

**RCA**

# Electronic Age

Spring 1970





Cover: A surrealistic mood is captured through this double exposure of a child's drawing and the face of its creator. The girl was one of several fourth-graders asked by an art teacher to illustrate their dreams. She called her piece *The Funny Zoo*: "There was a red cat and it had red, violet, orange, and black on it. There was a violet monkey. I like the elephant..." Several imaginative, new approaches to the education of children are covered in an article beginning on page 10.

# Electronic Age

Published  
Quarterly by

**RCA**

30 Rockefeller Plaza  
New York, NY 10020

©1970, RCA—all rights reserved. For permission to reprint or reproduce any portion of the magazine, write to the Editor, Electronic Age, 30 Rockefeller Plaza, New York, NY 10020. Printed in USA.

When requesting a change of address, please include the code letters and numbers appearing with stenciled address.

Editor  
JULES KOSLOW

Managing Editor  
Kenneth B. Platnick

Associate Editor  
Mary Jeanne Carlson

Assistant Editor  
Ann Ovodow

Production Associate  
Britton G. Bailey

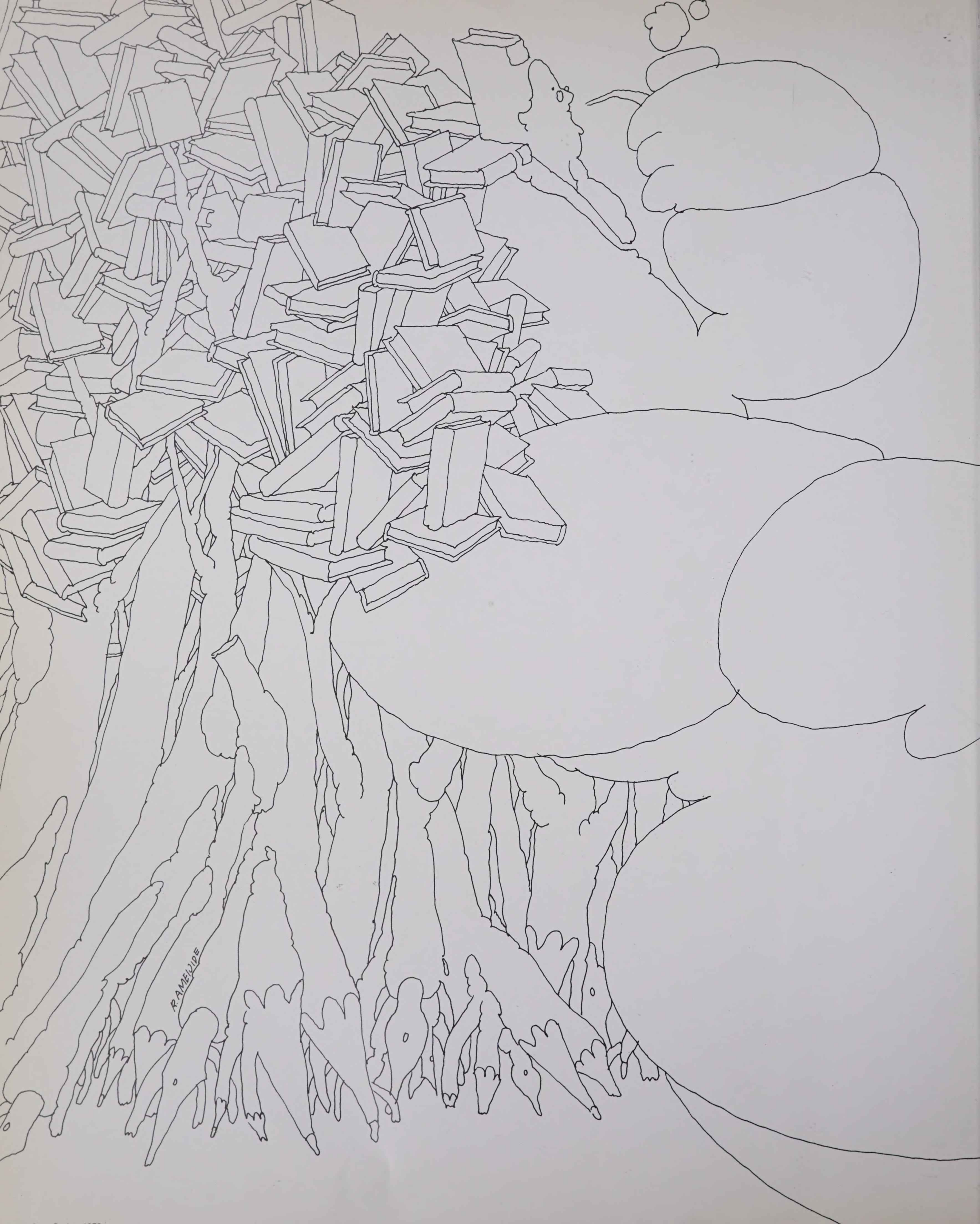
Production Assistant  
James W. Rostron

Design Consultant  
Sheldon Seidler

## Contents

Spring 1970 Vol. 29/No. 2

- 2 **A Publisher Looks at Publishing** by Robert L. Bernstein  
During the 1960s, while U.S. population increased about 10 per cent, sales in the book industry nearly doubled. In an interview with *Electronic Age*, the president of Random House explains how that gain occurred and why the industry can look forward to still greater gains.
- 10 **Technology in the School** by Gene Wyckoff  
Technology, says the author, has had limited effect in America's "traditional" schools. Classrooms are not organized to use it properly; the schools themselves cannot afford it. However, as efforts to modernize education meet with increasing success, all that may change—restoring significant markets for the manufacturers and publishers of educational materials.
- 15 **This Electronic Age...**  
A page of cartoons.
- 16 **TV Evening News:  
A Day in the Life of a Half Hour** by Elisabeth Coleman  
A news media reporter goes behind the camera for a revealing look at the "city room" of network television—the bustling production studios where news shows are prepared each day by hundreds of producers, directors, editors, and writers.
- 23 **For the Records...**  
News of recent RCA recordings.
- 24 **Switched-On Sports** by Norman H. Solon  
Electronic "umpires." Computerized boxing. Quarterbacks wired for sound. These are the signs of changing times, as the world of sports meets the world of technology.
- 28 **Art, Technology, and the  
Creative Process** by Earl Reiback  
In a continuing search for new means of expression, the modern artist seizes upon the artifacts of technology to project his vision of the world today.
- 33 **Books at Random...**  
News of recent books from Random House.
- 34 **Alaska—Transportation and  
Communications** by H. M. Hershberger  
Housewives fly to bridge games 100 miles away, but their husbands cannot drive to a home-stead 10 miles out of town. And the longest road in the state melts away when spring arrives. For this is Alaska—our colorful, but remote, 49th state—where the frontier spirit is fading fast as people turn to science and technology to meet the demands of modern society.
- 38 **Electronically Speaking...**  
News of current developments in electronics.



RAMELIDE

# A Publisher Looks at Publishing

The head of one of America's best-known publishing houses tells *Electronic Age* what has accounted for recent tremendous growth in the book publishing industry and what may lie ahead.

by Robert L. Bernstein

**D**uring the 1960s, sales in the book industry nearly doubled. How do you account for this tremendous gain?

Well, contrary to popular belief, I think that other forms of communication and entertainment have contributed significantly to publishing gains. They have actually stimulated reading rather than inhibited it. Take television, for example. A great many people think that watching television has cut down on children's

Robert L. Bernstein is president of Random House, Inc.

reading. But we've found just the opposite to be true. The sale of children's books has grown enormously in the last decade, far beyond the population growth. This has been particularly true in the areas of history, biography, and science. And our evidence shows that television has a lot to do with it. Kids are eternally curious, and when they see something on television that excites their interest — say, the moon shot — they want to find out all about spaceships and stars and everything that has to do with them. Their best, most readily available source of knowledge is books. So, their parents buy books for them.

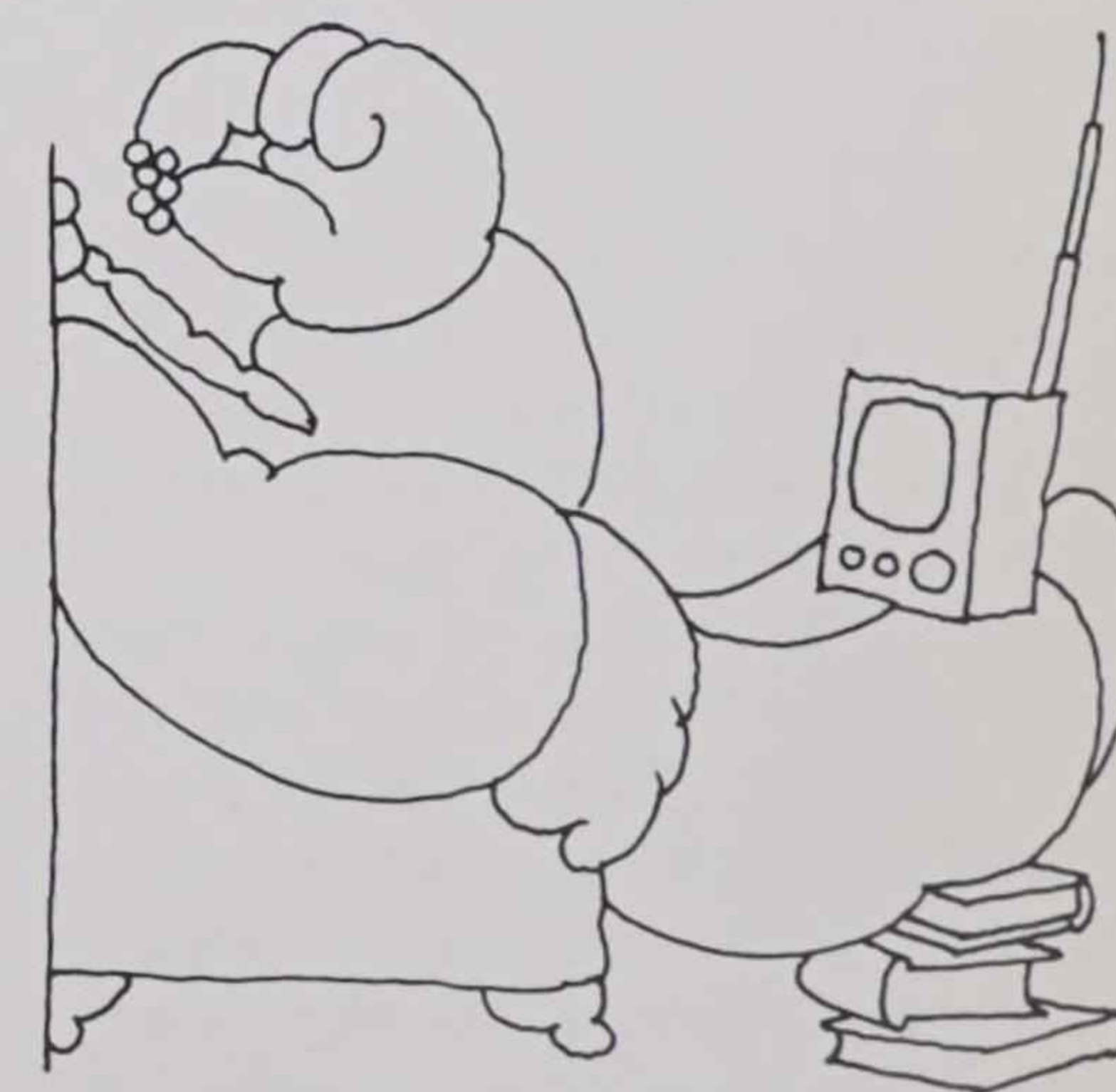
In the field of education, too, one witnesses an ever-widening range of reading needs. Children in past years learned from a single textbook, and those books usually remained standard from year to year. But now schools are using a great variety of books — not only texts but supplementary reading. And, because the curricula and the fields of study have been greatly enlarged, many more books are required for schools and school libraries.

Among adults, there is much more leisure time than ever before, and this has led, in turn, to the increased use of all forms of communication. People are reading more and enjoying it more. They are rediscovering that books are both a basic source of information and a most gratifying source of entertainment. And, unlike many other commodities of the communication world, the book is readily available to the user. It's not a one-hour TV special that vanishes with the closing commercial. It's there whenever you want it.

This increase in leisure time also means increased travel. Hundreds of thousands of people go abroad every year, and hundreds of thousands more explore their own country. They buy books before they go, as a guide to greater enjoyment of the countries they will be visiting. And often, when they get back, they want to find out more about the places they've been and particularly liked. So again they buy books. And not just travel books, either, but all kinds of books about a country and its people — history, biography, even fiction.

Also, one must take into account the decline of magazines in recent years. A lot of people used to do all their fiction reading in magazines. Today, however, there are not only far fewer magazines but those remaining print very little fiction. Consequently, the fiction reader is now buying books instead.

**W**ill books ever be replaced by electronic media, which have shown such a remarkable rate of growth in the few years since their inception?

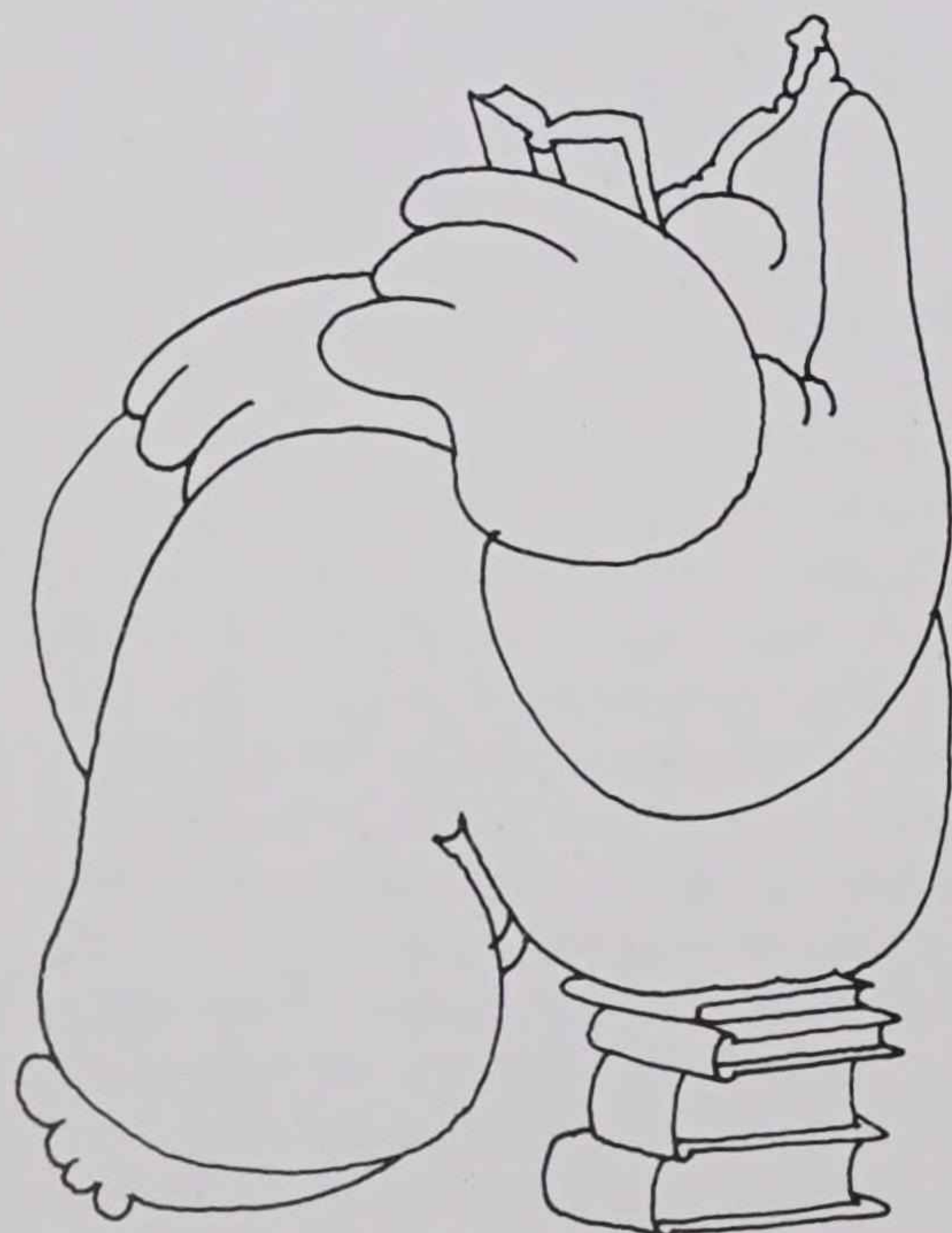


**"The editor-author relationship is a very personal one, very close, unique in business. The editor becomes the author's friend, confidante, confessor, and adviser."**

First, let me say that I think these growth trends will be still more evident in the next 10 years. But I really believe that, even a thousand years from now, one of the main ways of conveying an idea from one human being to another will still be the printed page.

A book will continue to be one of the most portable forms of communication. It will also remain one of the simplest ways of allowing an individual to absorb an idea at the time *he* wants to absorb it, at the speed that best suits *him*, and in the utmost privacy. Then, too, books are more personal, and this is something to be increasingly treasured in a world that is daily becoming more and more impersonal.

**D**o you feel that "bigness" changes the spirit of a publishing house?



A lot of ridiculous things have been said about bigness or smallness per se. I believe that bigness in publishing today is good, not bad.

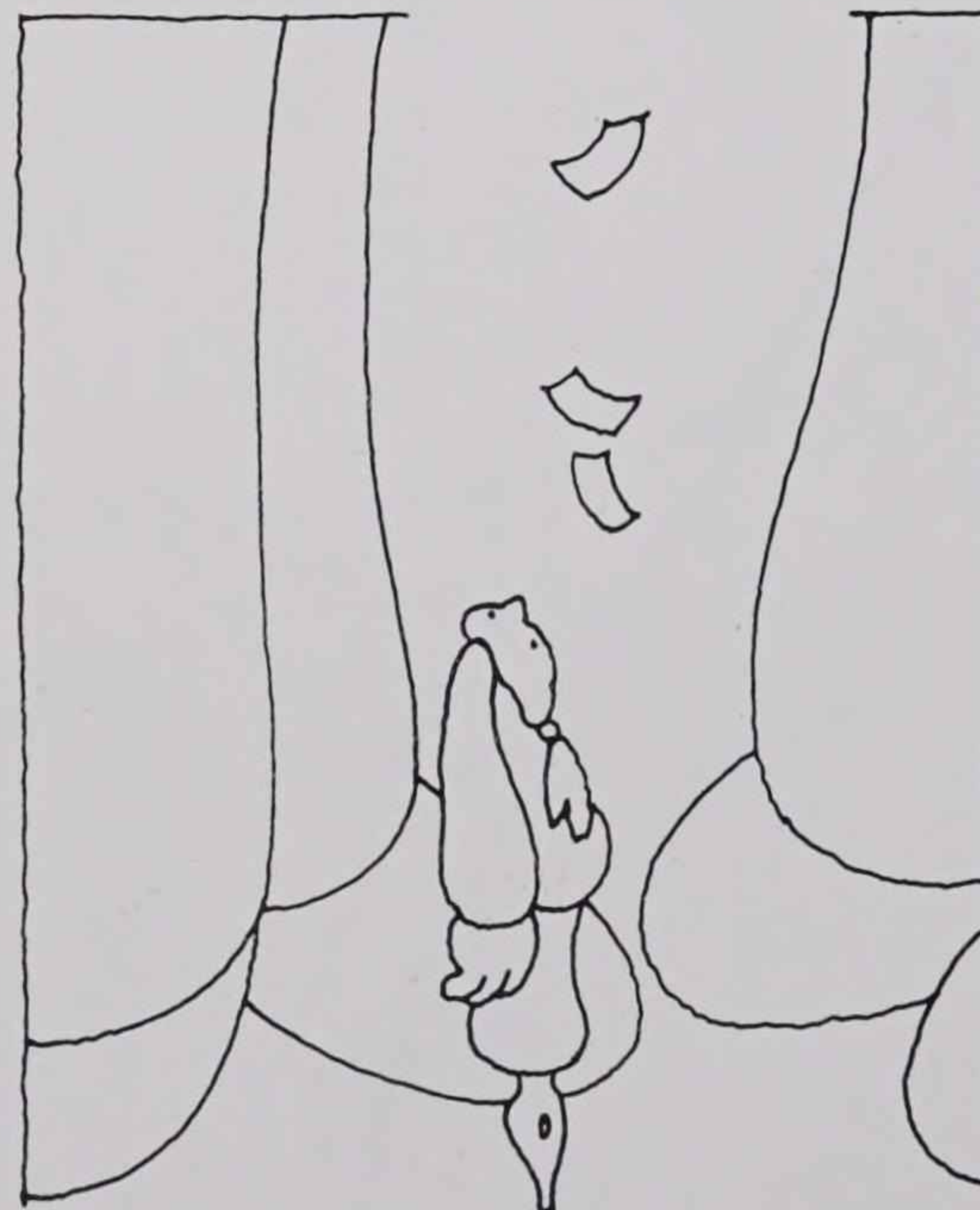
There are 20,000 new books published every year now — more books, I think, than phonograph records. They compete against not only each other but every other media you can think of: television, radio, magazines, movies. The problems of book distribution are enormous, with the publisher having to do more and more work for the bookstores. The bigness you speak of is of the utmost im-

portance in enabling many a publishing house to cope with those problems.

