM. IBM has developed several prototype systems that are not yet marketable. In our research environment we have created office-type systems and are determining what the functional capabilities of different systems are. One of the things we are going to have to do is speed up the communications process. We have to eliminate this three to four days it sometimes takes to move a memo from one office to another. We also have to gain and improve access to information, for example, being able to sit down at a terminal and access a branch office manual, tap into the library directory from a terminal, and generate a keyword index.

The ability to manage information is also needed. The computer has generated so much information (reams of paper) that it can no longer be managed effectively. Some of the speakers here today have reviewed some specific functional capabilities. Let me speak generically, instead of specifically. One of the things we are going to have to do is to develop systems that will capture the document itself. Some of these system take the form of magnetic card devices; others are OCR scanning-type devices.

In addition to "character" scanning devices, we also need systems that will store engineering drawings in a scan fashion. The state of the art is essentially the recognition of a printed character and the transformation of that into information that a computer can understand. We have to convert into text the coded information that some of the other speakers at this conference showed you. We then have to create indices so that we can retrieve this information. We have to develop the cross-reference indexes, the key word in context, or abstracts to be able to easily retrieve a filed document or letter.

Document creation is an area that is currently undergoing expansion. The CRT devices are basically used to keyboard coded information into a computer. The coded information provides functions such as automatic hyphenation and automatic spelling checkers. These are the types of functions that will have to be performed, and vendors will need to provide these and other functions in the development of office systems. More definitively, document creation is the ability to edit computer-stored information—move copy, delete it, manipulate it, and annotate it.

We have to have the ability to distribute and acknowledge receipt of the information that we get. We have to have the ability to send messages. There are many experimental systems for sending and receiving messages. For example, the one I mentioned earlier—you come to your terminal in the morning, ask for any mail received, and take a look at all the topics and their response dates. Electronic mail is one area that will speed information flow.

One of the things that we are experimenting with in our Yorktown facility is voice response—the ability to speak and have a system recognize your voice. Each of us speaks with a slightly different variation or voice slant and may at some date go to a computer terminal, speak into it, and, because of our unique voice print, be able to gain access to our information. We have some message-routing kinds of systems. We digitize the voice, record it, send it to the computer; we then have the ability to, again, like your messages, call them back and hear voices that have been stored in a digital form.

Distribution and receipt, another category in a transmit, documents the fact that you received a transmission and when you plan to acknowledge the particular item(s). Another office system concept is the ability to access airline schedules and telephone

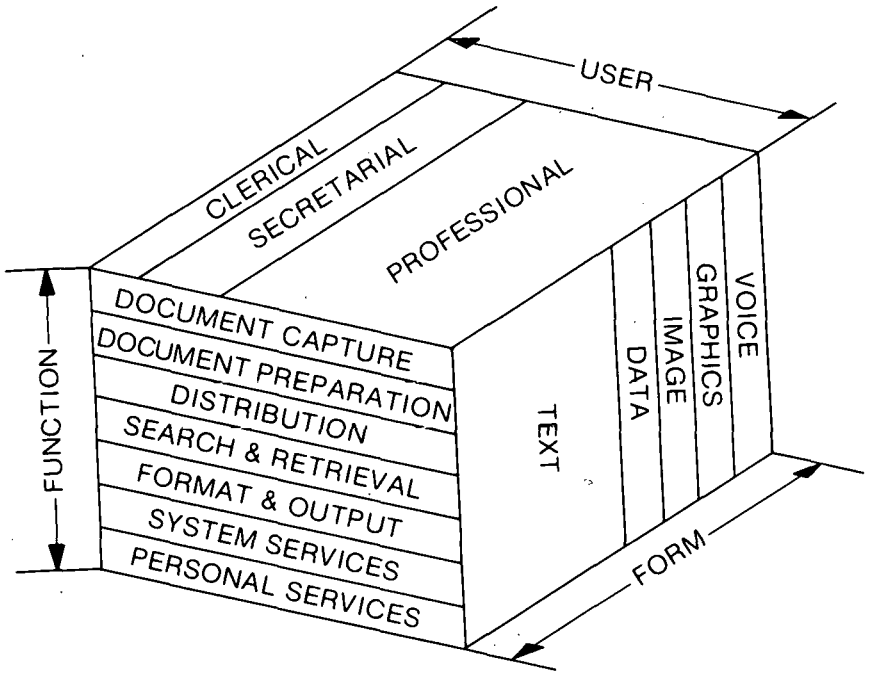
directories. Another function that has to be provided is file search (retrieval of stored documents). For example, ten years ago, it was possible to read all the abstracts of IBM manuals—I read the abstract of everything that came to my desk. There are now so many new manuals coming out that it is impossible to read even the abstracts. We have a system in the office that allows us to go through a series of searches to find a document or its abstract, or we can review the complete document or the abstract by accessing a microfiche reader in the office.