When Bennett Cerf and Donald Klopfer founded Random House in 1925, they began in a few rooms in a loft building with only two or three people working for them. Today, we have a \$50-million company with nearly 1,500 employees occupying 14 floors of a new Manhattan skyscraper bearing our name and a new warehouse in Westminster, Md.

Cerf and Klopfer made Random House a great name in publishing not only because of their literary tastes and business know-how but also because of the "personal touch" in all their relationships. We have managed, during all our years of growing, to maintain that same "personal touch" — between editors and authors (and even publisher and author), between our sales department and the bookseller, between our publicity department and the news media.

**I**t has been suggested, though, that an individual author gets "lost" in a big publishing house. Does this seem to you a valid assessment?

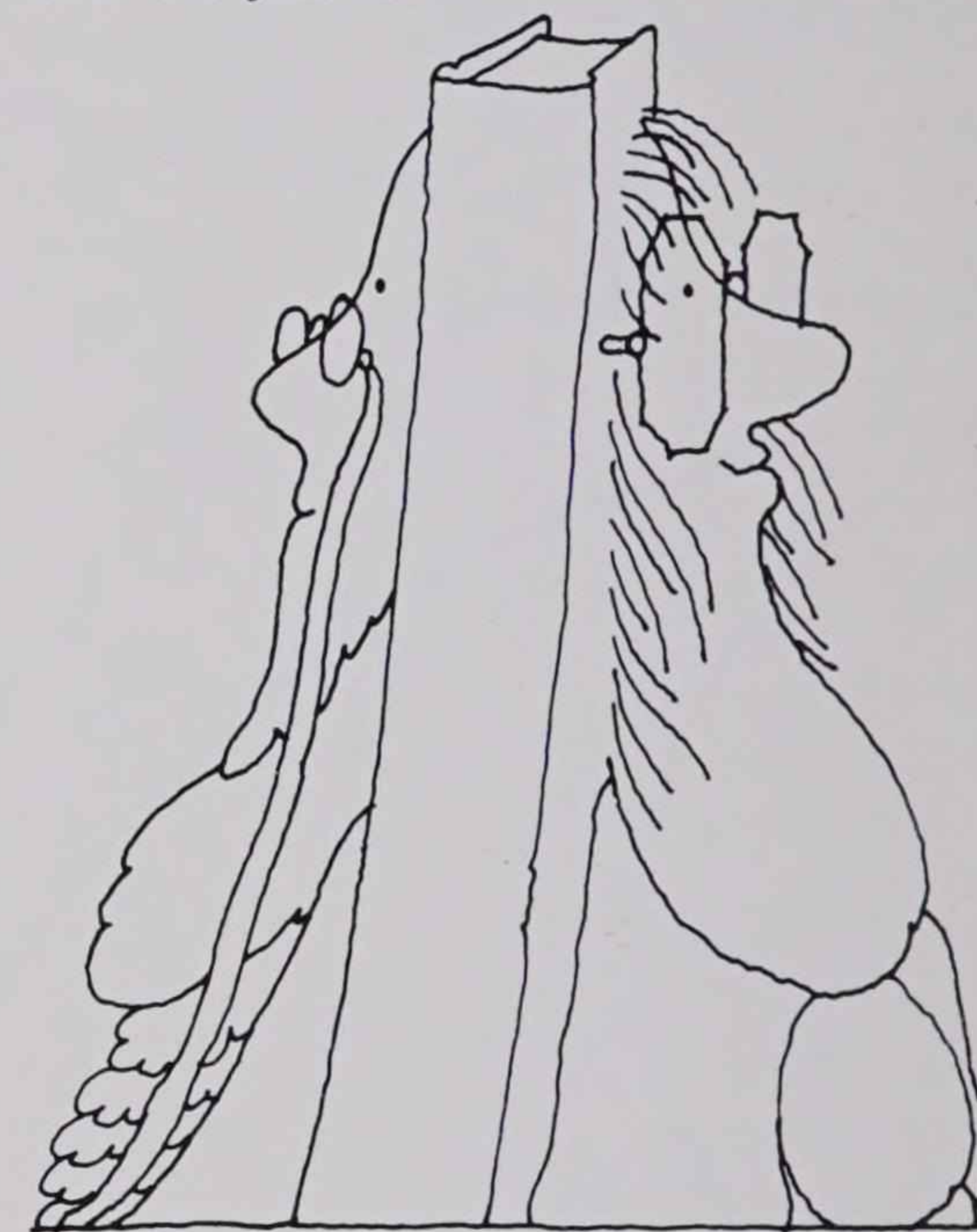


Indeed not. In a small house, the author may well feel very important. He is one of the few authors on that publisher's list. He may not be "lost" in the company, but I think he will be "lost" in the world. I believe the chances of a talent emerging today are much greater if the power and the financial assets of a big publishing house are behind that talent. It is difficult enough for a writer to get his work published without having to take the chance that his publisher may not have the means or the staff to promote his work — or even to stay in business.

I don't think any of our authors feels lost. And what's more, I don't think any of them is experiencing the frustrations

he'd have in a small house not staffed to do the enormous job of launching a book in America today. It's not the size but the philosophy of a publishing house that determines its quality and its relationships with authors. Bad policies are just as bad, and just as prevalent, in small houses as in big ones.

**A**part from sheer growth, how have publishing and publishers changed over the years?



I don't think book publishing has changed. At least, not in the way it thinks nor in the way it does the things that give it life. Of course, it has changed technologically, but technology is not what pumps the lifeblood into publishing. What does that is philosophy, imagination, taste. And these don't change, not in a great publishing house.

Publishing *has* changed in form, though. In the twenties and thirties, when Random House and other companies were

founded, publishing was almost a one-man operation. The heads of those houses published the books that appealed personally to them. But in the last 20 years or so, publishers have responded more and more to public needs and desires in literature. Basically, of course, a house still has a general philosophy and standards in publishing. But the books it publishes reflect not just the personal tastes of the head of that house but the knowledge and awareness that are brought to it by a variety of good editors.

In this respect, Cerf and Klopfer went one step further than most publishers did. Almost from the start, they hired talented people and gave them free rein. Today, we have nearly a dozen editors at Random House, all with different tastes. Each of them is, in effect, a publisher. My job, on the editorial side, is to be a consultant and aide, not a dictator.

One result of this policy is that our publishing represents many of the established names in fine literature — Faulkner, Camus, Auden, Michener, Capote, O'Hara — as well as younger writers like Philip Roth and William Styron. Another is that we reflect virtually all the philosophies on the American social and political scene, having published, over the years, Whittaker Chambers and Alger Hiss, J. Edgar Hoover and Stokely Carmichael, and hundreds of other authors of conflicting views.

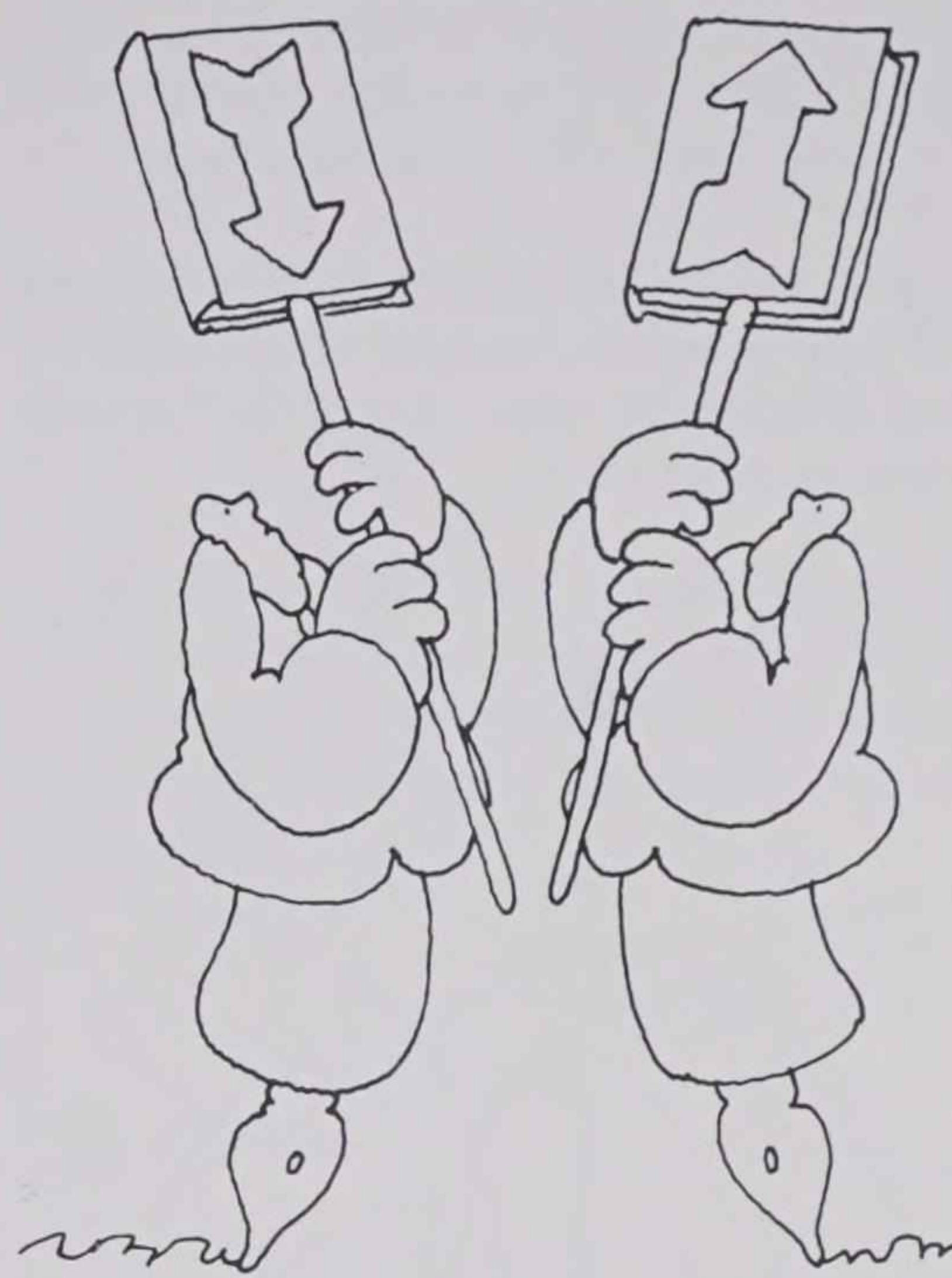
**Is it these editors who bring authors into a publishing house?**



Yes, for the most part. They hear about them in a variety of ways, but mostly through literary agents. It's interesting to consider, however, that we receive something like 4,000 manuscripts a year through the mail directly from new writers. All of them are read. But over the past 10 years, only about four of them have been publishable. Still, you never know. Mary Jane Ward's *The Snake Pit* was an unsolicited manuscript, and that became one of the biggest successes in publishing history. And, a few years ago, we got an unsolicited manuscript from a young writer named Cormac McCarthy. This was called *The Orchard Keeper*. We published the book, and critics agreed that it represented one of the best talents to come along in years.

Authors are our lifeblood, and signing them is a coup for the editor. But that's just the beginning. The editor-author relationship is a very personal one, very close, unique in business. The editor becomes the author's friend, confidante, confessor, and adviser. Of course, he has to edit; but, in so doing, he must never intrude roughly into the author's creativity. If the relationship is a good one, the author usually follows his editor's suggestions. Sometimes, for a variety of reasons — or no apparent reason — the relationship goes sour, and because the relationship has been so personal, the author may feel lost. He may leave the house without voicing his grievance to anyone, even his editor. I always hope that, in a situation like this, the editor or the author or both will come to me with the dilemma. I might be able to suggest another editor with whom the author could establish a happy working relationship and thereby save him for the house.

**What do you consider your major responsibility as a publisher?**



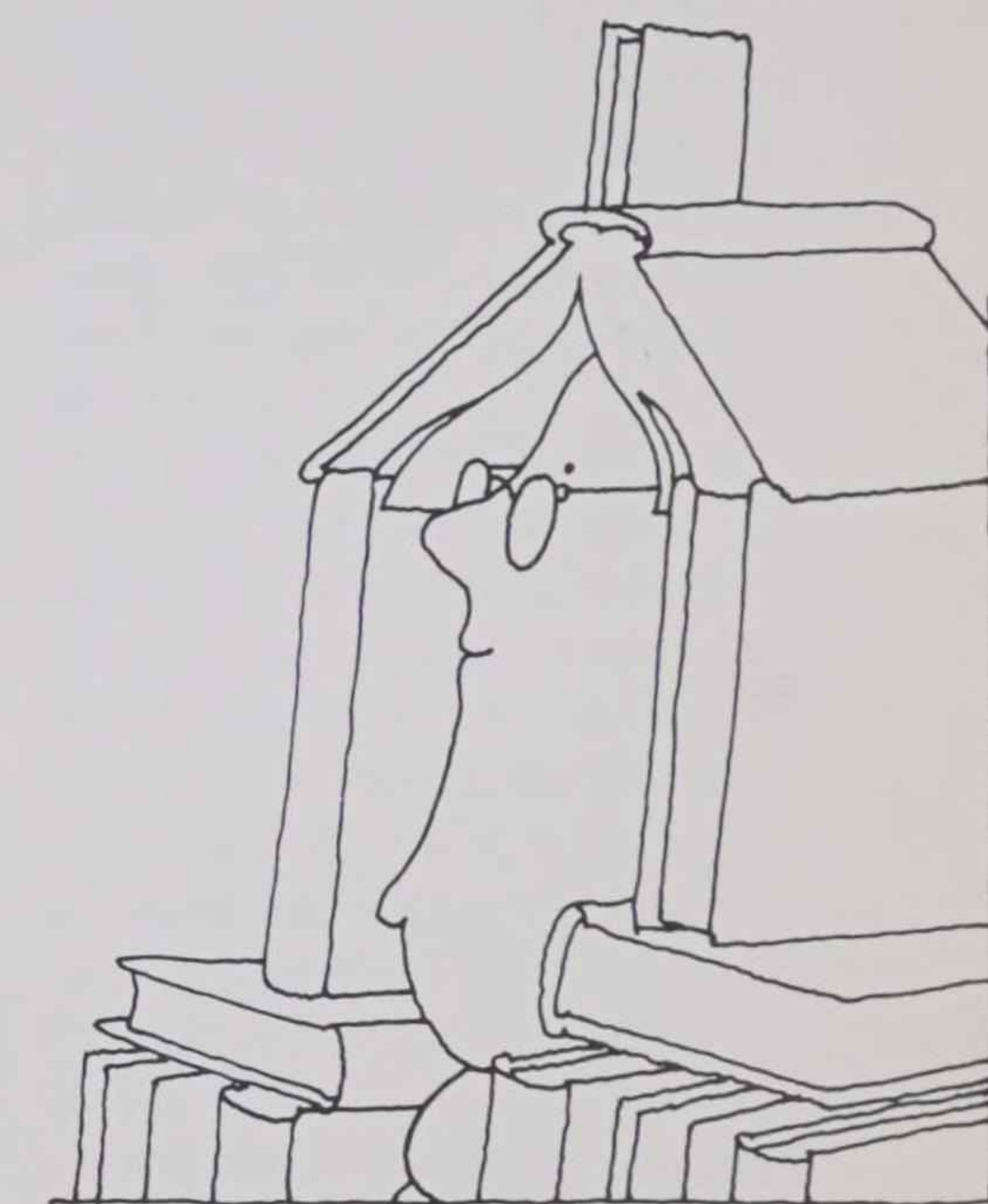
That changes to some extent with the temper of the times. Today, I think Random House has a major responsibility to keep open the channels of dissent in this country by giving a respectable publishing name to people who are writing responsible books that, nevertheless, may not reflect majority opinion.

Abbie Hoffman's recent book, *The Woodstock Nation*, is an excellent example. Giving my consent to its publication was one of the hardest decisions I ever had to make. It is beside the point that I may not agree with all of the book's judgments. What makes it unpalatable to me personally is its unnecessarily harsh language. I think the undoubted power of the book was diluted, particularly for many older people, by this language. But not for the many young people who constitute the book's largest audience. They're the ones who understand this man's frustration. They understand his language. They understand what he's trying to say.

The important thing, in any case, is that Abbie Hoffman now has a place to publish. Like a great number of today's young men and women, Abbie Hoffman finds a lot of hypocrisy in this country. The difficulty for these people is to try to express what they feel about this hy-

pocrisy, and to do something about it, without being destructive. I think that whatever destructiveness does creep in derives from the sheer desperation of trying to get attention in a country that has so many diverse groups and individuals clamoring to get what they want. It's a very, very difficult thing to do.

**What about your responsibility as a publisher to the company?**



As I said, I believe very strongly that my primary responsibility is to keep the world open to the reception of ideas of all kinds. This means taking certain risks — some based on my own personal judgment, some based on the judgment of Random House editors. And that distinction is all to the good. The best thing a publisher can do is to have people around him who do not see things as he does. Then he can really present views as varied as all the views of society, which, in my opinion, is what a great publishing house does.

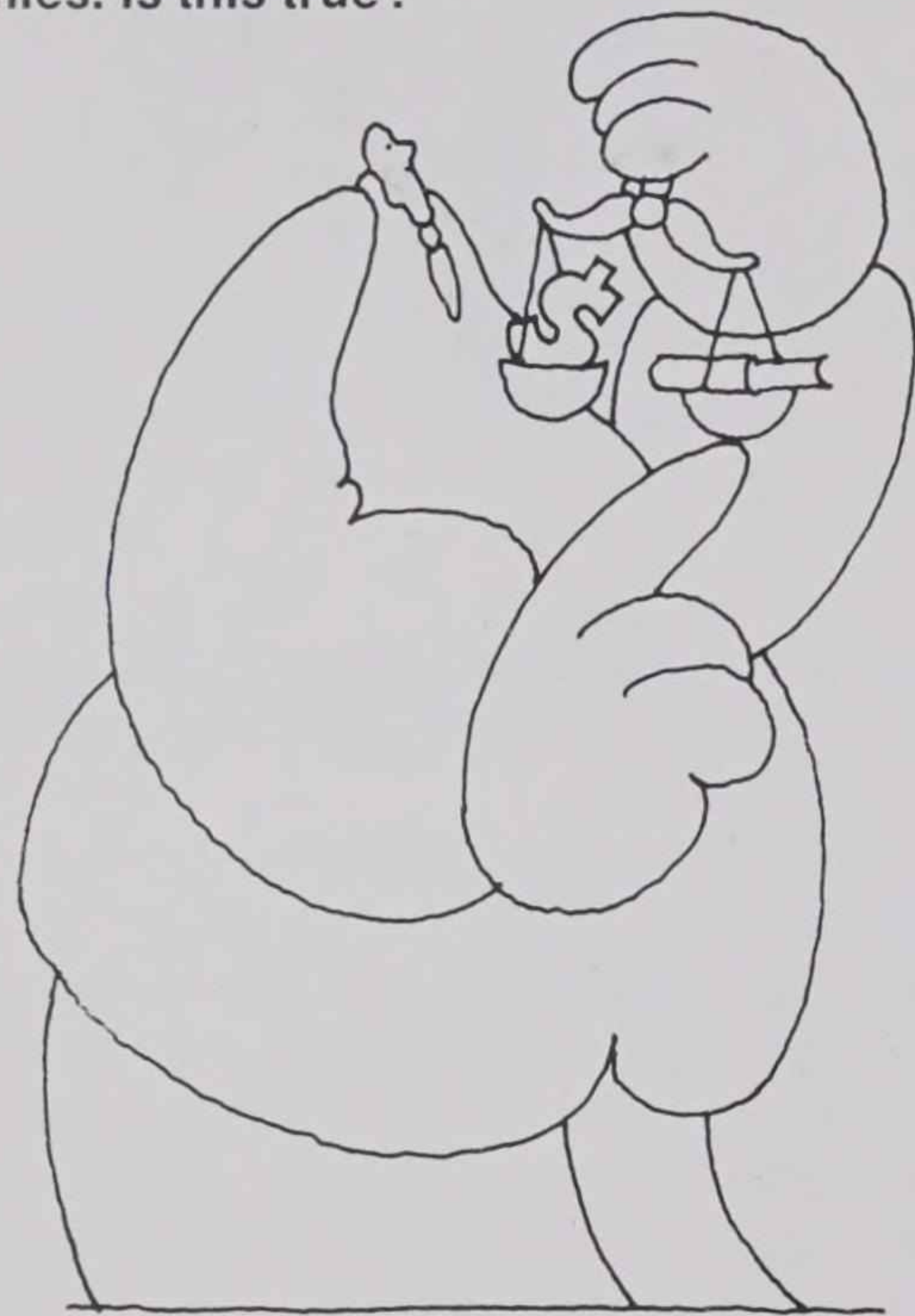
Of course, my primary goal is to maintain and enhance the excellent reputation Random House had before I ever came here. I have been trying to do that and, at the same time, to add new facets to the enterprise in educational publishing, children's books, textbooks, reference books. The head of a publishing house today has to be a jack-of-all-trades. He has to know much more about his business than did his counterpart 20 years ago. When publishing houses were small, they tended to specialize into purely literary houses, textbook houses, and so forth. Today, Random House and other large houses publish virtually all kinds of books, so we need to have more knowledge of both business and books in order to survive.

We are not putting out a product in the same sense that other manufacturers are.

"I believe very strongly that my primary responsibility is to keep the world open to the reception of ideas of all kinds."

If we were, all we would have to worry about would be the superior quality of our paper and ink. In our case, that's the least of it. It's the choice of what goes on paper that makes the difference.

**You feel, then, that a publishing house has a special public responsibility not shared by other kinds of companies. Is this true?**



Yes, it is. It's true because our responsibility goes beyond merely making money, though we certainly must do that, too. Let's say, for example, you're an automobile manufacturer. You bring out a new mass-production car. Your only responsibility to the public is to make the car as safe as possible. Beyond that, all your considerations are merchandising ones. That is, they involve economic, physical, and aesthetic appeal.

Now, let's say, the public doesn't take to your new car. If you were a good manufacturer, you wouldn't keep this product on the market — not just for the few people who may have liked it. You would discontinue production, and rightly so. With profit as the dominant motive, *all* cars designed for general use must appeal to the greatest number of people.

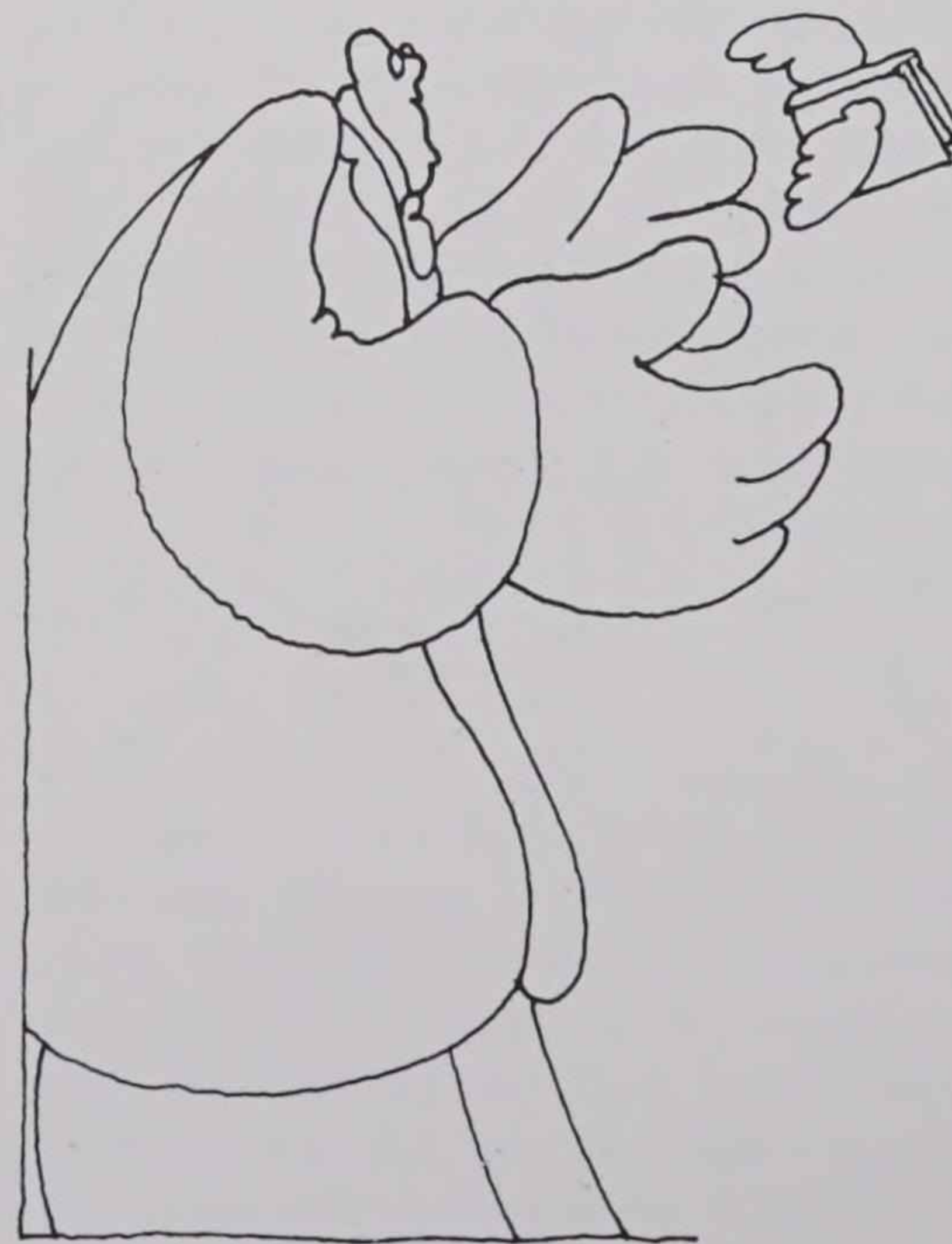
That's not true in books. You can be the best businessman in the world and still fail as a publisher if you don't love books and understand the problems of the creative person. Or if you don't realize that the prestige of your house depends upon publishing a great variety of good books reflecting the best talent going — not just the books that are bound to make money. Your authors are not the only creative people you have to deal with. Publishing houses are filled with

creative people: editors, promotional staffs, designers. You don't judge them by facts and figures. You judge them for their taste and imagination.

Some real financial wizards have fallen by the wayside in publishing houses because they lacked the imagination to shape their statistics and forecasts, their budgets, their warehousing and shipping systems, without choking off the creativity behind the product and changing the character of the company.

Naturally, we publish many books we hope will find a large market. But we also publish a good many that we know will make only a small profit, or none at all. We may even publish some we know will turn out to be financial losses. We publish them because we think they ought to be in print for the author's sake, for the public's enjoyment — even that small part of the public who *will* enjoy them — for the prestige of our house, and for posterity. Plays and poetry are good examples. And I can think of one author who has written four unprofitable novels. We will continue to publish him, because his talent deserves exposure. If we made our publishing decisions only on the basis of profit, we would cease to be a great, or even a worthy, publishing house.

**So far you have talked of greatness only in terms of policy. What about the mechanics of publishing?**



Well, of course, publishers don't live in the clouds. You can have the greatest publishing list in the world, but if you can't handle it mechanically, you simply don't get across — no matter how great your policy may be. Or, to put it in sports terms, a flashy quarterback with no line in front of him is in for a very rough time.

In publishing, you need much more than top editors who can put a number of great books on your seasonal list. If you don't have a good publicity department, no one will ever hear about those books. If you don't have a sales department that knows what it's doing, you won't get many bookstores to promote or even carry those books. Books are so hard to sell that publishers must have the very top experts in sales, publicity, promotion, and production to fulfill their ideals, let alone make money.

Back in the thirties, a wonderful novel entitled *Call It Sleep* was published in hard cover. I can't even remember who published it, but in any case it vanished without a ripple. Thirty years later, in 1964, a talented publisher named Peter Mayer, who was then with Avon, decided to bring it out in paperback. Mayer was not only a talented publisher who realized the book's merit. He also knew the mechanics needed to get that merit across. The result was that *Call It Sleep* was one of the few paperback books — if not the only one — ever to be reviewed on the front page of *The New York Times Book Review* by one of our leading critics. It was produced and merchandised to stores with so much enthusiasm and originality that it became a big best seller and was recognized as the classic it is.

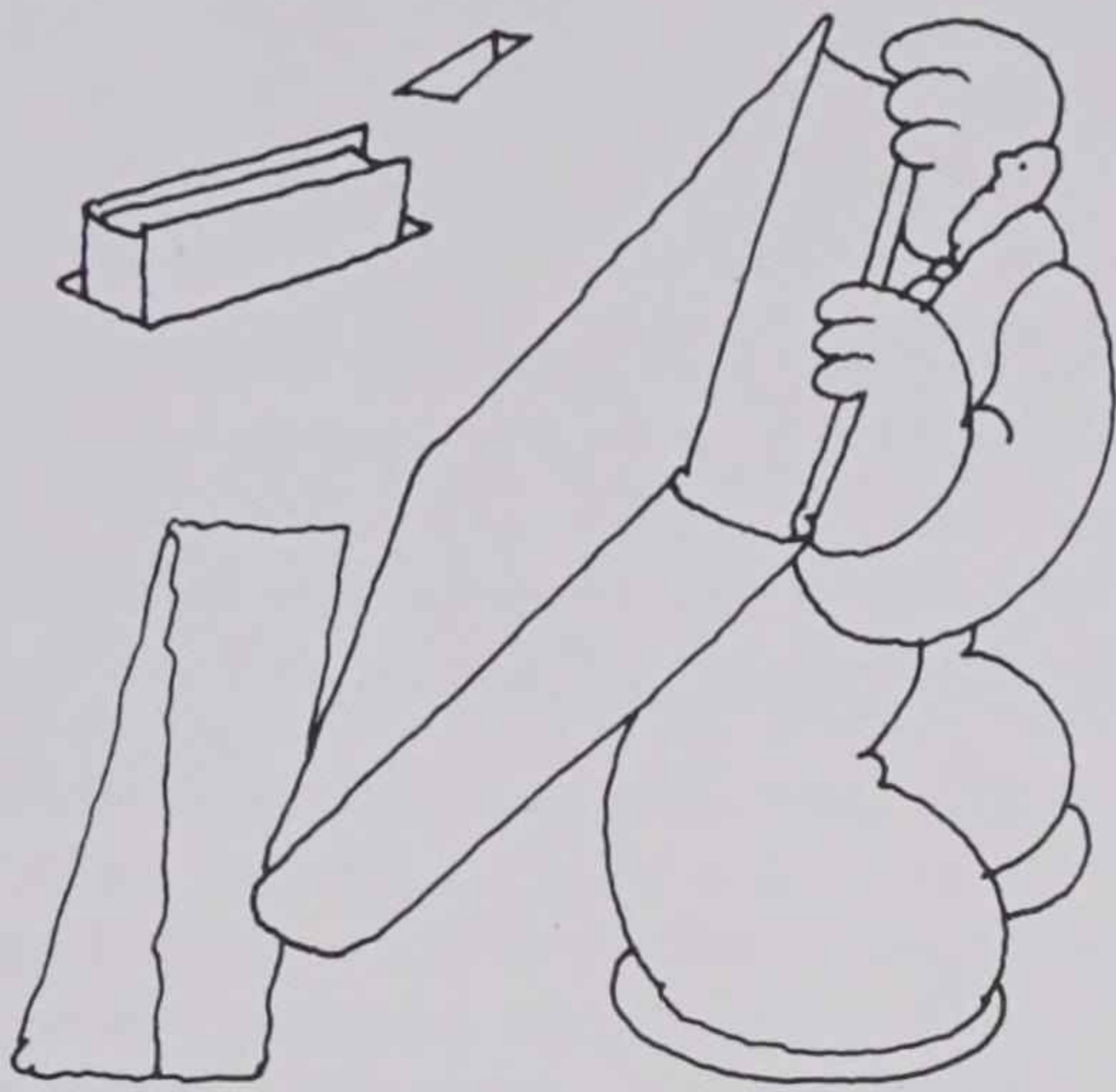
**In what areas have the greatest strides been made recently?**



In paperback books, unquestionably. Publishing has never been a mass media business, and it still isn't. But the growth of paperbacks has brought us closer to it. And the truly heartening thing is that the biggest growth has occurred in the literary area — which means to me that people really want fine literature if they can get it inexpensively enough. People today don't have to rely on the public library as their sole source of fine literature and nonfiction. They can afford to buy and keep the books they want.

And, of course, paperbacks have been a boon for students, who often can't afford to buy hard-cover copies of all the books they need or want. Albert Camus' *The Stranger* is one of the best-selling books in the United States today, and the biggest reason is that college and high-school literature courses have changed so radically. Again, it was students who made Salinger's *The Catcher in the Rye* such a smashing success. But probably the best example of this influence is John Knowles' *A Separate Peace*. Published 10 years ago in hard cover, the book received excellent reviews. But it was not until it went into paperback that high-school and college students discovered it and made it their own. After nine years in paperback, it is still one of the great sellers.

**In fulfilling their informational role, do you see books competing with the regular news media?**



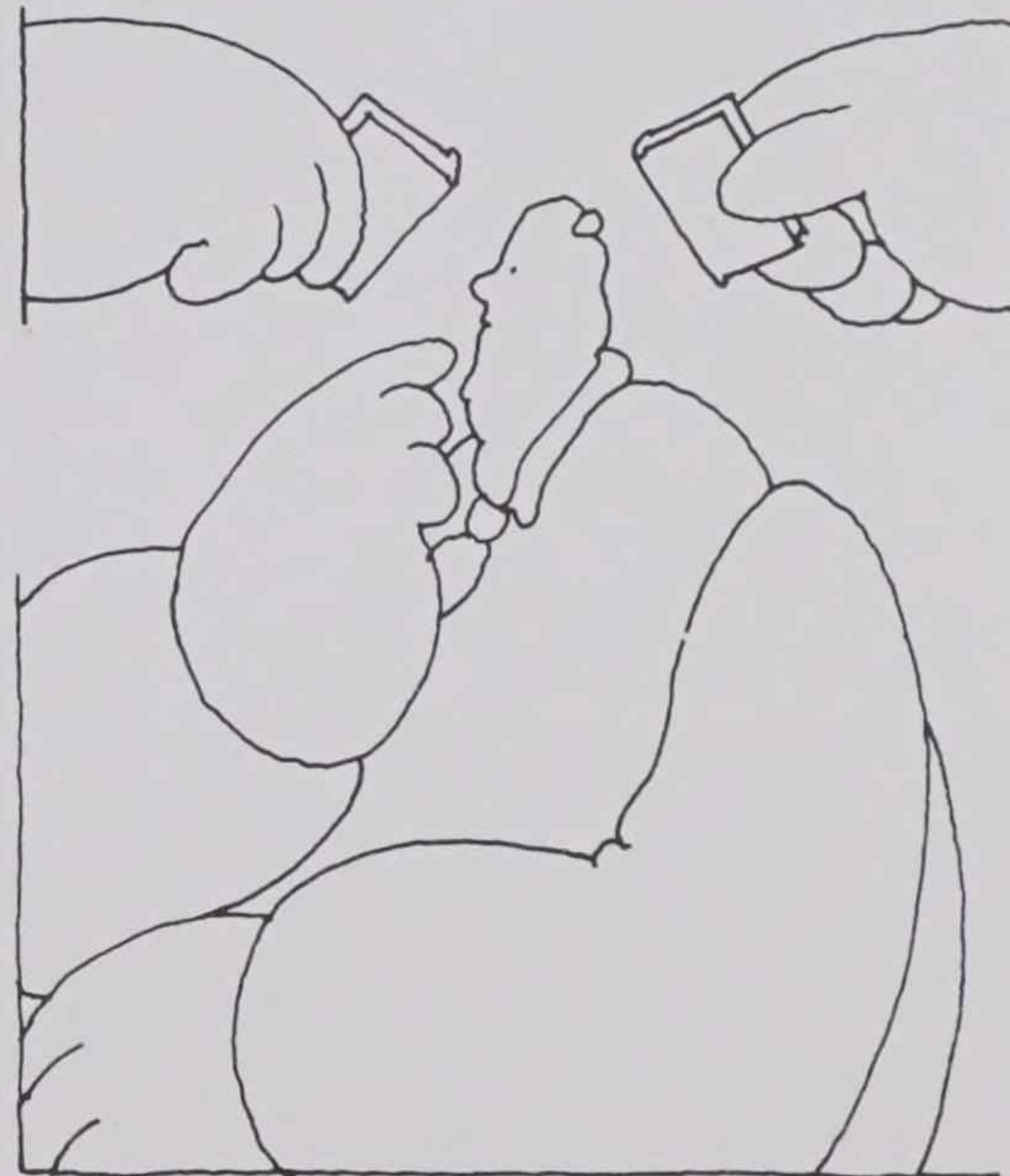
Not competing, really, but filling gaps. Book publishing is becoming one of the few media to offer constructive reports on changes and problems in our society. Television concentrates increasingly on entertainment and sports and stays pretty much out of the discussion area. True, it offers some admirable programs, like "Meet the Press" and "Face the Nation." But they're one-shots. There is precious little offered on any sustained basis.

Think back to the days, not so long ago, when Edward R. Murrow did his series of documentaries about Joseph McCarthy. The series had enormous effect in stimulating public thinking. That sort of documentary-in-depth doesn't happen any more. Of course, there are isolated documentaries, and good ones, but they're not followed up. And people forget about them quickly.

Nor do newspapers tackle society's problems on a sustained editorial basis the way they should, the way they used to. Thus, today, there are more books than ever before on the issues facing our society, offering the opinions of people on all sides of the question. For the most part, publishers keep these books available on a long-term basis. The things that matter to people today are put on the record in books so that readers can refer to them over and over, think about them, perhaps get interested enough to do something about the things they believe in. Senator J. William Fulbright's book, *The Arrogance of Power*, is a splendid example. Certainly not everyone who bought the book agreed with the Sena-

tor's beliefs. But it has strongly stimulated public thought since its release in 1967. More than a quarter-million copies have been sold to date, and the book is still selling well. Unlike a one-time television documentary or a newspaper, it continues to be available. And that's why I say that books lead the field in informing and stimulating the public where other media are failing.