We've seen many forms of output today—especially in the graphics area. However, once that output has been captured, we have to provide multiple ways to display the data, either in graphical or audio form. Some of these display devices are already on the market. There are all types of security devices: cards that magnetically read the magnetic strips on a card, keys, crypto, and voice print. We need to improve the overall security of the data that we've accumulated. We need accounting-type data—for example, how many documents we've prepared, how many are in progress, and how long they are. Again, we have to provide access to a centralized computer where all these data are stored. We have to provide some degree of personal services, for instance, the mail log and maintaining calendars and schedules. How many telephone calls does it take your secretary to schedule, for example, a ten-person meeting? It may be that she could get 80% on a given day, 90% on another, 30% on another; the phones calls back and forth become rather difficult. It you are scheduling for a month ahead, you may achieve this fairly easily; but if you are trying to schedule for the following week, it becomes a very large chore in communications. With our system, you could call up a calendar of every person that you were interested in to see if they were free on the date you wanted to schedule a meeting. These are just some of the experimental systems that we have been working on in our facilities in Yorktown and Lake Plains.

The aforementioned are some of the overall functional capabilities that have to be provided for an effective office system. The system resembles a three-dimensional matrix (Slide 14.2).

A conceptual configuration of an office system in shown in Slide 14.3. Basically, the system operates from a centralized processor (a machine that some large corporations have), but it uses small distributor systems. This is probably the area in which technology has been most productive: the ability to have an intelligent function located in the office rather than having to tie in via a telephone line. In most of the early entries into text processing or word processing, the intelligence always resided in the central computer room, and the terminal was used to access the centralized file. Current word processing systems that have all the intelligence in the office cost about as much as did the terminal five years ago.

The system itself, which taps into the centralized facilities, does all the things that the big system does: for example, archival storage, the ability to store information. Computer on-line storage costs now match the cost of maintaining a filing cabinet. In the past, on-line storage was very expensive. Now, a megabyte of data stored on a centralized computer costs only pennies per month. This cost is really approaching what it would cost to maintain a filing cabinet and all its stored multiple copies. The centralized post would store all the large documents, and the small distributor system would serve as the work station or the input device that would have the scanners, the mag cards, and the input and output devices. The centralized computer would contain the limited storage required to do the operation for the local office, and then there would



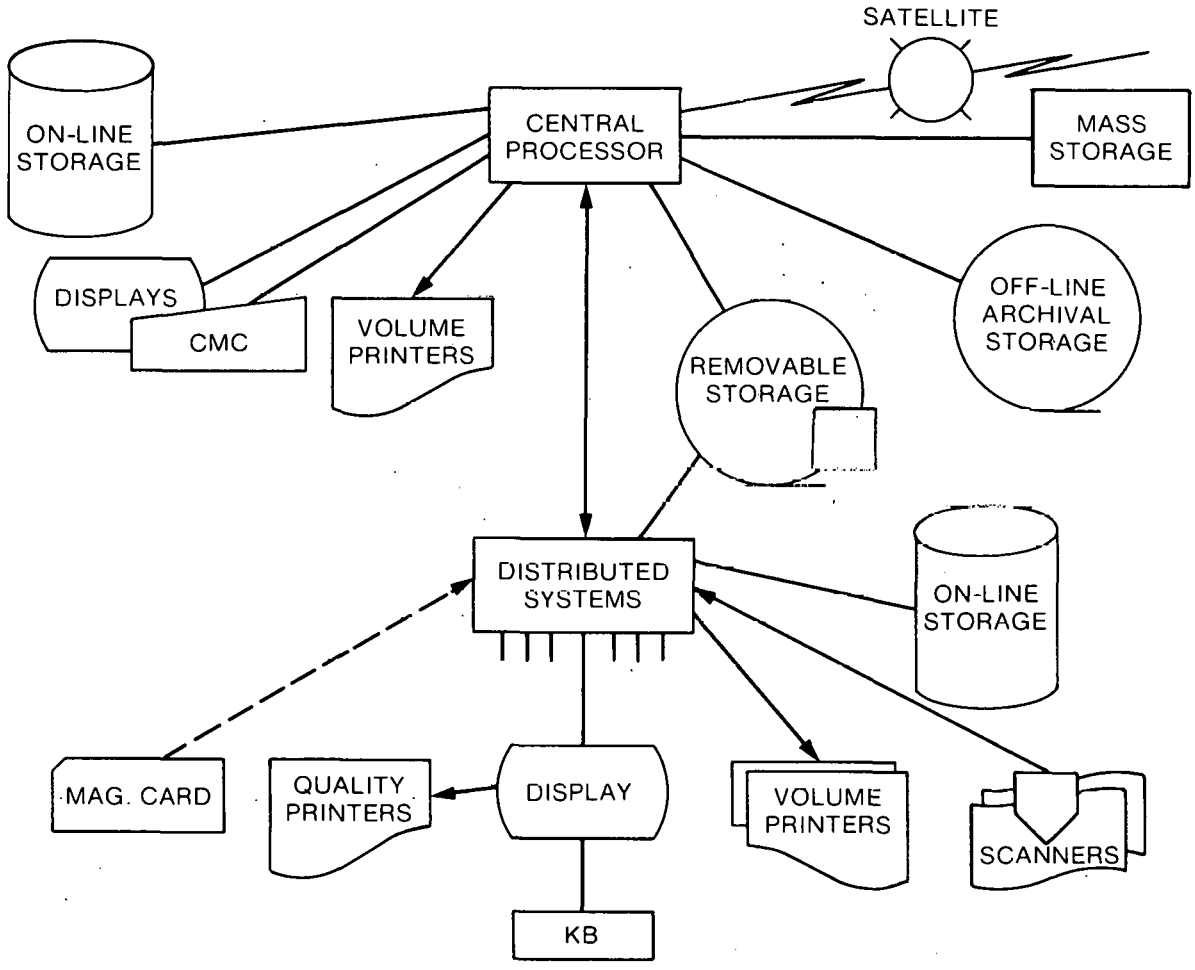
Slide 14.2

be communication back and forth. And, again, the large host computer would probably do the message switching and transmission of mail between offices via a small satellite system in the office.

What kind of potential savings are we talking about? Very little savings would be realized in the area of professionals because we would only be attacking the minimal areas of the professionals' time—devoting a little more time to creativity. Preliminary studies show that perhaps a 10 to 20% productivity increase could occur by transferring the professionals' administrative tasks into the system. We have attacked the clerical the most. By reducing the clerical effort, 25 to 40% productivity gains are now possible; in the secretarial area, perhaps about 30 to 40%. As these products become available, these percentages are the potential kinds of savings that can occur for the various types of people in the office.

Many companies, including IBM, have a very extensive communication network. The network ties all the plants together, and administrative systems that have terminals are tied to a centralized computer. The telephone lines we use daily could be used to transmit mail between branch offices and plants. We are just now beginning to use the telephone as such a device. For example, our internal message system uses the communication lines primarily at night. If I wanted to send a wire, for example, to the San Jose Plant and tell them to check on a particular schedule, I could key the message in during the day; the local system would store the data on the local disk and then send it at night when the communications lines were not in heavy use. There are many kinds of savings that could occur in the office. We've just talked about a few of them.

The office systems approach is nothing more than developing an office strategy to determine the direction of the office. What is the office function? What kinds of services does it provide? Is it to improve the quality, for example, of output? Is it to improve response time—instead of handling customer response in three days, is it to handle the response in one day?



Slide 14.3

An overall strategy for the office should be developed to determine whether it should break even or merely maintain the current head count with the increasing demand for greater work load. Possibly, it is to maintain the current head count and still handle the work load.

A company should develop a pilot program before it jumps into a particular program full steam ahead. It's the same thing with word processing; create several pilots and try different methods to make sure that you are selecting the correct one. The involvement of top management plays a key role in developing an office system. For example, our data processing and administrative departments have to work together to develop a viable office system. The secretarial word processing area, because of the many devices there, is a good area in which to begin a pilot program.

What I have attempted to do in talking about office systems is to broaden the scope and put word processing in perspective. Too, I have shared with you some of the studies that IBM has made of the office concept—to give you a glimpse of the future. I have discussed the kinds of devices that will be coming on the market in the next few years. The thought I'd like to leave you with is to be sure to develop a plan in whatever method you pursue with word processing technology.

Thomas R. Diaz is a software publications supervisor for Digital Equipment Corporation, Marlboro, Massachusetts. He has worked in technical communications since 1972 as a technical editor, technical writer, and publications supervisor. Since 1976, he has produced software documentation for Digital's Laboratory Data Products Group. His group's documentation on the MINC-11 computer system received the award of Distinguished Technical Communication from the 1979 International Technical Communications Conference.

15. Getting It Right with the Designer

I am going to talk about the role that technical writers play as part of the design team for a new product at Digital Equipment Corporation. I hope this discussion will be useful to all of you who work with engineers, in whatever capacity. I believe the audience here contains both technical editors and course-development people, and I think that, regardless of your particular role, you share many of the same principles. We are all technical communicators, and we all have to work with engineers on new projects.

In recent years, several factors have combined to change the role of technical writers—probably forever. Among these factors are (1) the growing complexity of software systems and the consequent need for readable explanations of them; (2) the growing importance of software in an industry that was initially more concentrated in electrical engineering; (3) the expansion of the computer market to include technically unsophisticated users as opposed to the highly educated, highly skilled users of the past; (4) a growing recognition that literary excellence requires special skills and training; and (5), a very important factor, technological changes in writing and publishing: word processing, computer graphics, and so forth, many of which you have heard discussed here this morning.

The technological changes in writing and publishing have both direct and indirect advantages for technical writers. A direct advantage is that writers now generally have much better tools than did their predecessors: computer text editors, indexing programs, word processing systems, and computerized typesetting. If these tools are used wisely, the writer can produce a manual much faster than in the past, or alternatively, can rewrite and revise a manual several times in the same amount of time formerly taken to write a single

draft. This is a subtle point that is often overlooked. When we at Digital were still developing our in-house systems, some of my managers said that they were disappointed that it still took as long as ever for writers to get their work done: It still seemed to take the same number of months to write the same number of pages. But, I believe the point being overlooked was that the writers were writing, refining, and revising in that period of time. They had written a manual, thrown it out several times, and rewritten it, which I consider a very good procedure; they would not have been able to do that with a less flexible medium like typescript or pen and ink or whatever.

An indirect advantage of these technological changes is that writers learn to use these tools, especially to use them creatively, and become relatively sophisticated users of computer systems, in many cases, users of the same system they write about. These tools are increasingly available to technical writers, and they are benefitting directly and indirectly.