**You have said that more and more books are being bought as sources of information. Do readers today show a distinct preference for nonfiction as opposed to fiction?**



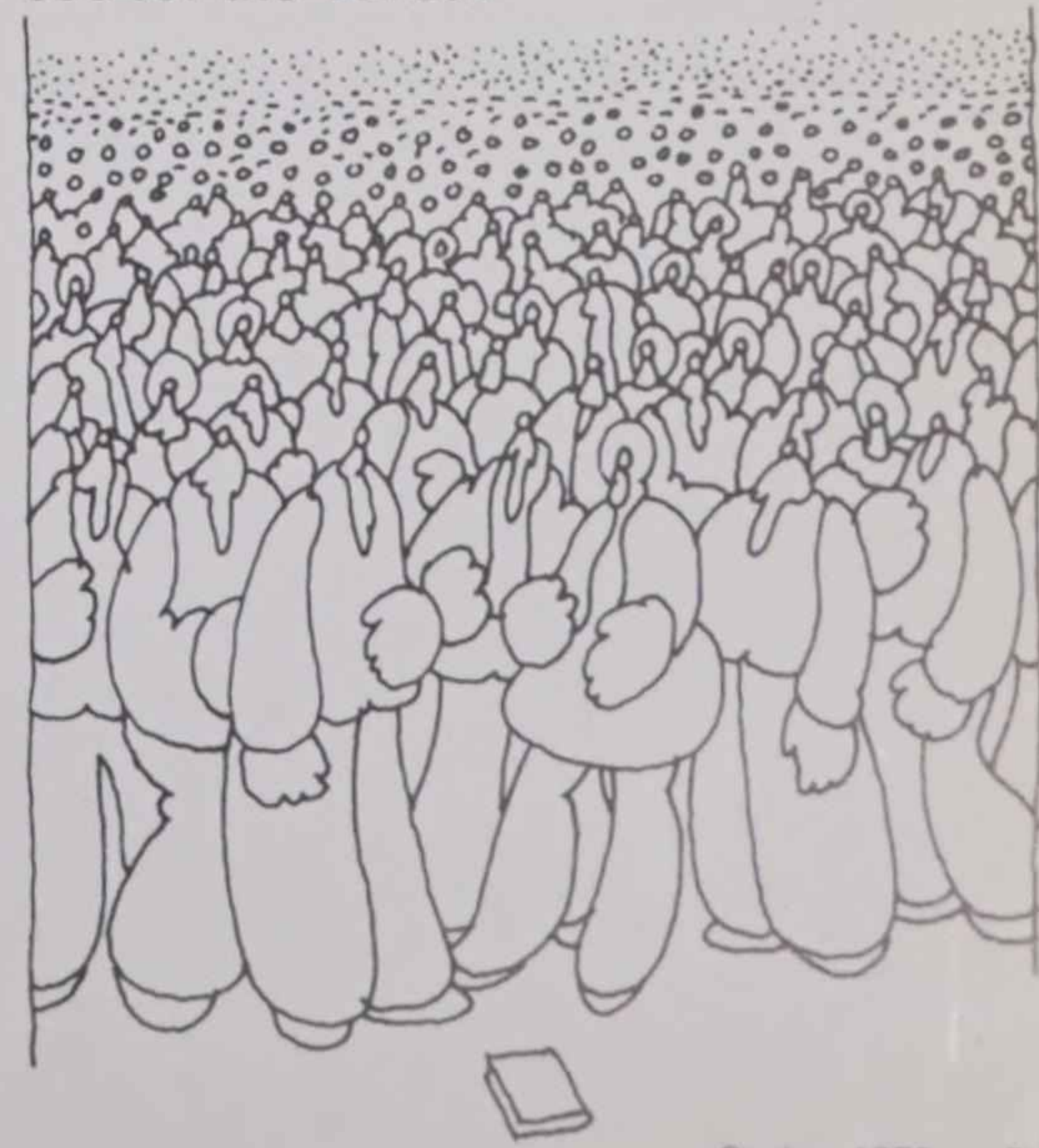
In general, nonfiction is more interesting to readers today. This was not true 15 years ago, and I account for the change very simply. People today are much more aware of world problems and the ills of contemporary society — not only aware but concerned. They want to be informed so that they can do something about these problems and ills. We're all scared of the Bomb — that someday it

will annihilate us all — so we inform ourselves about world politics and leaders. We're uneasy about riots and violence, so we read books by black militants and student revolutionaries to see what they're thinking. We've found out that a democracy must have a highly informed public opinion in order to thrive in the context of the large, important, complex questions of our day.

Of course, people still like to be entertained. That accounts for the popularity of many novels. In troubled times, people have to escape once in a while. But the interesting thing is that, even in fiction today, people don't want to escape from reality altogether, as they often did in the past with the sugary, romantic, boy-meets-girl-and-isn't-life-grand novel. Now they want stories about real people and real problems or events that changed the course of history. James Michener is one of the most popular authors writing today. He is a master storyteller, to be sure. But his readers also get a lot of accurate information from a man who is very concerned about today's problems and the influence of history upon them. *Hawaii* and *The Source*, his two biggest sellers, are outstanding examples.

Or, take a work like Portnoy's *Complaint*. Sure, people like to read about sex; but if that's all they want in a book, they can get it in any of the cheap novels turned out by pornographic publishers. Portnoy's sex habits, however, were a part of his life and his problems, a life and problems with which many people could identify because of Philip Roth's extraordinary talent as a novelist. The book is a great piece of literature. It is also a very courageous book that broke through barriers no leading novelist had even approached before. Young people, I think, admire it simply because it is so frank and honest.

**Where is publishing going now? What major changes do you foresee for the 1970s?**



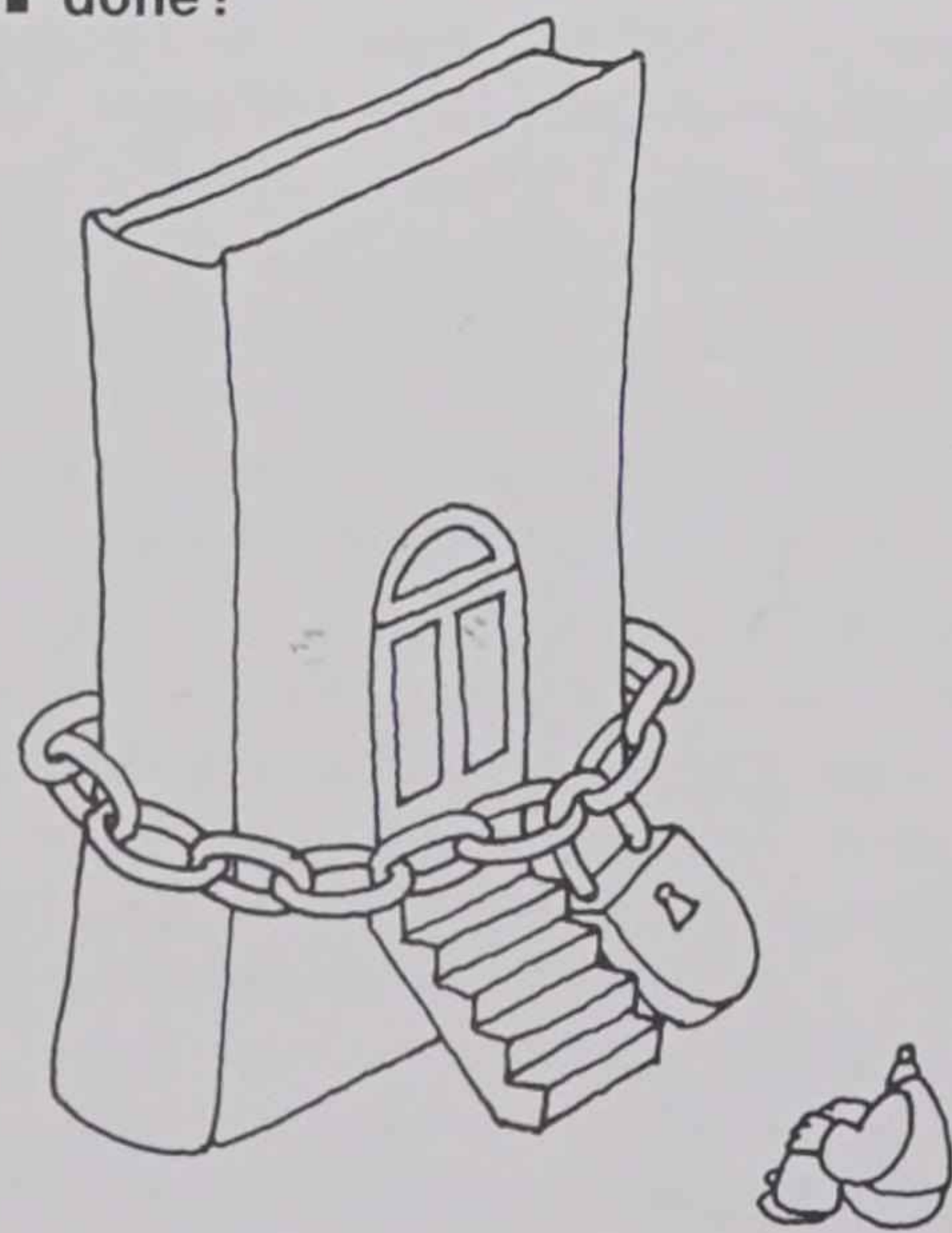
"If we made our publishing decisions only on the basis of profit, we would cease to be a great, or even a worthy, publishing house."

I think that great progress will be made in international publishing. Today, each country concentrates on developing its own publishing operations. But as the world begins to think more and more along the same lines, it is even possible the great American publishing houses will be able to help solve some of the problems of developing countries by getting reading material to them in ways we haven't even touched yet.

One of the great unsolved problems in those countries is that books are too expensive for most of the people. They have to be very cheap. Maybe the solution is that they should be printed on newsprint. It's not the paper or the packaging that counts for the people of those countries. What matters is that the book is readable — and available.

Before we take on the world, though, we have a lot to do at home. Changes are taking place in distribution, yes, but nothing like what we need. We have to devise more ways to get titles to the public. We have to give readers a wider choice of books at lower prices. We have made a good beginning with paperbacks. Nearly every publisher has a paperback line now. But we have concentrated distribution heavily on college communities. We must do more to make these books available elsewhere to people who have little or no money to buy them now.

**H**ow do you propose that this be done?

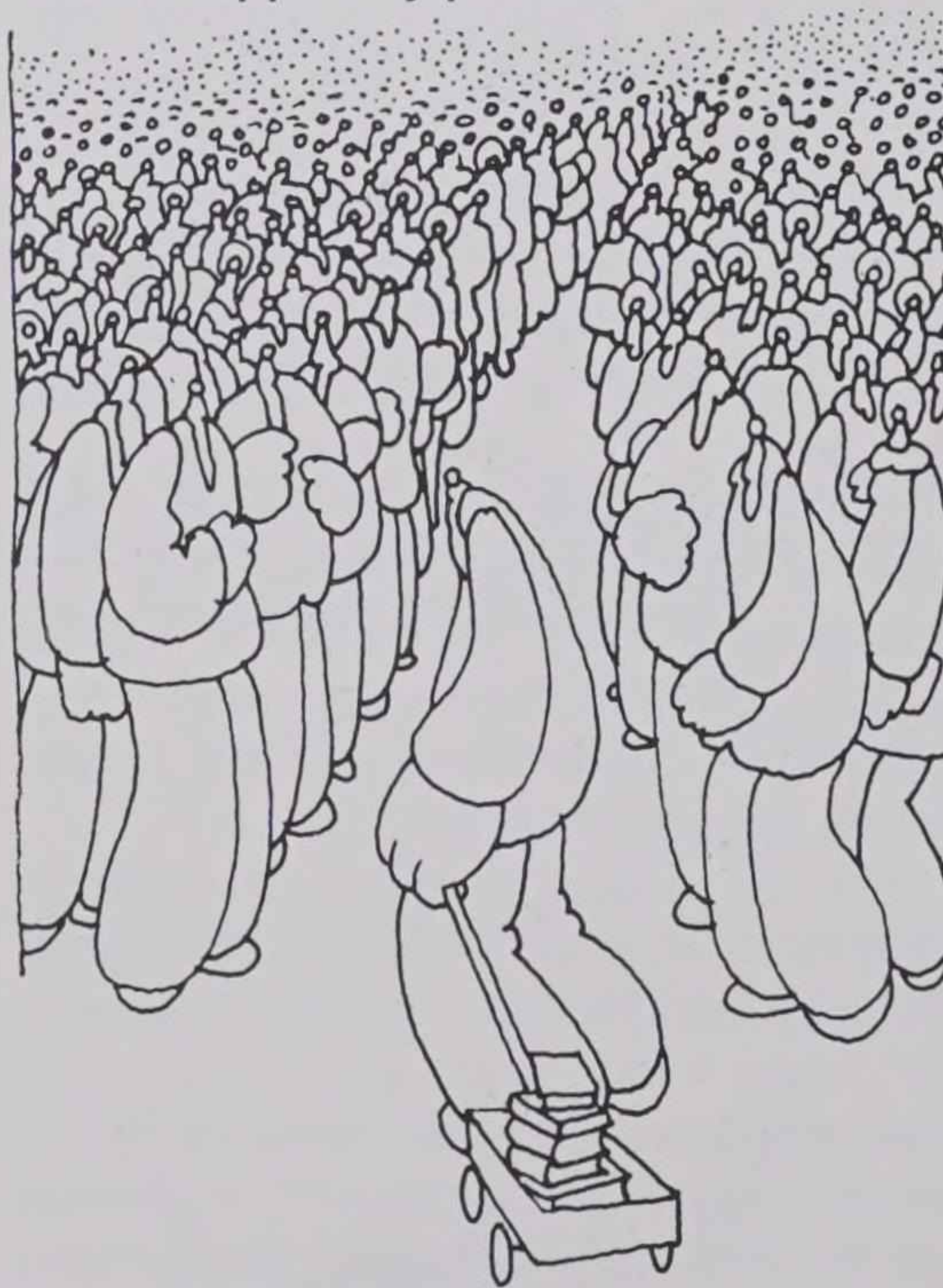


One way is through libraries. It's appalling to think that, in the last year, some public libraries have actually been

closed. And even those remaining are not adequate. What we have to do is make the city or town library a community cultural center, much the way a university library is at present. This should contain work, office, and research space, a place for authors to work, and a center for cultural communication among people of the community.

And there should be a bookstore in every public library. It's a natural place for them to be — private bookstores, I mean, leased to individual entrepreneurs. Plenty of paperbacks would be available at low prices for persons who can't afford hard-cover books and perhaps can't get them from the library because the few copies it owns are so much in demand. The money paid by the lessees for bookstore space would give municipal governments additional resources to maintain their free libraries.

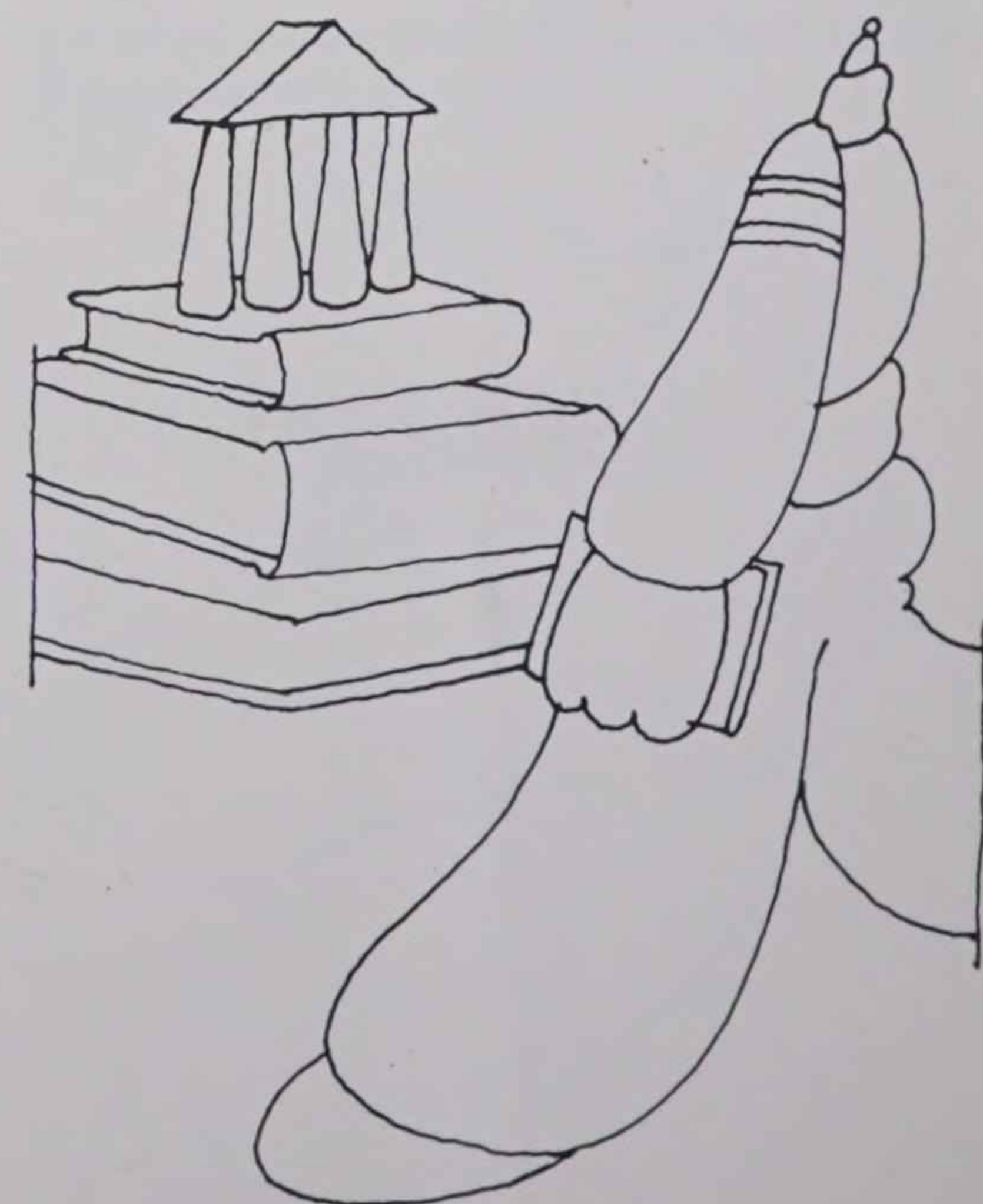
**A**re there any new markets that should be tapped by publishers?



When I was in the direct selling end of publishing, I used to go into discount houses that had book departments along with other general merchandise. I discovered that the people browsing around the book counters in these places were very different from those I saw in conventional bookstores — blue-collar workers, if you like. They were buying many of the same books to be found in bookstores. I asked several of them if they ever went to bookstores, and they said no, they felt uncomfortable in bookstores.

The question is, Do we get the people into bookstores or do we take books to the people? Ideally, I think we must try to change the idea that bookstores are the province of the so-called intellectual. But, in the meantime, we have chosen the latter course. We are taking books to the readers. Paperback books can now be bought everywhere you turn — in airports, bus stations, drugstores, supermarkets, newsstands. I think this is marvelous. Books should be made at least as available as toothpaste and soap powder! Inexpensive children's books are now being sold in supermarkets and dime stores. And publishers are experimenting much more with direct-mail selling of certain types of books, thus reaching whole new areas of readers. It is my theory that, once people discover, or rediscover, the pleasures and profits derived from reading books, they will want more. And then they'll go where the books are — even into bookstores!

**E**arlier, you mentioned that television had served to stimulate children's interest in books. What are publishers doing in the field of education itself?



The most important element in teaching is still the teacher. To be sure, he has excellent mechanical aids—and must have them. But they are only aids. The teacher still comes first. The second most important element is the books the teacher uses. Together, these elements provide the sense of direct communication between mind and mind that pupils need.

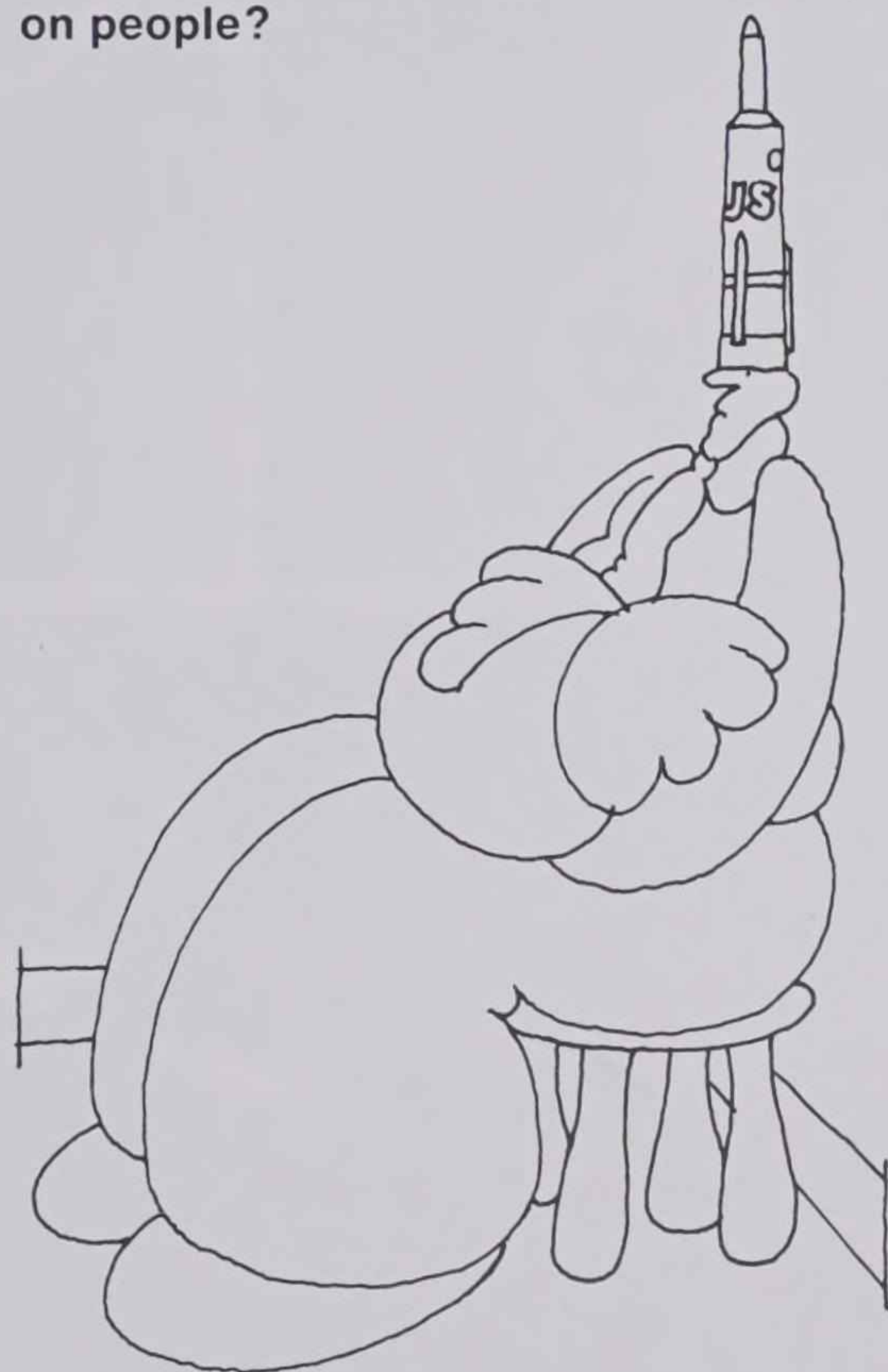
But pressures on the teacher today are becoming greater and greater. There simply aren't enough teachers to give individual attention to the growing numbers of students. And I don't think this situation will be alleviated in the years to come. Therefore, we must adapt old tools to new methods. For instance, Random House, through its subsidiary School and Library Service, is sending education packages to schools. Each package contains eight copies of a book, eight sets of earphones, and a cassette on which the teacher can record the book or parts of it. This means that, as the teacher is working individually with each pupil, the others can be listening to the record as it speaks the words in the book they are reading. No student need be idle while a classmate is receiving special attention from the teacher.