In computer-related consumer industries such as Digital or in computer industries that sell directly to end users, there is the additional and sometimes overriding factor of customer demand. Well-informed customers will not purchase a poorly documented computer system. The computer market is now diverse enough and competitive enough to give customers the ability to evaluate documentation as well as other system properties. In many cases, the competing hardware and software systems are fairly similar in price and performance, and, in some such cases, ease of use and documentation quality can become the primary criteria of the customer.

It might interest you to know that Digital discovered from some market surveys about four years ago that this was, in fact, the case, and that their products were being rated by customers against those of the competition, primarily on documentation quality. That realization created a number of changes within the corporation, mostly to the benefit of technical writers, as you might expect.

These trends have raised the visibility and importance of software documentation to very high levels in such companies as Digital. Digital has for several years been involving software publications groups, which are, in many important respects, equal partners, with software engineering and marketing. The company's approach to organization in general, and software publications in particular, is an interesting topic, but it is really beyond the scope of this discussion. The relevant topic is our actual relationship with software engineers and designers on a project. We've derived many benefits from our style of organization in the way of professional development, computer resources, and the management of writers and writing issues by people who are professionals in the field. Nevertheless, we are part of a larger corporate society that does not and would not exist solely for the sake of writing good documentation.

The relationship between writing and software engineering at the level of the individual contributors and supervisors, the area under discussion today, is one that still calls for as much energy and creativity as ever. The writer must understand the fundamental nature of the software system at Digital, even when the scope of his or her job is limited to only one aspect of the system. There are many acceptable ways to distinguish between junior and senior technical writers, but it is not acceptable to make the distinction on the basis of breadth of knowledge. The people who hire and manage software writers must commit themselves to educating new people about their technical environment, regardless of their probable assignments or seniority. It makes sense to give the most

difficult jobs to more experienced writers. On the other hand, no manual is easy to write when the writer misunderstands the general purpose of the target system.

Virtually all major software development projects have a rather protracted phase of design and definition. The participants in this phase spend most of their effort defining and redefining the precise requirements of an eventual software system, and this process usually requires that the participants learn at least some aspects of fields entirely outside their formal training and experience. For instance, there are very few software design experts who are also nuclear engineers. If the task ahead is to automate a nuclear fuel factory, the engineer should be spending most of his time in this phase learning about the factory's current operation and talking to operators, nuclear engineers, and other users who have specific knowledge about the operation. The designer's software expertise has relatively little to do with this process unless the requirements of this factory immediately create the need for some radical innovation in software technology. To summarize, this process, which is more properly called analysis in design, is a careful and detailed study of the user's requirements and is divorced from specific software techniques or implementations. At least that is the way it should be; however, software engineers may be so eager or so pressed for time that they plunge directly into the system design with few or no discussions with actual users. Generally that happens because the product has to be developed quickly and people aren't sure that they can afford the time for all that discussion. Corporate security in consumer industries and in end-user industries is another big concern; the computer industry is very competitive and in many of the cases where that kind of discussion with users would be most useful to writers and engineers, it is impossible, for security reasons, for them to tip their hand to the public. So, people do the best they can to construct a model of users or to speak in terms of the general audience and try to do the design from that point. Unfortunately, a frequent result is an expertly designed and beautifully constructed system for users who don't exist. It is at this point in the old dreadful scenario that a technical writer used to be called in to construct an interface between the system and disgruntled users who couldn't understand how it worked. Writers' efforts at this stage are rarely successful. Fortunately, the standards for software design are improving gradually, and we can hope for the eventual disappearance of such problems. Meanwhile, these circumstances still occur and have to be dealt with; I will discuss them and some possible solutions later, after we look at a more ideal project.

After the analysis phase, after the definition of users' requirements, the actual design of a system converts those requirements into a plan of implementation. This plan may be called a project plan, a design specification, or a functional specification, but the analysis determines what the users want and the design specifies what they get. If possible, the whole writing team, or at least a representative, should participate in both the analysis and design of the system. Just gaining the acceptance of the participatory role is a major undertaking, but for now I'll limit the discussion to its technical advantages and disadvantages. The advantages of writers participating in this kind of thing are pretty straightforward. First, writers experience at first hand all considerations that affect the design of the system. These discussions make up a fine level of detail that exists in all projects but is rarely documented in a specification, such as the user's requirement that is not implemented with or without his or her knowledge or agreement.

It simply is impossible to describe all the things that a system isn't going to do, and unfortunately those are often important to writers because they have to know what the

users' expectations are and say something about how a system is going to meet them. The writers are involved at a point when all members of the development team are absorbing and digesting new information. Although a general knowledge of analysis and design methods is important, there is no special advantage that accrues to electronic engineers, programmers, or writers in this kind of situation. Of course, being articulate and being able to think logically are important. Writers, by virtue of their training, can assist the entire effort by clarifying obscure and confusing statements and plans. Most engineers who work with writers in this kind of situation, whatever their initial feelings, will end up saying things like "Writers ask very good questions." That's because we are concerned about the recipient of the system—we're a kind of user advocate. Writers are introduced to other team members as people—professional people—at this earliest stage of the project. The first contact, therefore, does not occur late in the project when everybody is trying to get back on schedule. I don't think there is anything worse than getting a job and being introduced to the project leader, program supervisor, or whoever and finding out that this person is already a year behind schedule and doesn't really have time to talk to you. This is a very bad situation. Writers who participate in an orderly analysis will, in fact, learn the system rather than the software implementation, and there can be a number of subtle differences between those two things. If the design team maintains a good dialogue with the users, writers can hear their needs and respond to them with documentation written for the user rather than about the software. It may be, in a great many computer systems, that either implicitly or explicitly a certain user's requirement is not implemented in the software with the expectation that the documentation group will make up for it and will explain how to do a certain procedure, for instance, maintaining and cataloging word processor files. They will explain how to do that in an office rather than trying to automate the procedure. If there are expectations of that kind—that the documentation has to teach people things that the software doesn't do—it is good to recognize that at the beginning of the project because it is going to dramatically change the nature of the work the writers do. When writers get down to the business of documenting a system, and this is, I think, an important advantage, they will not blame all the inadequacies of the system on the software engineers; neither will the software engineers blame inadequacies in the documentation on the writers' misunderstanding of the system. It will be clear to everybody that all the teams members were there at the beginning and that all had the same information; the writers may have actually contributed to the design of a system that now is less than perfect. In general this is a good morale factor. It has proved to be a good way of avoiding that sort of conflict late in the project. Writers must be active contributors, not passive bystanders, throughout this process. It may be impractical for an entire team of writers to participate. In this case, the task should be given to an experienced person who has been adequately prepared for the job.

The writer's experience should include writing documentation on a similar system or at least a system of comparable complexity. The writer should also be familiar with current research and methodology on the field of design. Most of the available commercial courses on structural analysis and design are excellent preparation. They do not require intimate knowledge of software, and the principles involved can be transferred with relative ease to the analysis and design of virtually all complex products, including manuals. Most of the modern methods for analysis and design rely very heavily on written and graphical presentations of both user requirements and software design. The writers are apt to be the

most expert people on the team at producing and maintaining documents, and they should volunteer their services to the design team, at least for this purpose. This is a natural contribution for a technical writer to make, but it must also be made clear that the writer is not there to act as a stenographer or historian. To the greatest extent possible the writer should be a full participant in the analyses and designs. Engineers respect ability and creativity, and they will quickly overcome any misgivings about the writer's role if the writer actually contributes to the flow of ideas.

I'll give you a few comments and answers to some of the specific questions Don Caron raised about this topic. (Don is with Tennecomp Systems, and it was he who suggested my talk.) By what methods can the writer fully learn to understand the system so that he can organize the user's manual logically? How can he obtain the background information to set up the skeleton for the text? How does the writer balance the time spent in writing the manual with the time spent with the designer? What parts in the writing of a manual do the following tasks play: the writer's research of the system, taped interviews with the designer, and the designer's writing of an engineering report? And the last question, which, in many ways, is the most interesting one to me, is "Are there any tips for the beginning writer to help him gain the respect of engineers?" I'm not sure about the motivation for this question, but there are many different ways to answer it. My immediate response is to say that I don't think it a problem. That may sound naive or overconfident, but my general advice on that score is that I feel that writers and technical people in general—technical writers, technical editors—should respect engineers for what they do and understand that they face many of the same pressures to produce quickly and to not make mistakes. They are measured in many of the same ways as people in publishing. By the same token, I believe that engineers are experts who are hired to build things; for better or worse, they are not measured, in most cases, on their ability to be nice people or to communicate freely. We, the writers, are more in that category. So, without denying that I've had my full share of hassles with engineers on projects, I really must say that I don't think this question of significance to a beginning writer or a writer at any level. I believe that if writers understand what they are writing about, do it well, do it in a way that is clearly professional and special, they will gain the respect of everyone, especially of engineers.

I guess it is clear from what I've said, to answer some of the other points, that I place very heavy emphasis on the writer's research of the system as opposed to reliance on engineers to provide information. There is more than one way of doing that, and there is more than one point of view. Digital doesn't really have rules about the way writers operate in this regard. There are writers at Digital who would tell you that they are essentially literary people, that they don't want to be programmers, and that they can successfully function in the company. This approach requires that they demand functional specifications in very large volume and in great detail. My own bias is that writers who work that way spend most of their so-called writing time chasing technical details. Just given the nature of functional specifications and the fact that there are many details that just can't be recorded or are forgotten, I usually see writers who work in that mode spending most of their time in an engineer's office asking questions. You can succeed that way, although there is some question as to how much original writing, writing for the user, you are doing. It seems to me that if you are spending your time in that endeavor, you can't be spending much time carefully considering and reconsidering the way something could be best presented to a customer.

In that same regard, I've used and dispensed with taped interviews just on the grounds that the best answer to a complex question is not verbal. I may give away a little bias here again, but I do not think that engineers are necessarily the most articulate people in the world. The idea of going in and getting an engineer's voice on tape sounds like a good defensive move to me in that you could play the tape back and say "Ah, but you said this, and it doesn't work that way." However, if your goal is to get a correct description of the way something works, I'd suggest you find out how it works without asking an engineer. He may not have tried it himself yet, and you still wouldn't know.