Schools are also becoming more and more interested in books for supplementary reading. These must be books that children find exciting as well as informational. We are working closely with the people who plan school curricula, and we are packaging a variety of books to suit their needs.

In order to provide more efficient service to elementary and secondary schools, we recently combined L. W. Singer Company—an established textbook house we acquired in 1960—with our School and Library Service. And last year, our college department, which was begun as a modest venture in 1956, ac-

counted for about 16 per cent of the company's business. I give you these facts to show how important the educational field has become to trade book publishing houses. We are getting ready for unlimited expansion in that area.

**You have indicated that the publishing industry is aware of both social and technological needs. Do you ever feel that our government is spending too much on technology and not enough on people?**

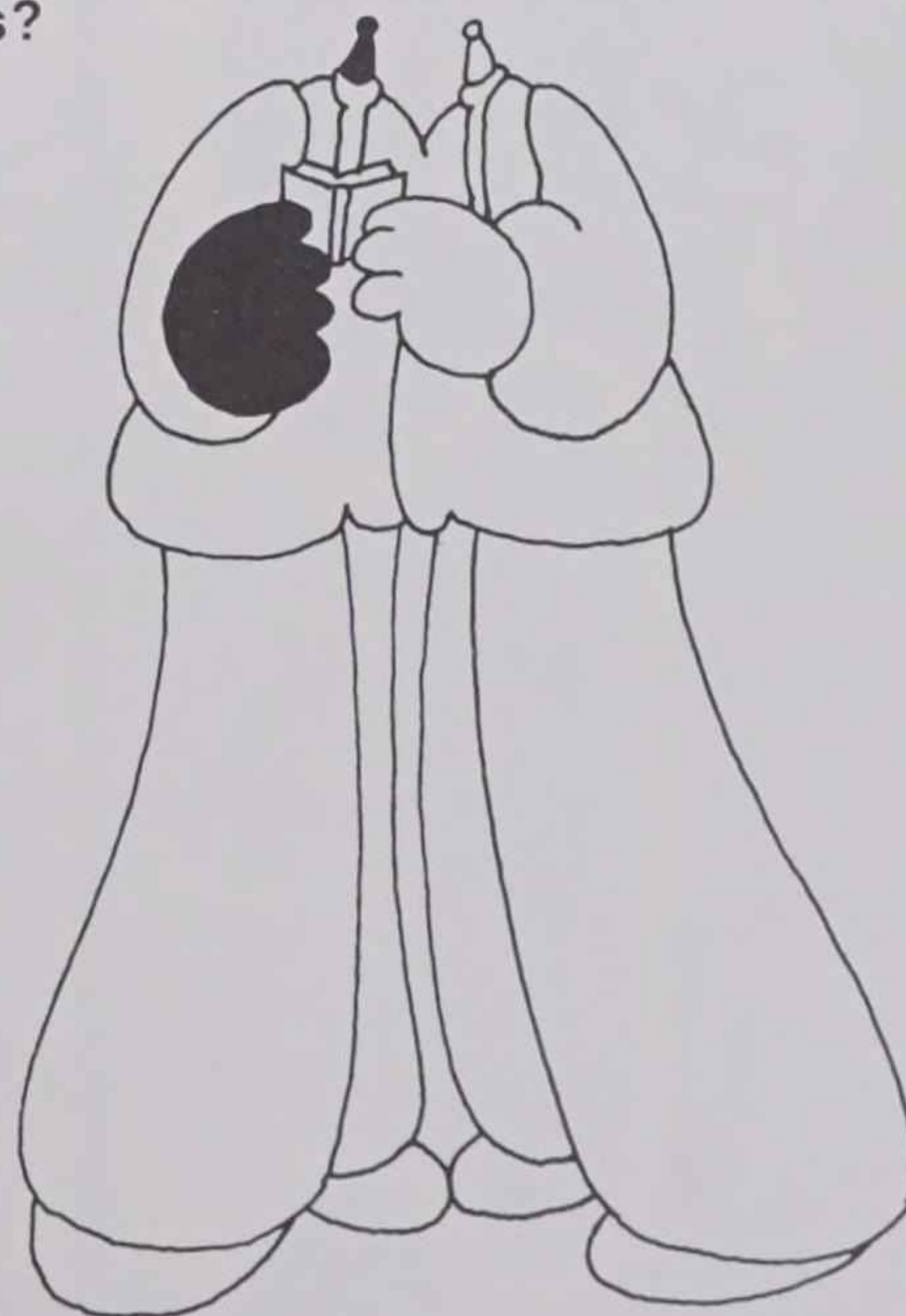


As a book publisher, my answer may sound whimsical. But I mean it very seriously. Even a casual look at our federal budget will show that a lot of money is being spent on outer space. I would propose that our government spend some money on inner space as well. And, as a first step, I suggest that, instead of cutting the budget for libraries, the whole library program should be placed under the space agency, which has all that money available.

Second, I suggest that space agency officials go into the ghettos and then ask themselves a few questions. Is there enough space there for the adults of the future to build their minds so that they will be able to deal with the problems they are going to have to face? Is there enough space for them to do their homework? Is there enough space for them to read, to understand the ideas that will influence their adult thinking? Is there enough space for them to realize that a lot has been accomplished in this country—and that they are better off building it than destroying it?

Should the space agency answer "no" to even one of these questions, then I suggest that it divert some of the money now assigned to outer space and spend it on inner space.

**What is the publishing industry itself doing to help alleviate our social ills?**



One of our greatest social ills is illiteracy. Although some progress has been made in teaching teen-age or adult illiterates to read, the problem will never be fully solved unless we begin at the beginning—with the children. No matter what teaching methods you use, you will never teach them to read properly unless they are interested in what the books contain. Give them a story that captures their attention, and they will want to learn how to read it. Book publishers have been making great progress in this area, getting away from those dull Dick-and-Jane primers. Nowadays, book publishers are getting talented authors, good storytellers, to write books for very young children. Schools are using them both for texts and for supplementary reading.

The most popular author of children's books in America today is Dr. Seuss. He has made reading a joy for children through the use of genuine humor and captivating drawings. Some years ago, Random House and Dr. Seuss started a series for children just learning to read. These are called Beginner Books, and they are written by Seuss and other authors. The basic criterion is that they tell a good story, despite a limited vocabulary. The books have been widely successful, not just in bookstores but in schools as well. Teachers have found them invaluable in teaching children to read.

In the adult area, I think the main contribution of book publishing is the growing number of books about our social ills and the people who are trying to correct them. This contribution is all the more significant because these books are usually available in paperback and can thus reach a wider audience. Hence, the privileged American is finding out for the first time what life is like for his underprivileged fellow-citizen. Books by Malcolm X and Eldridge Cleaver and Martin Luther King are more important for whites than blacks, because they illuminate problems many whites have never been aware of before. And awareness is the first step to social action. ■

RCA language lab enables each student to dial tape playback of prerecorded lesson.



## Technology in the School

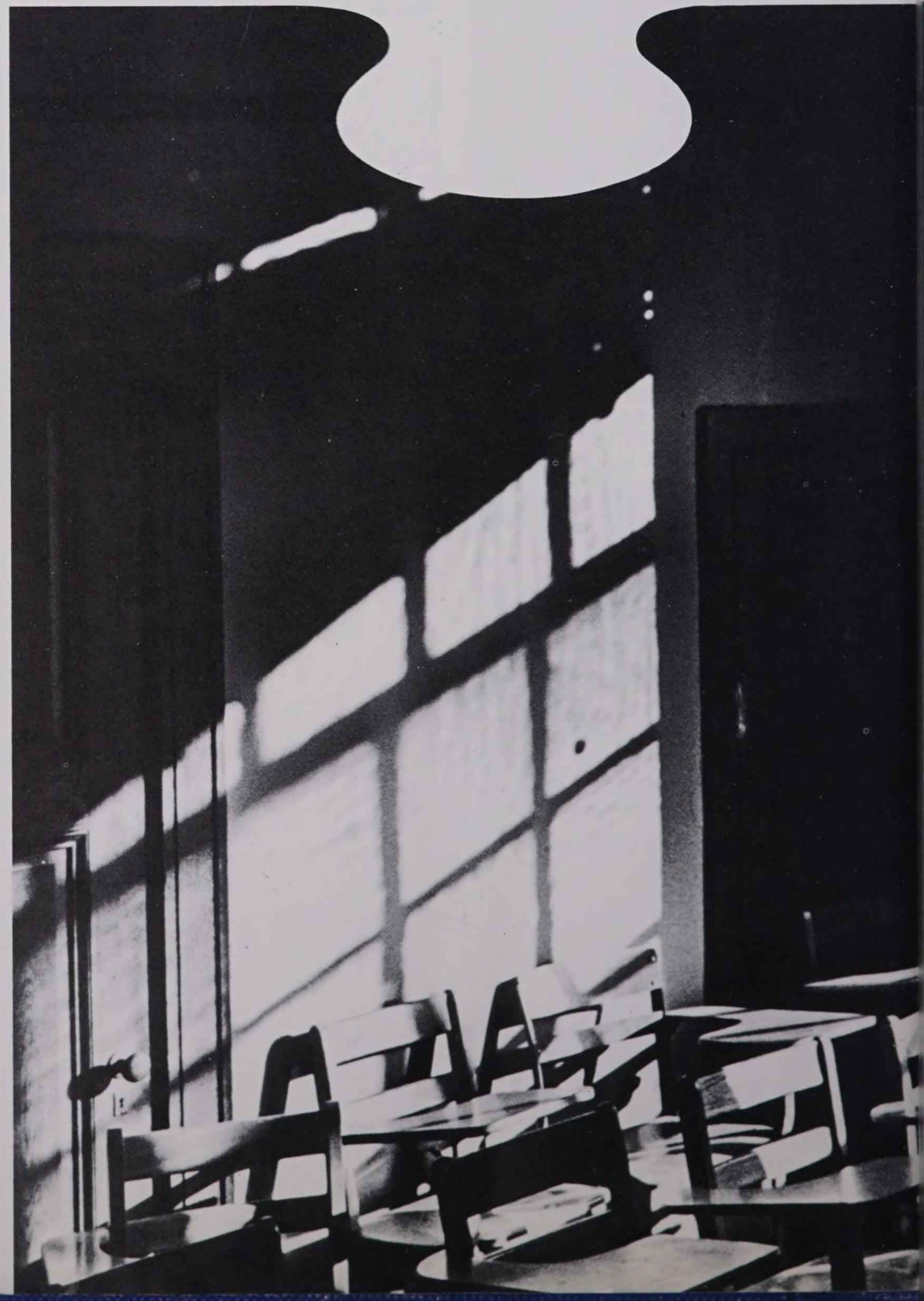
Only as education systems themselves begin to modernize can they hope to make full use of modern technology.

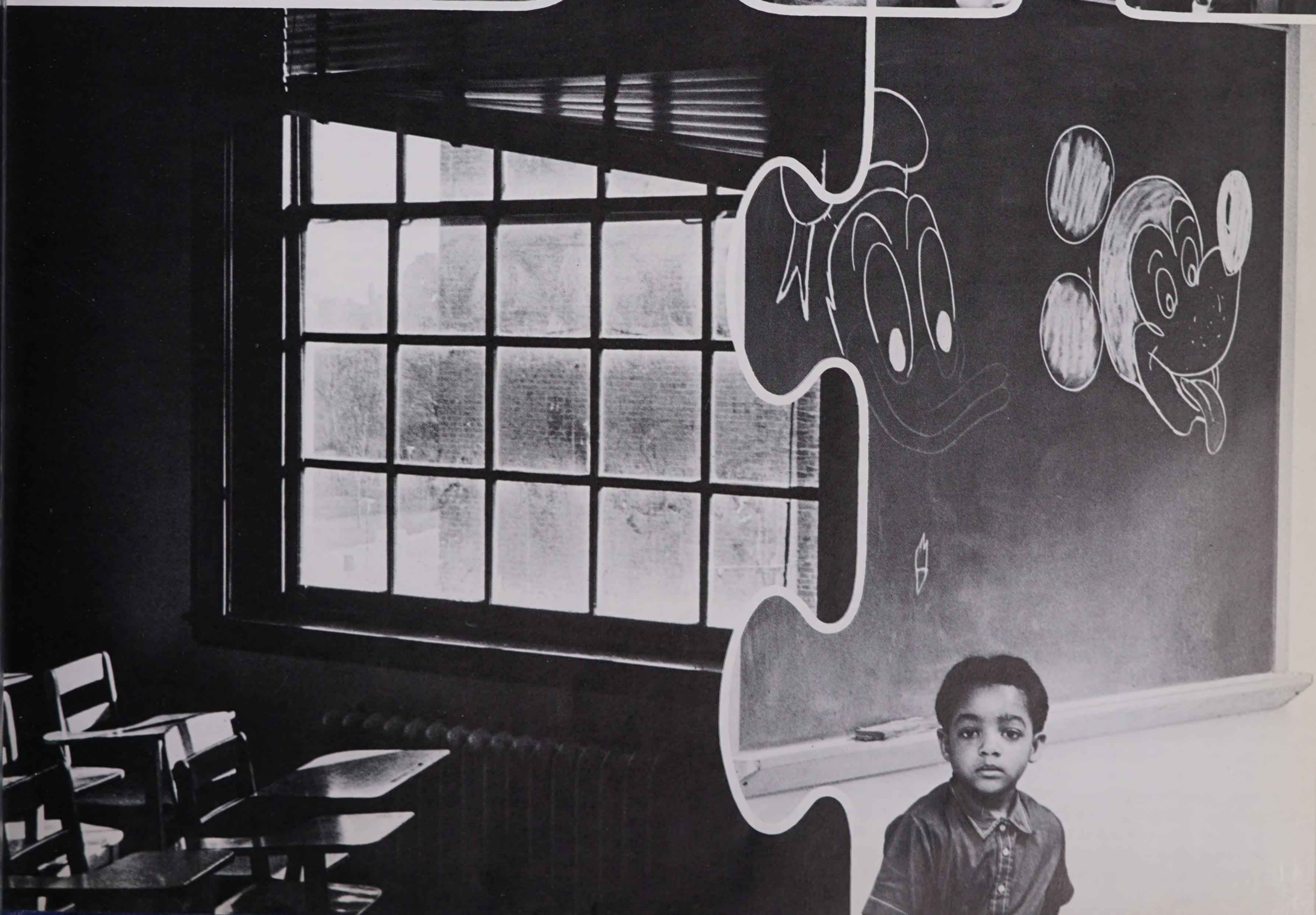
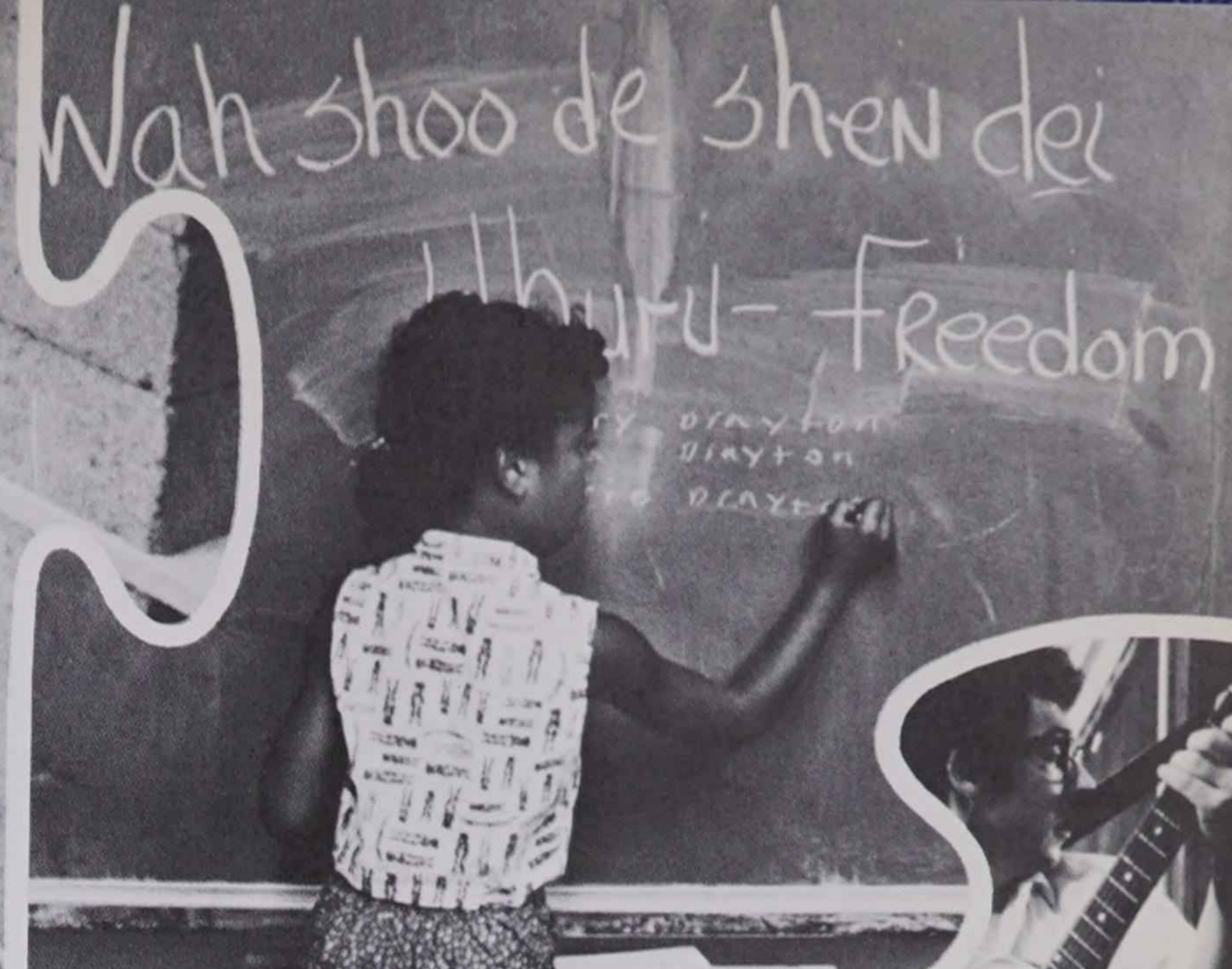
by Gene Wyckoff

Most American schools today are "traditional." That is, they comprise any number of boxlike classrooms, with 30 or 40 students and a teacher in each one. The teacher's role is to keep order, tell the students what they are to learn, supervise homework and other "reinforcement" exercises, and then test the students to see how much learning has taken place.

There are variations. In elementary school, students stay with one teacher in one classroom for most of the day. In high school and college, students travel from box to box where specialist teachers await them. In affluent private or public schools, the pupil-teacher ratio may drop to 25:1 or lower. In required freshman courses, more than 1,000 college stu-

Gene Wyckoff is on the staff of RCA Education Systems.