The last point is about the designer's writing of an engineering report. If by that Don means a functional specification, that is very important. None of us could function without engineers producing some kind of description of their intended goal—their intended product. My comment is that most functional specifications are not organized in such a way as to be readily translatable into a users' manual. In fact, people at Digital who follow the corporate standard for functional specifications will produce a large document, but probably only 20 to 30% of it describes how the system is going to be built. Much of the other 70 to 80% is necessary to explain what the goals of the system are not; quite a bit has to be there to justify the spending of money on the project; and so on and so forth. So, functional specifications and engineering reports are vital, but they are not sufficient.

A couple of people here have suggested that technical writers are actually, or basically, editors in the sense that they are rewriting the work of engineers—a functional specification or something—and, quite honestly, that is often the case. It is not as true at Digital as at other places I've worked, but I'm not sure whether that is by design of the company or if it just turned out that way. Quite a few writers at Digital are former computer programmers for one thing, and there are some of us who just prefer not to work that way. But it can be done successfully, and in many cases the function of a technical writer is not terribly distinct from that of a technical editor. In fact, often the job description specifies writer/editor. So the answer is both yes and no.

One point I make about the relationship between writers and engineers is that physical proximity is important. One of the first companies I worked for, in that case as a writer/editor, was a software house that did contract work for the government. The building in which I was interviewed for the job was a beautiful chrome and glass model office building. The work seemed interesting, so I took the job. Then I found out that the hardware and software engineers and manufacturing people were housed in that building, and the training and documentation people were located in a sleazy converted warehouse several hundred feet away. I don't bring this up to complain about the work environment in a particular building; the point is that, in this company, the engineers and writers did not enjoy very friendly relations. I believe one of the reasons was that we were located in a department with training people and we all had very different jobs: The engineers were doing course development work for the most part, and we were mostly literary people. However, we became great friends, went to lunch together, got drunk together, and got our budgets cut and were laid off together. So, I believe the reason is simply that everyone in the company worked very hard, but the work of the training and writing people was not very visible to the people who were most affected by our job, namely, the engineers and marketing people. I believe that can be a very serious problem if there isn't the right kind of visibility to demonstrate what a professional group really does.

By contrast, Digital seems to have an unwritten policy of locating writers and others associated with technical publishing in fairly random places—anywhere a particular

engineering group has to be located. This arrangement does make it harder for the manager of a publications department, but I've seen it have the effect, sometimes for the first time, of showing people who aren't in publishing and don't know anything about it that people who do that kind of work work at least 40 hours per week. It can also show that if the project is in such a state that the engineers are behind schedule, this will affect the writing group—the writing group, just like everybody else, will have to work much more than 40 hours per week. It's largely a question of morale, and politics in a way, but I've found that sometimes the best way to convince nonpublishing management that a certain function in publishing is really necessary is to let them see the work going on, to let them see that they are getting what they paid for.

There was a discussion here earlier today about what can be done with word processing and text processing systems. I commented that in the hands of a skillful writer these tools are superior to other media, and I would like to give you an example. Most writers at Digital use a programming language called RUNOFF, which manipulates text, whereas most programming languages manipulate numerical data. This language, like most programming languages, allows a writer to construct conditionalized text, text that can be programmed to either exist or not exist, depending on a certain external condition. I am working on a manual that is programmed this way, and, by using RUNOFF, by changing a one-word command, it can be produced in alphabetical order (encyclopedic style), in chapters or sections, or another style. I don't believe we could do that on a standard typewriting system in the same amount of time. So, a word processing system, if it is good and if it is used skillfully, is not only faster but also much more flexible.

THIS PAGE

WAS INTENTIONALLY

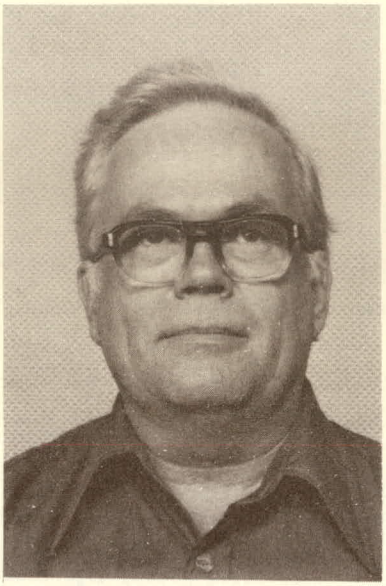
LEFT BLANK

The following paper, presented at the Second Annual Practical Conference on Communication (1978), is published here in response to the many requests we have received for it.

THIS PAGE

WAS INTENTIONALLY

LEFT BLANK



T. R. Walker is supervisor of the Composition Unit of the Central Publications Office in the Technical Publications Department, Information Division, at the Oak Ridge National Laboratory in Oak Ridge, Tennessee. His 34 years of experience in various aspects of typesetting and printing have included work for the U.S. Army, commercial newspapers, and typesetting companies. Mr. Walker has been instrumental in developing techniques for using computer capabilities in conjunction with typesetting equipment.

16. Typographical Terminology

Welcome to the world of typesetting. When I began my career in printing more than 30 years ago, most typesetting was done by hand; that is, each character was removed individually from a typecase, assembled in a compositor's stick, and transferred to a chase, which was locked by means of furniture, reglets, and quoins. The chase rested either on an imposing stone or on a form truck, also called a "turtle," which was on wheels. It was on the "turtle" that the locked-up type was rolled to the press for printing.

Many of the words that I have just used are probably unfamiliar to most of you—unless, of course, you have had several years of experience in the printing industry. To the printer, however, these words were as familiar and complementary as the combination of ham and eggs. A chase is a metal frame that was used to hold the type in place on the press bed. When placed inside the frame, the type was surrounded by wooden blocks called furniture and smaller strips of wood called reglets. Metal quoins—sliding metal wedges that were adjusted by turning a large key—were then locked tightly to hold the form in place. Pages of type were composed originally on tables with heavy stone tops—hence, the name stone. All these words were a part of the printer's typographical terminology, which for many years remained unchanged.

Then came the Linotype machine, which accomplished more rapidly the work done formerly by the hand compositor. Actually, it is not a typesetting machine, because individual pieces of type are not used in any of its operations. Instead, the process consists of assembling brass matrices, or letter molds, from the magazine into a line interspersed with spacebands, then sending the line to the casting mechanism, where the face is cast on the top of a bar of metal. This produces a finished line, or slug, accurately trimmed for

height and thickness and ready for use by the printer. With the exception of the assembling of the line by the operator and the raising of the assembling elevator, all actions of the machine are entirely automatic. By the 1960s, more than 100,000 linecasting machines had been distributed throughout the world, with matrices for more than 900 languages and dialects. Large headings were still handset, but all else had changed.

For years the Mergenthaler Company's Linotype machine, together with linecasting machines built by other manufacturers, dominated the printing industry both here and abroad. Then came the computer. Today, gone are almost all the Linotype and other linecasting machines, and in their place reigns the new lord of printing—the computer. The air is filled with new typographical terms such as cursor, configuration, and display resolution. Indeed, computerized phototypesetting is no longer a dream of the future. The "future" is now.

All these changes in the printing industry have resulted not in a replacement of previous typographical terms at each step of the way, but in an interweaving and pyramiding of both old and new technical terms. The result has been a breakdown in communication between those steeped in the terminology of the past and those just becoming acquainted with the typesetting practices of the present. Without a bridge to span the changing currents in communication, it is little wonder that some frustration has been the result. Let's cross that bridge together and, at the same time, take a look at the world of tomorrow.

Although almost all the words that were used years ago still have basically the same general meaning, no clue is found in their spelling that would unravel their usage today; for example, current usage of the word "quad" is not at all like that of the past. In the early days when type was set by hand, quads referred to the blank elements that were used to fill in at the end of a line of type. All lines had to be the same length; otherwise, when a page of type was picked up, the short lines would fall out. Each line had to be tightly justified. Thin spaces and quads of 1- and 3-em widths were used. Today, when a compositor says that a heading will be typeset quad center and that all the text will be quadded left to achieve a ragged-right margin, he is still speaking of spacing, but pieces of type metal are not used to achieve the desired result. Instead, a line of type is positioned, usually automatically, in a certain place on a page.

Suppose a compositor receives a manuscript to be typeset. The instructions are: "Typeset in Times Roman, 10-point type, with a 28-pica line length and 14-point leading. Indent all paragraphs 2 ems, and justify all text. Set all heads bold and centered. Keep the galleys under 12 inches in length." Do you understand these instructions? Several of you probably know exactly what is going to happen to the type, but do you know why those particular words were used? Let's examine the origins and meanings of some of the more commonly used typographical terms.

What is a type font, such as 10-point Times Roman? A font is a complete assortment of characters—letters, numbers, punctuation marks—that makes up a branch of a family of type. Later I will discuss, in depth, type classifications and families.

The next instruction was to use 10-point type. All type is measured in points. One point equals about $^1/_{72}$ of an inch, which is the smallest unit used in the point system. Line lengths are always designated in picas; 1 pica is equal to 12 points. The manufacturers of type in the early days had no typographic standards, no uniform measurements. Type from one manufacturer was not compatible with that from another. Typsetting was almost

complete chaos. In 1764, a French printer devised the point system. His standard point was not the same as that used today, but his was a major step forward in clearing the confusion. However, printers in the United States were slow to accept change, and it was over 100 years before the point system came into this country. In 1878, a major type-manufacturing company lost all its equipment in a fire. When they started rebuilding, they adopted the point system. By 1887, the United States Type Founders' Association had adopted 0.01384 of an inch as a "point." This is still the standard.

We have established the typeface to be used, the type size, and the length of the line. The next instruction specifies 14-point leading. Whether type was composed by hand or typeset on a Linotype machine, it was necessary to place some form of spacing between the lines of type. Generally, this is a thin piece of type metal, either 2 or 3 points thick, called a lead. Thicker pieces, 6 points or more in thickness, are known as slugs. These leads and slugs are cut to standard lengths and stored in racks. The thickness of the lead, combined with the number of leads used between lines, is known as leading. This term is still used to indicate the amount of space between lines. Fourteen-point leading means that the distance from the base of one line to the base of the next line is 14 points. Ten-point type on 14-point leading means that 4 points of white space exist between the lines.