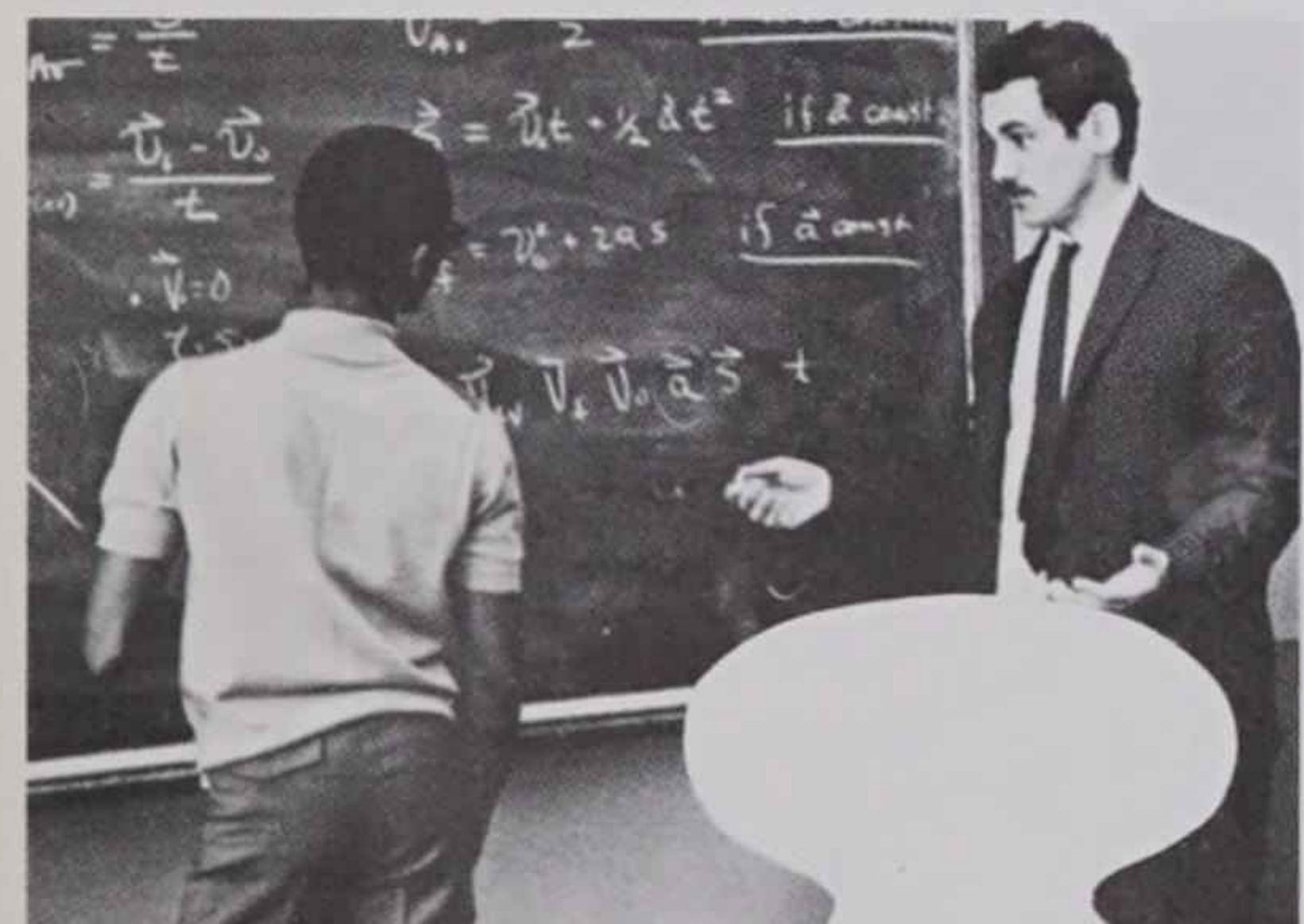


"...most teachers have neither the time, the space, nor the freedom for individualized instruction to help overcome those negative self-concepts that might be inhibiting any one student."

dents may be crammed into a single auditorium with a performing professor. Some schools have instructional television, educational films, records, tapes, and color slides as classroom aids. Others have little more than the same sort of printed materials in use a generation ago.

But these variations, say many educators, appear to have little influence upon the amount of learning that does or does not take place in a traditional school.

A movement outside the window causes eyes to turn away from the Big Talking Face (educational acronym BTF) on the Instructional Television (ITV). Two pigeons have landed on the sill and are carrying on the courtship of their species (SEX). They are drab birds, yet more alive than the view beyond them — acres of rubble where urban renewal has torn down rat-infested tenements before running out of whatever fuel urban renewal runs on. The fourth-graders in this classroom are children of the inner city. They look hungry and wary. They wear sneakers in the dead of winter.



Teacher works with one student while others in class perform drills via closed-circuit television.

The teacher raps on the window, ending SEX just as the BTF on the ITV says: "Now pay close attention. These are the facts about the outer planets. The average distance of Pluto from the sun is 3,664,000,000 miles. At some points of its orbit, it is as far as 4,600,000,000 miles. At other times, it is as close as 2,760,000,000 miles, which makes it closer than Neptune. But the average distance is good enough for us to remember. So let's write in our notebooks: three comma six six four comma zero zero zero comma zero zero zero zero."

Little hands push their pencils laboriously. One boy senses you are watching him. With a furtive movement, he pulls the sleeve of his sweater around so you won't notice the torn elbow. He glances at a neighbor's notebook to see how many zeros he missed.

At the back of the classroom you are visiting, an ITV supervisor whispers in your ear, "What hath man wrought?" Your face reveals that you are not tuned in to his channel. "That was the first message sent over the telegraph," he ex-

plains. "A real prophecy. Here we are, a hundred years later, using telecommunications to bring qualified science instructors into those classrooms in which teachers haven't kept up with scientific developments."

Cheerily, the BTF concludes, "See you tomorrow, boys and girls. Same time, same station." The classroom teacher switches off the ITV and begins a reinforcement session. "Who can tell me the average distance of Pluto from the sun? Robert?"

The boy with the hole in his sweater traces each digit with his finger as he reads aloud: "three comma six six four comma zero zero. . . ."

The supervisor nods to himself: "Quite an achievement." You would be impolite not to reinforce his self-satisfaction by agreeing with him: "What hath man wrought?"

The fault, to paraphrase Shakespeare, is not in our technology but in ourselves. Whatever is wrong with the traditional system of education, all our modern devices and media can help amplify as well as remedy it. Worse yet, we suffer a continuing confusion about what is wrong—fundamentally wrong—with American education.

From the din of discontent, one might be prompted to conclude that just about everything is wrong with our schools today and that nothing is right. That simply is not so. Almost 200 years ago, the fledgling United States of America took upon itself the unprecedented dedication to a society in which sovereign power (and with it sanctuary of freedom) resided with the common man. Hence, the common man had to be taught a trade or other useful function; he had to be made literate and given a sense of history. Over the centuries, generations of teachers met generations of pupils in classrooms, laboratories, and workshops. By and large, the multitude of graduates learned well enough to create the largest, most stable socio-economic system in the world.

The job goes on. A dedicated corps of teachers in the nation's classrooms is still hard at work, refining the intelligence and promoting the humanity of the human race as best it can. It would be a mistake, therefore, to lump together all complaints about our schools and take them as an indicator that the traditional system is about to fall.

Looked at closely, criticism of our schools is less general than it seems. There are three basic areas of complaint and a relatively specific complaining group in each area.

1. College students are now crowding

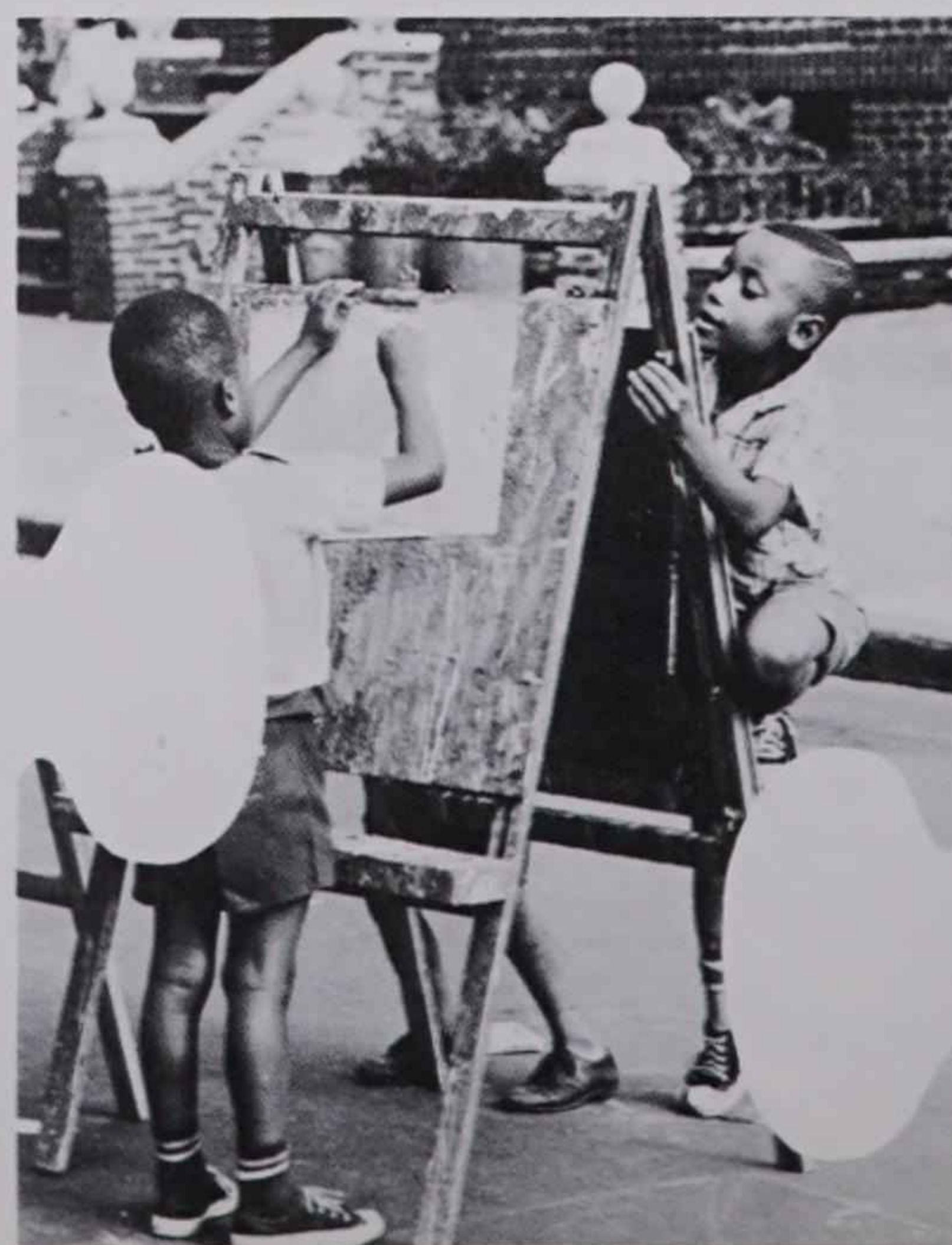
our campuses in unprecedented numbers, as higher education becomes a requisite for better-paying jobs. These young men and women complain loudly that curricula are not relevant. Courses, they contend, do not bear sufficiently on the everyday crises of war, poverty, and environmental pollution.

2. Minority-group leaders, especially among the black communities, condemn as ineffective the methods used in schools of the inner city. Their proof is in their children, who are graduated less literate and less well trained than their white middle-class counterparts.

3. Homeowners, particularly those who have retired on fixed incomes, are raising a chorus of opposition to ever greater education costs, since local schools are traditionally supported by local property taxes.

Relevance, effectiveness, cost: these, then, are the points of stress, and changes will have to begin there. In terms of political dynamics, changes to lower costs per pupil will probably get most attention in the next few years because taxpaying homeowners represent such a strong voting voice. Innovations directed at increasing the effectiveness of teaching methods will probably fluctuate in proportion to the pressure that minority groups can bring to bear. And curricular changes will probably get the least attention. (Students, at least at the lower grade levels, are not much of a pressure group on their own; and recent U.S. moon landings have all but nullified the pressure of international rivalry that began with the launching of the first Sputnik.)

Meanwhile, by the mid-1960s, a number of the largest corporations in America began assembling "educational conglomerates" to apply the expertise of industry to the problems of our nation's schools. Educators were urged to buy all sorts of devices that promised to do



Arts program helps urban children gain confidence of self-expression.



some task better, faster, or cheaper than teachers could do it. These included computer-assisted instruction, instructional television, elaborate dial-access systems, and sundry teaching machines. Whether or not this sort of product could generate or enhance learning, much of it simply did not fit into or could not be afforded by traditional schools.

In August, 1969, President Nixon's Commission on Instructional Technology submitted a final report on its \$500,000 study of the field. For all the promise of technology, it concluded, these systems had made no marked impact on our schools. By the year's end, educational conglomerates across the country were writing similar findings in red ink.

Too often, the limited market for educational technology in traditional schools is attributed to either resentment or ignorance on the part of the teacher. The truth is that most teachers want to put on varied and impressive presentations. They eagerly seek out "guest experts" and striking audiovisual materials. But practical barriers—such as the inflexibility of ITV scheduling or difficulties in obtaining the right film and film equipment at the right time—often militate against this. Classroom teachers in Chicago have to anticipate their audiovisual needs two to six weeks in advance; and, even then, with a fleet of trucks making deliveries according to computerized schedules, the city's Department of Visual Education cannot fill all requests.

Some of these barriers may become less formidable as industry finds cheaper ways to distribute materials. Telecommunication is one possibility. Cheaper, smaller equipment is another, since necessary hardware and software could be stored closer to the classroom. Yet, even then, technology may fall far short of educators' hopes unless it is found to be more than a simple aid in conventional classrooms. It must prove its worth in altering the factors that govern student achievement and in providing real economies for the system.

True, televised lessons may enable a superintendent to carry fewer specialist teachers for such courses as art history and foreign languages. But there is still that basic need for one classroom and one teacher per 30-40 students. As enrollment goes up, more teachers and classrooms are needed to maintain the accepted ratio. Generally, what is left

over for instructional materials is about 2 per cent of a superintendent's total budget. Of this, less than half goes for educational technology. In 1968, that meant some \$570 million for the purchase, maintenance, and deployment of modern media and devices out of about \$58 billion in total expenditures for all our public and private schools.

Educational conglomerates, however, have probably been more premature than wrong. The handwriting on the wall of our traditional schools clearly says: *last of the handicraft industries*. Any changes to promote greater economy and effectiveness must come before the year 1984, not because that ushers in the era of Big Brother but because, by then, another and still larger generation of pupils—children of the "war babies" born in the wake of World War II—will have begun to overwhelm the existing schools.

What causes some children to learn while others fail? Recent studies of children with normal intelligence have identified the critical factor as something (a) inside the individual child that is (b) largely formed outside the school and that (c) traditional schools, even with technological aids, rarely change for the better.

The massive Coleman Report (*Equality of Educational Opportunity*, James S. Coleman, U.S. Government Printing Office, 1966) is perhaps the best-known recent study. Professor Coleman surveyed some 600,000 children and 60,000 teachers and principals in some 4,000 schools across the country. He found that differences in achievement levels between schools were related almost entirely to differences in the social, economic, and educational backgrounds of the students and teachers—not to any variance of educational "input" provided by the school, such as pupil-teacher ratio, age of building, or technology. Children from lower-class homes (including but not limited to children of minority races) were found to start school with severe educational difficulties. Little happened in their schools to help them catch up to the levels of achievement being reached by middle-class children. Indeed, this gap often proved to be greater at the end of the school year than at the beginning.

Interpretations of the Coleman Report have given rise to a number of programs seeking to enrich the preschool years of culturally deprived youngsters. "Operation Headstart," for example, and television's "Sesame Street" series supposedly prepare them better for school by exposing them to bits of knowledge at an early age. However laudable in intent, such attempts at preschool enrichment may

Youngsters film their own 8-mm motion pictures for school project.



have little real effect. They may not touch what Coleman and others single out as the critical factor in school achievement: the individual child's sense of control over his environment, his inner conviction that he can be effective.

Apparently, a positive self-concept is more readily generated in middle- and upper-class homes. This may be a matter of differences in culture and communication. More likely, it is the product of early environment—total environment, including parental attitudes, peer and sibling influences, nutrition, shelter, disease, and so on. (This is not to suggest that the only hope for the disadvantaged child is to take him out of a poverty-stricken home environment and put him in a structured institutional environment at an early age. The Bureau of Indian Affairs has been trying this tactic for years with no measurable success.)

"We are beginning to understand today," says Arthur Combs, professor of educational psychology at the University of Florida, "that this concept of a person's self is perhaps the most important single aspect that determines his behavior, no matter what the conditions may be. Most children who come to a reading clinic, for example, have unfortunate ideas about themselves in this connection. They believe they can't read. Because they believe they can't read, they don't try. Because they don't try, they don't read well. So the teacher ends by

saying, 'My goodness, Jimmy, you don't read very well.' That just proves what the child is thinking. Now how can a child feel able unless somewhere he has experiences of success?"

Locked in classrooms all day with sizable groups of students, most teachers have neither the time, the space, nor the freedom for individualized instruction to help overcome those negative self-concepts that might be inhibiting any one student. This failure may be most obvious in schools of the inner city, which receive the most disadvantaged students. But its implications seem clear for the entire traditional system.

It may well be that the only students who are not being shortchanged by the traditional system (by not being educated to their fullest potential) are the ones who come to their school with a winning combination of intelligence and positive self-concept—that is, those who could learn equally well under any reasonable sort of system.

Hiring more teachers to reduce the size of classes is not the answer. The costs of such an approach would generally be prohibitive. More specifically, some teachers, quite normally and quite humanly, may display just enough class prejudice in ghetto schools to damage students' self-concepts.

"The underprivileged child is underprivileged because he is rejected," says Dr. Kenneth B. Clark, a prominent psy-

chologist and educator. "He is rejected in the community. He is sometimes rejected at home. But the important thing about him, as far as academic performance is concerned, is that he is more often than not rejected in the schools. When the schools cease to reject this child as a human being, he will begin to perform much more effectively."

Innovators do not start out with any particular passion for technology. But they are disillusioned with traditional methods. They are determined to find any way that works to individualize instruction so that more students experience success at learning and to heighten the active involvement of students in learning exercises. This determination leads to a variety of uses for educational technology, some perhaps unforeseen by manufacturers. For example:

□ The Fox Lane Middle School in Bedford, N. Y., has an elaborate video dial-access system intended to speed distribution of conventional audiovisual materials to classrooms and the school library. One social studies teacher found her students profited most from its use when they themselves prepared learning exercises that could be stored in the system and retrieved for use by other students.

□ A new computer in the cellar of the Altoona (Pa.) Area High School was intended to provide administrative services, such as payroll and grade reporting. Ac-

**"The truth is that most teachers want to put on varied and impressive presentations. They eagerly seek out 'guest experts' and striking audiovisual materials. But practical barriers...often militate against this."**

According to Superintendent Tom Heslep, the computer has become a valued instructional tool simply by allowing students to learn the Fortran language of computer programming and assigning them to "teach" the dumb machine how to do math and science problems. In the process of breaking down essential calculations so the computer understands the formula, students develop a remarkable comprehension of the concepts involved.

□ Seminarians at St. Mary's in Baltimore use an inexpensive videotape recorder and camera to analyze their own pastoral consultation techniques.

□ At the Manley School in Chicago, a language-arts specialist uses an 8-mm motion picture camera to reach disadvantaged youngsters. "The making of movies," she maintains, "is a very concrete experience and particularly helpful to children who haven't the ability to abstract easily. These children must combine the graphic arts in order to produce the movie. They hear themselves and see themselves. A soundtrack must be produced. The children must attend to what is being said. They must listen. They must speak."

When innovators have enough fervor, some seed money, and an understanding administration, a department-wide or school-wide pattern begins to emerge in the use of technological devices. This is the crossover point from novelty innovation to what can be called a "modern" system.

The teacher's role is markedly changed. Whereas he was once exclusively a presenter of information and a classroom custodian, the teacher now makes key presentations only to large groups. His remaining time becomes available for more crucial tasks: preparing learning exercises that his students can do on their own and consulting with individual students about their learning difficulties or special projects.

The student's role is also changed, with each student carrying out a substantial part of his own education. This does not mean that he must work alone on individual projects when he is not attending large group lectures. Indeed, one of the most valuable forms of learning activity comes when students work together in small groups, helping each other along and practicing the sort of leadership that is never necessary in traditional classrooms. In English, for example, small group activity may include play performances and choral reading. In foreign language classes, small groups can "travel abroad." It is a major oversight of the education industry that there is so little

material—and almost no technology—marketed specifically for small group activity.