"Indent paragraphs 2 ems." What is an em? This is a square of the type size being used, such as 6-point, 10-point, 18-point ems, etc. You may hear someone use pica and em interchangeably, but they are incorrect unless they are talking about 12-point type. The term "em" originated at a time when the lowercase letter "m" was cast on a body with dimensions equal to the type width. This is not always the case today. Remember, an em is always as wide as it is deep. We speak of em, en, and thin spaces. An en is one-half the width of an em. All arabic numerals are almost always the same width as ens; thin spaces equal the widths of periods and commas—also designed, of course, to aid in typesetting tabular work. Two thin spaces will equal an en in most fonts.

"Keep the galleys under 12 inches in length." What are galleys? Galley is a word that is heard often. A galley originally was a metal pan, which was usually 20 to 24 inches long and varied in width from perhaps 10 picas wide to the width of a newspaper page. Made of steel, they looked like shallow bread pans—open on one end so that type could be pushed directly out into the page form. Type was placed in a galley, and magnets or heavy weights were placed at the end of the column of type to hold it erect. The galley of type was then placed on a proof press. The type was inked, and a proof copy was printed. A galley proof simply distinguished that proof from one that had been made on a press. The printed copy has since acquired the name of the equipment that was used to produce it.

Capital and small letters are often referred to as uppercase and lowercase characters. Handset type is stored in trays called cases. A case has a number of compartments of different sizes; the larger compartments contain frequently used characters, such as the letter "e." The capital, or uppercase, letters are located in the right side; the lowercase, in the left. Capitals are in alphabetical order; lowercase letters are not. Originally, two cases called "news" were placed on a stand one above the other—capital letters on top, small letters on the bottom. Thus the terms uppercase and lowercase came into being.

Linotype, Intertype, and Monotype linecasters use molten metal to set type. When the phototypesetting process came into use, the type was simply not "hot" any longer; hence, the term "cold."

This brings us to today's computerized phototypesetter and, along with it, more new words. A unit is a measurement smaller than a point. Units can range from 6 to 9 per em to 400 or more per em. Character recognition scanners "read" a sheet of typewritten copy (typed with a special element on an IBM Selectric typewriter) and input the information into a computer's memory for processing. One new capability of phototypesetters is that of digitizing. One simply inputs the proper coding, and the typesetter outputs any character desired.

Earlier, I referred to fonts of type. Identifying a particular face of type can be difficult. Several faces may appear to be the same, but closer examination will reveal differences. Study of the capital letters "T" and "A" and the lowercase letters "g," "e," "r," and "t" will help in this identification. Observe the lengths of the ascenders and the descenders and the sweep of the serifs. What is a serif? This is a short crossline at the end of the stroke of a roman letter.

Many of the editors at the Oak Ridge National Laboratory (ORNL) aid in the design and preparation of brochures and other specialty publications. To reflect the degree of professionalism requisite at ORNL, the editor must have a broad knowledge of typefaces. Similarly, wherever you are employed, the experienced compositor will probably recommend certain fonts of type for your publication, but will you really understand what he has recommended?

It is important that you know how type is organized. Type may be divided into (1) groups, or races, (2) families, (3) fonts, and (4) series.

Type groups, or races, are distinguished by both structural form and the historical development of the face. These groups can be divided into Text, Roman, Gothic, Script (Cursive), and Novelty. Other groups and subdivisions are sometimes listed, but these five basically cover the spectrum.

Text, the first group, originated in Germany and is often a variation of Gutenberg type. It has heavy, angular strokes. William Caxton, in the 1400s in England, designed a type copied in part from the German. This text face, called Old English Text, is the present-day form. It may be seen in church literature and wedding invitations.

Roman faces evolved from Text faces. Garamond, Caslon, Bodoni, Baskerville, Century—all are examples of Roman type. (The upright version of a face is also called "roman" by printers to distinguish it from the italic face.) Roman is subdivided into Old Style (Caslon), Modern (Bodoni), and Transitional (Baskerville).

Gothic faces are skeletal, very plain, and machinelike. Easy to design and manufacture, they are often called Sans-serif, Block, or Contemporary. Gothic typefaces make good headlines but are not recommended for text. Typeset in small print, it looks very monotonous and uninviting. Examples are Univers and Megaron.

Scripts and *cursives* are typefaces that resemble handwriting—they are designed so that the characters join together. Coronet is a typical Script typeface.

Novelty includes typefaces such as Broadway, P. T. Barnum, Typewriter, or almost any other face that does not fit the above-mentioned categories.

"Family" is descriptive of all the variations within one typeface, for example, the Century family. Whether one selects Century Bold, Century Italic, or Century Condensed, the basic design stays the same.

As I discussed earlier, a font refers to an assortment of alphabetical letters, arabic numerals, and punctuation marks—all of which make up a branch of a family.

"Series" depicts the range of sizes available in a certain typeface, for example, from 6- to 92-point type.

Today's world of typesetting is far different from what it was 30 years ago. While we continue to build on the basic and solid foundation of the past, new technologies, new words, and new ideas propel us into the future. I hope that I have helped you to understand better the language of compositors.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1981-740-062/551