School buildings are used differently, too. When there has been the dedication to cross over to a modern system, conventional schools have successfully reallocated space for large group, small group, individual study, and consultation needs. Requirements for circulation space, such as corridors and lobbies, may be greatly reduced because of flexible scheduling. Some newer schools are being designed with large, open instruction areas that can be divided and redivided by temporary partitions. However, even the varied or open spaces of new school buildings may end up being poorly used if the dedication is lacking or if the administration itself remains rigidly traditional.

Does the modern system make any difference? Do students who cannot achieve under the traditional system continue to fail even with all the emphasis on individualization and involvement?

Ron Higday, chairman of the English department at Emery High School, across the bay from San Francisco, answers without hesitation: "We have seen students who were behavior problems in a regular classroom situation operating without supervision on their own and working profitably with language skills. We have seen students who spoke only a dialect, after just a few months of work, speak both their dialect and standard English."

Higday abandoned traditional methods of instruction when he saw his disadvantaged students going out into the world without sufficient language skills to function successfully. He ungraded the four-year English curriculum and divided it into a series of "learning packages" of literature, composition, and oral language. Students formed their own small groups to work with these packages—dramatizing a scene from a play, listening to a completed tape recording, seeing a movie based on a book, using a controlled-speed reading device, working with the staff speech pathologist, going on field trips, inviting guest lecturers.

"Anything and everything goes," says Higday. "The only requirement is that it appeal to the interests of the students and involve them in language development."

Mrs. Kay Killough, principal of the Matzke Elementary School near Houston, Tex., almost echoes Higday's words. Matzke is a modern "one-room" schoolhouse, an open-space facility with hundreds of students and a pupil-teacher ratio no lower than 28:1. Yet, by allowing many students to pursue learning exer-

cises on their own and using large group instruction for certain courses (such as physical education, music, and art), Mrs. Killough can redeploy most of her faculty to work with small groups and individual students.

"What we're basically trying to do," she explains, "is develop a positive self-image in children. I've seen this happen in innumerable cases where boys and girls completely change their style of living and their behavioral patterns. They become more independent and self-assured."

Much of this is known to the educational Establishment. But simple inertia has long impeded progress in improving the quality of instruction. That inertia seems to vary in direct proportion to the size of the community—which means that modern methods may come last to the one place they are needed most, the highly bureaucratic inner city.

What is not yet known to the Establishment, however, or even to the tax-paying public, is that these modern methods may actually cost less per student than does the traditional system. The experience of Camden (N.J.) Catholic High School is a good example. Until last September, it functioned in the traditional manner, and it was crowded to the sills with its 2,000 students. Then the school went modern.

Reallocating space and faculty-student time, the principal found that he could accept 120 additional students without having to add one new faculty member or one additional classroom. Capacity had immediately increased 6 per cent and, according to school estimates, may yet go as high as 15 per cent above the original 2,000 without a sense of overcrowding.

True, large group lectures of 100 would go to 115, but that does not change the dynamics of a large group situation. If every small group learning exercise went from five students to six (a 20 per cent increase), this would not appreciably change the interaction of the small group experience. Some of the additional revenue brought about by increased enrollment would have to go for instructional materials and possibly more individual study locations. But the net result would be a substantially lowered cost per pupil/year.

In the end, it may well be this basic pocketbook factor that will act as a catalyst in bringing about real change in education.

For the producers of educational technology—manufacturers and publishers—a changeover to the modern system is

doubly significant. Whereas technology is of little use in traditional schools, it becomes an essential part of modern methods. Furthermore, while expenditures for the hardware and software of modern media seem fixed at about 1 per cent of traditional school budgets, a considerably increased percentage may be available in the budgets of schools operating under the modern system.

Again, take the example of the Camden Catholic High School. Let us peg the annual income related to each student at an arbitrary \$100.

Under the traditional system, the high school's annual budget would have been \$200,000 for 2,000 students, and the 1 per cent it had available for educational technology would have come to \$2,000. However, with an increased capacity of 2,120 students, annual income under the modern system would amount to \$212,000. Since no new teachers or classrooms were needed, \$14,000 (the original \$2,000 plus the added \$12,000) would be available for materials and technology.

If the capacity of the school eventually went to 2,300—with no new teachers or classrooms and no diminution of achievement—as much as 15 per cent, or \$32,000, might be available for materials and technology. (This, of course, is a gross oversimplification. It does not consider uses of the additional income for higher teacher salaries, more elective courses, or for plain old reduced cost of operation, which was an important reason for making the changeover in the first place.)

The design of future hardware and software lies in the needs, both instructional and administrative, of the modern system. To date, the most urgent need seems to be for a wide range of individual and small group learning exercises that may be performed by students working alone and that schools can afford.

"What hath God wrought?" That, you now remember, was the first message sent over the telegraph.

But perhaps the misquote heard in an inner-city classroom was more appropriate to situations in which the miracle of the modern media is used to bombard children with irrelevant facts and to perpetuate the traditional rigidities of our educational institutions. What has man wrought, indeed?

The original sentiment by Professor Morse was lofty and reverent. The challenge now is to live up to it. The challenge is to use educational technology with a sense of reverence for the true needs of students and for the growing financial pressures on those who are paying for our schools. ■

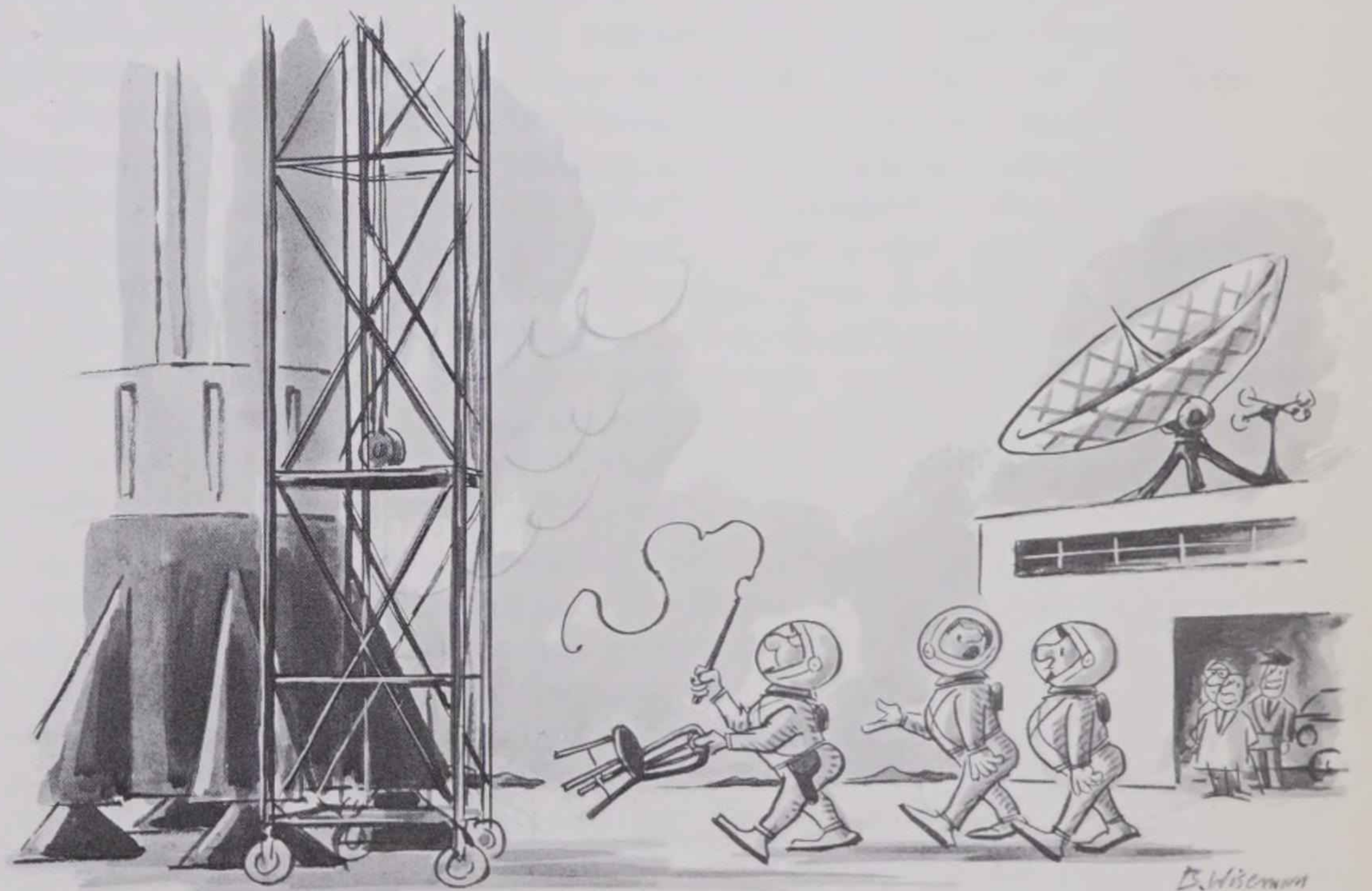
# This Electronic Age...



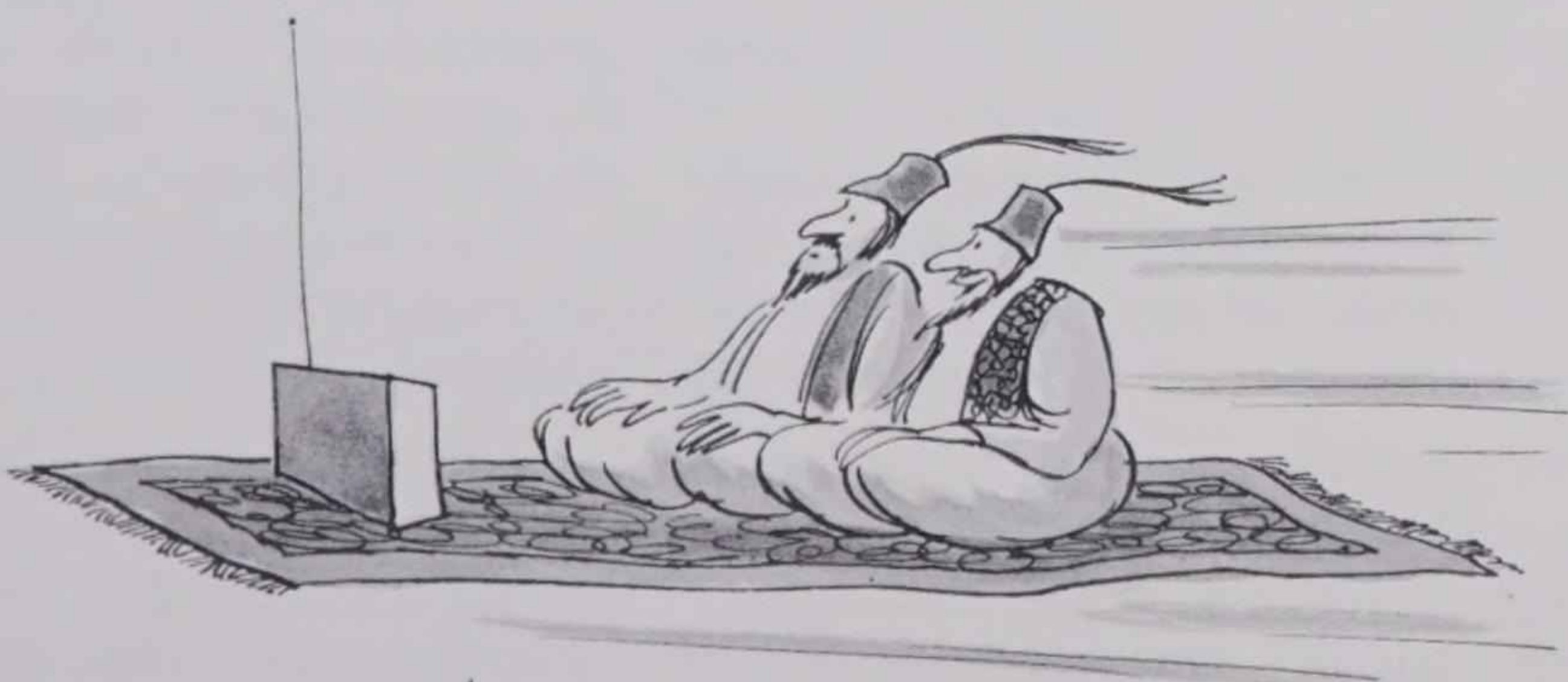
"I think he's a little weak with his potentiometers, but the oscillating feedback is inspired."



"Which countries show American programs on their television?"



"Thompson believes we'll find rather advanced life-forms . . ."



"I suppose the younger generation having grown up with TV will take it for granted, but to me it's still a marvel."



"This is my first experience on a super jumbo giant jet."

# tv evening news

## a day in the life of a half hour

by Elisabeth Coleman

It's a typical Wednesday afternoon in New York. The television networks are applying final touches to their evening news shows.

On the fifth floor of the RCA Building at Rockefeller Center, executive producer Wallace Westfeldt plucks in nervous frustration at his bushy, sandy-gray eyebrows. NBC's courier with film from London is stuck in a traffic snarl en route from Kennedy International. . . .

Farther uptown, at the CBS Broadcast Center on West 57th Street, Westfeldt's counterpart, Leslie Midgley, listens on the phone to his Washington producer Ed Fouhy. Fouhy is pushing for an extra 20 seconds on Dan Rather's Nixon piece. Midgley frowns, scribbling on a yellow legal pad. . . .

Meanwhile, on the second floor of ABC News' West 66th Street headquarters, Av Westin paces the gray carpet in his small office. He's worried. The show is to be aired in an hour and must include some late footage coming via satellite from Tokyo. But satellite color reception recently made South Vietnam's President Thieu look as bloodless as a vampire on "Dark Shadows". . . .

The always hectic and frequently nerve-racking daily routine of network news begins, appropriately enough, with events. News events. It begins in the deltas of Vietnam, in congressional cloakrooms, or in an assassin's cell. It ends, hours later, on television screens in 21 million American homes.

The processing and presentation of television news demonstrate the growing sophistication of the medium more clearly than does any other part of television. Each day, a battalion of reporters

and correspondents captures every "significant" news development in carefully phrased words. With them are their camera crews (typically, a cameraman, sound man, light man, and field producer), recording the events on film and tape. Together, they feed hundreds of stories and thousands of feet of film back to New York via jet, telephone, and satellite.

Awaiting their reports at network headquarters are hundreds of producers, directors, editors, writers, and anchormen. These men further sift and compress the

news. And they work with lightning speed.

"We have all the technology that put men on the moon at our disposal," says one producer. "Couple that with our experience and expertise, and if we can't give you the fastest, best reports ever then we should get out of the business."

Of course, such speed and sophistication cost money. A lot of money. In 1969, the three major networks budgeted close to \$140 million for news operations. Each allocated \$7-10 million for its evening news alone.

Overall, the networks lose millions each year on the news (which includes daytime shows, special events coverage, and documentaries). But evening news reports are blue-ribbon money winners. NBC, for example, charges Huntley-Brinkley sponsors about \$22,000 a minute. In 1969, according to a report in *Fortune* magazine, the show grossed some \$34 million, making it the network's largest single source of revenue.

However, evening news has not always been conducted on such a grand scale. Following the general pattern of television history, its beginnings were meager and its growth rapid. CBS began the first 15-minute evening news program with Douglas Edwards in 1948. Expanded to a half hour in 1963, the show added \$3.7 million to a total news budget of \$30 million. Today, that budget is closer to \$45 million, and the allotment for the evening show, featuring Walter Cronkite, has doubled. NBC teamed Huntley and Brinkley in 1956; by 1959, they were grossing a mere \$8 million—a quarter of what they make today. (NBC followed arch-competitor CBS by just seven days in switching to the longer format in 1963; it led the trend to full color in November, 1965. ABC, which began a 15-minute show with John Daly in 1951, went to both color and the half-hour format in January, 1967.)

# 8:00

Westfeldt breakfasts on coffee and the "Today" show, digesting the *Times* on the 8:44 from Irvington, N.Y. A mound of newspapers, a stack of Associated Press wire copy, and the "film and feed" list (possible stories for tonight's show) await him when he lopes into his office at 9:30. He meets with a handful of news executives, including NBC News President Reuven Frank, at 9:45. "This meeting is pretty much pro forma," Westfeldt explains. "Reuven asks 'What's new?' and everyone says 'Nothing.'"

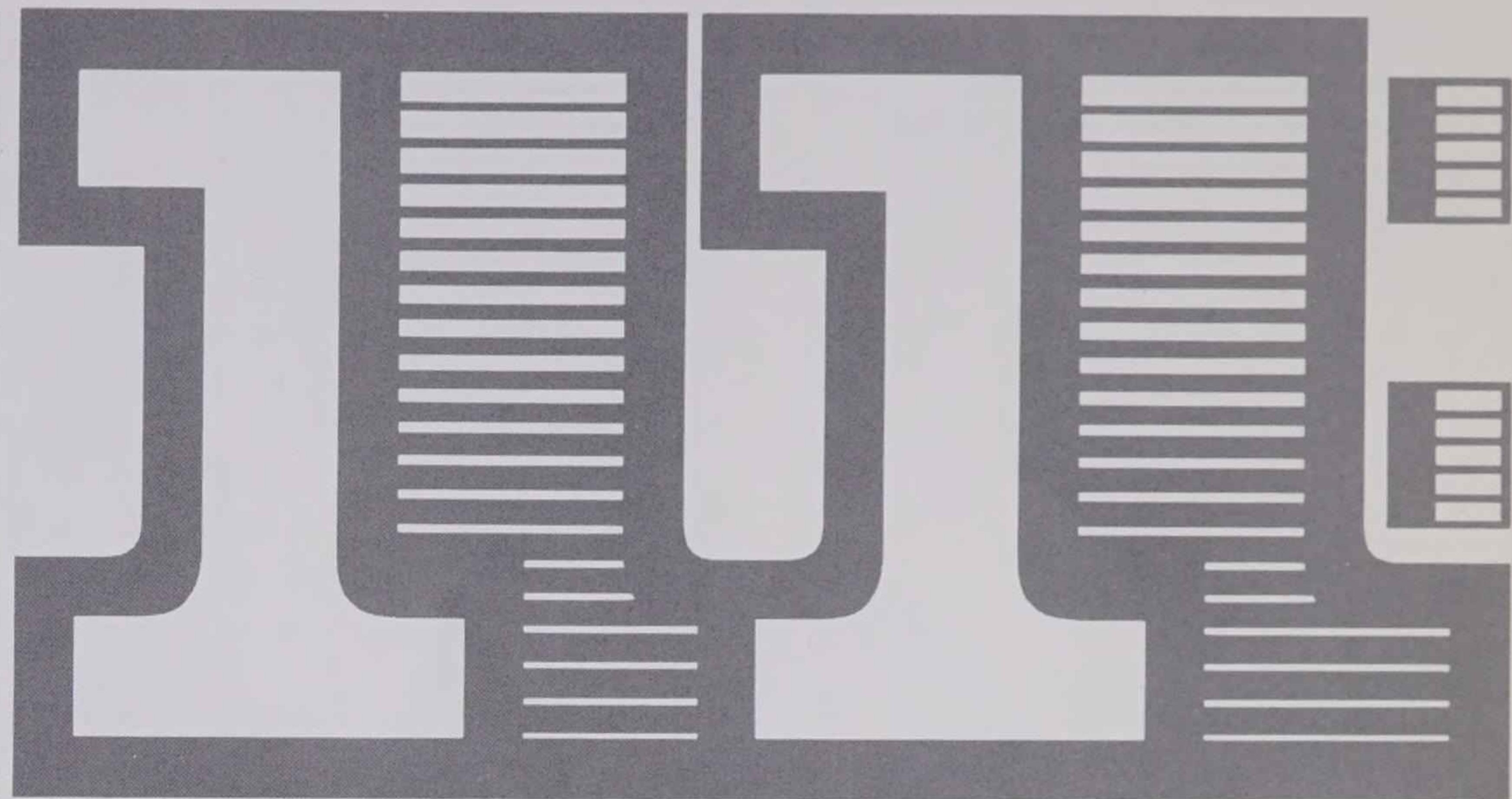
Midgley climbs into his green 1965 Pontiac in Hartsdale, N.Y., around 8:30. He has watched the late news and checked in with his assignment desk the night before. Now he tunes in all-news radio station WCBS. At his office he checks wire copy and the "CBS insights" list of story possibilities. But he holds no meetings. "We are," he insists, "one continuous staff meeting."

Westin combs his hair in his three-room Manhattan apartment to the same news that Midgley hears on his car radio. At 9:00, he grabs a cab for the 30-block ride to his office. At 9:45, he screens some Lebanese footage, deciding it is strong enough to use that night. Staffers crowd into his office at 10:30 for a rundown of the "morning situationer" (ABC's name for the same list NBC terms "film and feed" and CBS calls "insights"). With the Washington bureau listening on the phone, Westin runs down the list. Meanwhile, his aides, lounging on a couch or on the floor, casually check off items.

The assignment desk is never left unattended. Its job is to assign camera crews, reporters, and correspondents (high-ranking reporters) for the entire network. Often, the assignments are automatic. NBC's Herb Kaplow gets first crack at the President, since the White House is his "beat." Similarly, Steve Rowan covers the Defense Department for CBS, and Jules Bergman is ABC's science editor.

Unfortunately, though, correspondents are not always available when the pro-

ducers would have them. Recently, Westfeldt wanted John Chancellor to cover a Presidential news conference for Huntley-Brinkley and finish with a "stand-upper" (a filmed piece in which the correspondent is on-camera telling the story). Unknown to Westfeldt, the assignment desk had already nabbed Chancellor to cover the same conference for general network news and do instant on-air analysis immediately afterward. Thus, Westfeldt had to go with another correspondent.



Westfeldt, a tall, rangy Southerner, is in his first staff meeting of the day. The talk is about last night's show, today's stories (Vietnam, a congressional bill), and long-range projects (prison reform, women's liberation). One writer wants a story on black power in the Caribbean. Guffaws. The writer protests. The story is solid, he says. "Yeah," grins Westfeldt, "for *The New York Times*..."

Midgley and his producer, Sandy Socolow, are on the phone to Los Angeles, figuring out the best way to get footage from Susan Atkins' press conference regarding her role in the Tate murder case. They are interrupted by the news that police are seeking a white woman in connection with the bombing of a courthouse in Cambridge, Md., where Rap Brown was to have stood trial...

Westin's meeting has broken up. Back in the screening room, he looks at a piece from Tel Aviv. "Not much," says his film editor. "Okay," says Westin, "take it off the board." He walks back to his office and picks up a copy of *Variety*. "The day's got a feel to it," he mutters. "Things are going to get switched around..."

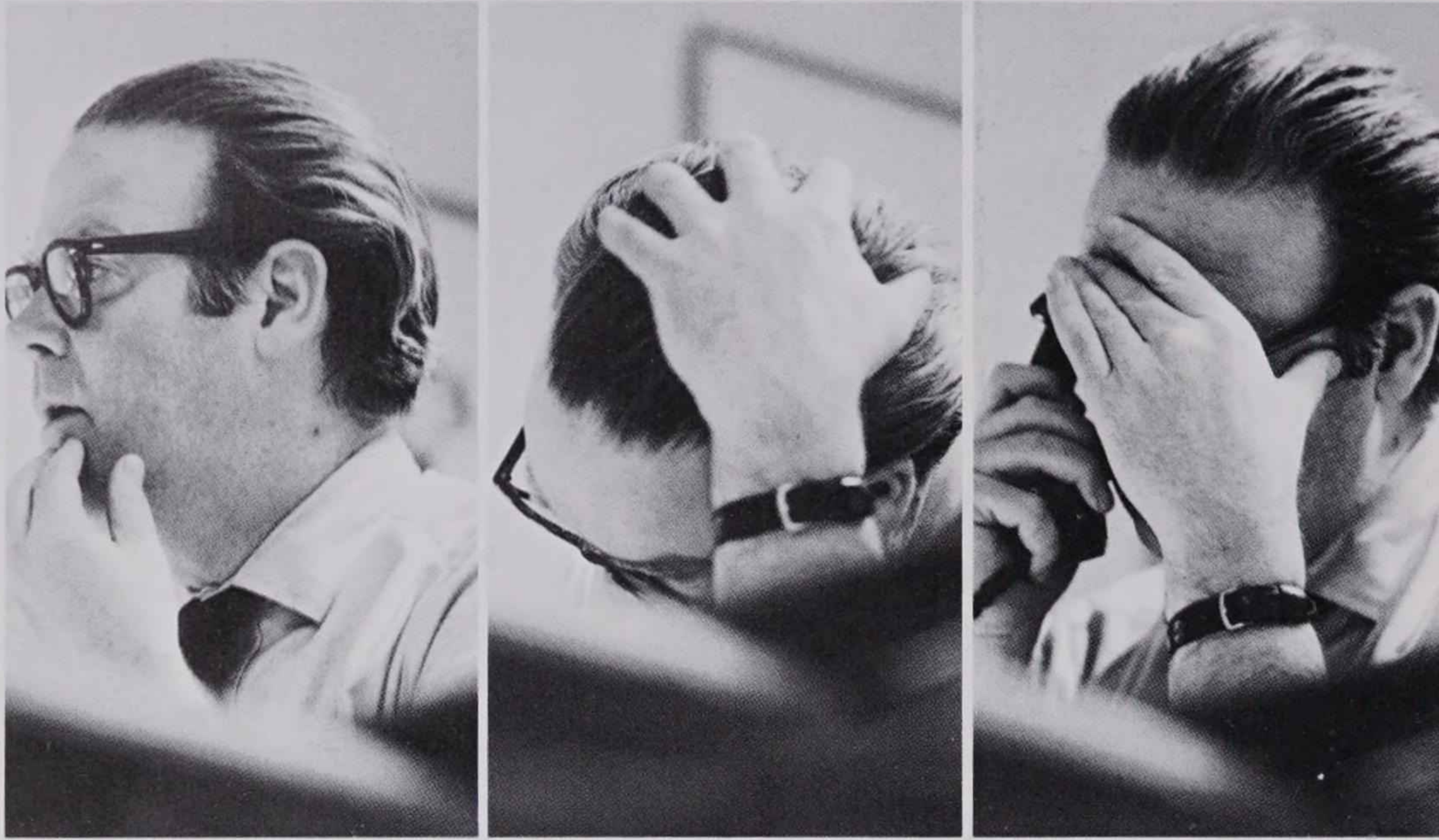
Each network has 15 to 20 news bureaus positioned around the world. Outside of New York, the Washington bureaus (and NBC's Los Angeles bureau) are the largest and most important. Almost a third of each night's show comes from the capital. Hence, the networks maintain large staffs there. NBC has 15 people for Huntley-Brinkley alone; ABC has 19 for Reynolds-Smith.

Technically, Washington is a "mini-New York." Permanently leased AT&T telephone lines permit instant telephone contact and instant transmission of videotape between the two cities. Footage is thus fed directly from Washington into the news shows being broadcast from New York. This means that Washington bureaus must process their own film, considerably easing the burden on New York staffers. (New York editors pencil

through all written copy from Washington before the show, but do not preview footage. ABC also regularly uses this system with its Chicago bureau.) For the NBC and ABC shows, which have anchormen in Washington, this processing is especially important.

Since the networks are connected with their affiliates by telephone lines, it is technically possible to switch to any area of the country. Indeed, when an important story is late-breaking, the shows will "go on live," transmitting a story on videotape directly from the nearest affiliate station. But the cost of renting telephone lines, which must be leased for a minimum of one hour, is very expensive. Since AT&T raised its rates 44 per cent last summer, an hour from Los Angeles to New York costs \$2,052; from Detroit, \$974.

“The processing and presentation of television news demonstrate the growing sophistication of the medium more clearly than does any other part of television.”

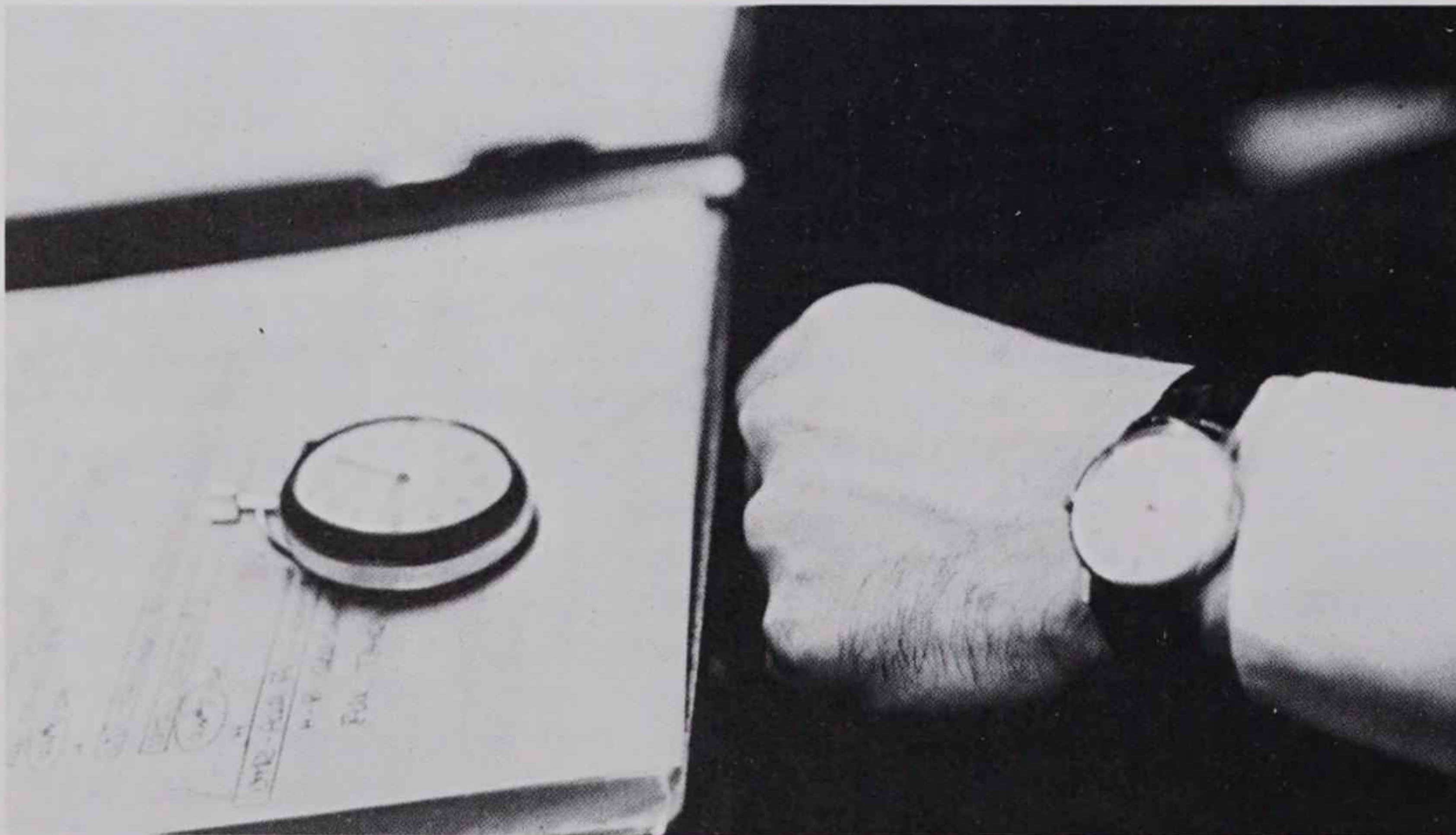


At NBC, producer Westfeldt's day begins with staff planning conference and calls to regional bureaus.



News correspondent Chet Huntley reviews tentative schedule with Westfeldt.

“Between the lead story...and the upbeat or funny ‘kicker’ at the end, the pieces are carefully arranged so as not to confuse the viewer and paced so as not to let his attention wander.”



Stopwatch symbolizes critical importance of timing to director, who must cue station breaks, commercials, and remote “feeds” with split-second precision.

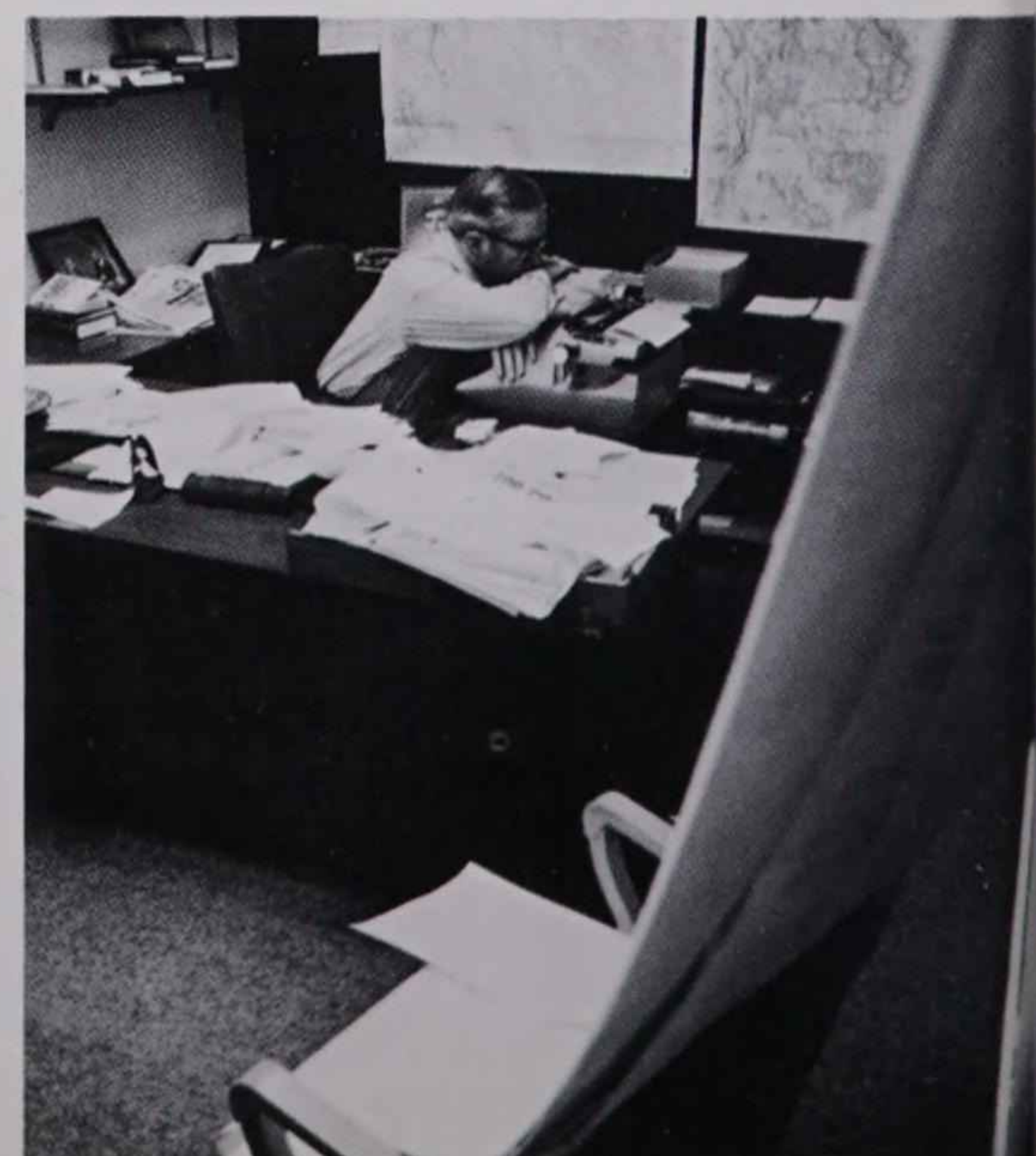


At ABC, producer Westin is joined by anchorman Frank Reynolds and news staff for mid-afternoon conference.

“In addition to the day’s ‘hard news’ stories, each show includes timely, general stories. These range from inflation in Vietnam to birth control in Puerto Rico...”



Time allotments and sequences of stories are set by staff approximately a half hour before air time.



Reynolds ponders final script.

# 12

Westfeldt rustles through wire copy, which is delivered every few minutes by a long-haired copyboy. Sander Vanocur calls about his piece on Senator Muskie. Then, promptly at 12:15, Westfeldt holds a coordinating telephone conference with his four domestic bureaus. Afterward, just before lunch at nearby Charley O's, he talks with his film editor, Tom Maccabe, about Saigon footage. Maccabe says it's good and suggests 1:45 minutes. . . .

Midgley, a gray-haired man of 54, also gets a noon progress report from his bureaus via conference call. Following that, he begins to prepare his first "lineup" for the evening. The list contains all the stories scheduled—but no time allotments. He decides not to use footage of the Strategic Arms Limitation Talks but to have Cronkite "tell" it instead. . . .

Westin has no conference call. "Any late starters?" he asks Washington by phone before sitting down to compile his lineup. The answer is "no." His assistants look on carefully, noting the times. "31:49," he announces. That's nine minutes too long. He rips off another sheet of paper and starts again. At 12:38, he clicks on the intercom to Washington and reads them the list, indicating which stories are for Reynolds to handle and which are for Smith. . . .

Because telephone transmission is so costly, other means are used daily. When time permits, for example, undeveloped film may be flown directly to New York from a domestic source. A "dope sheet" (cameraman's description of the footage) accompanies it to facilitate editing; a script of the reporter's narrative is either sent along or wired in advance. The film is developed, screened, and edited in New York.

When time is more precious, however, film is developed locally, at an affiliate or at a bureau. It is "rough-cut" (or completely cut, again depending on the time) and transferred onto videotape for "feed" to New York via telephone lines. The footage is screened in New York and may be edited further before it is aired.

About 90 per cent of all footage on the evening news is videotaped. Tape is pref-

erable to film, since it neither breaks nor distorts color veracity. Transfer is simple: the film is run on a projector, and a videotape machine pointed into the lens of the projector records the images.

When students rebel in Toronto, Buddhists protest in Saigon, or a general strike paralyzes Rome, film is normally flown to New York by commercial jet. Footage from Europe may cause the least headaches, since the time difference gives New York producers a chance to prepare for its arrival. Film leaving London as late as 1:00 P.M. local time, for example, arrives at Kennedy International at about 2:30 P.M. Eastern Standard Time. Film flown in from Asia is sometimes processed on the West Coast and transmitted eastward by telephone lines.

The time difference, however, may result in a full day's lag with foreign film.

When a story is too important to risk that lag, it is beamed to New York by satellite. This, of course, is an extremely expensive means, and it is used only in crisis situations—a huge train wreck in South America or the surrender of Biafra. The Pacific satellite costs \$2,520 for the first 10 minutes and \$110 for each additional minute. The Atlantic satellite costs \$3,290 for the first 10 minutes and \$89 a minute thereafter.

In the course of a day, some 6,000 to

10,000 feet of network film pass through the editing room. Most of it ends up on the floor. At a rate of 36 feet a minute, and 10 to 15 minutes an evening, each show uses about 350 to 550 feet of film. Producers Westin and Midgley see most of their film before it is aired; Westfeldt often leaves that responsibility to his film editor. Unused film may be saved for later use on the show, made available to other network news shows, or distributed to affiliates for use on local news shows.



The levity of earlier hours is gone. Westfeldt sits at his desk preparing the lineup. Staffers hover near the door, waiting. The producer works deliberately, slowly, finishing by 4:15. Then he makes a quick call to Washington to fill them in and to tell Brinkley which pieces he has. Huntley, in New York, retires to his spacious booklined office to write copy. . . .

CBS editors move quickly now, and quietly. Midgley slips the time allotments into his lineup, which has been changed twice since lunch. On the other side of a glass wall, Cronkite and two writers sit hunched over typewriters. . . .

Frank Reynolds, in a small office adjacent to Westin's, hurriedly finishes his commentary for the show. At 4:15, his assistant enters with narrative copy his writers have helped him prepare. Stopwatch in hand, he reads down the page, his lips moving silently. . . .

In addition to the day's "hard news" stories, each show includes timely, general stories. These range from inflation in Vietnam to birth control in Puerto Rico and are ordered in advance.

CBS uses about three such "enterpriser" pieces a week. NBC, which calls them simply "background pieces," uses about the same number. ABC has a "bank" system, which it considers slightly different: pieces are assigned and prepared for use with expected hard news developments. "Our competition has similar pieces," says Westin, "but they don't assign them with quite the same attitude. We always anticipate that there will be a hard news peg within 30 days after we assign a piece."

The order of the lineup's 25 to 40 stories is never accidental. Between the lead story—usually the predictable headliner of the day—and the upbeat or funny "kicker" at the end, the pieces are carefully arranged so as not to confuse the viewer and paced so as not to let his attention wander. The half-dozen film stories are spaced out. Stories on one subject (e.g., Vietnam, Congress) are usually kept together. Westin painstakingly arranges his 22½-minute program into a series of segments called "packages." These are bundles of stories that tie logically into one another. In between these packages come the "punctuation marks"—better known to viewers as commercials.



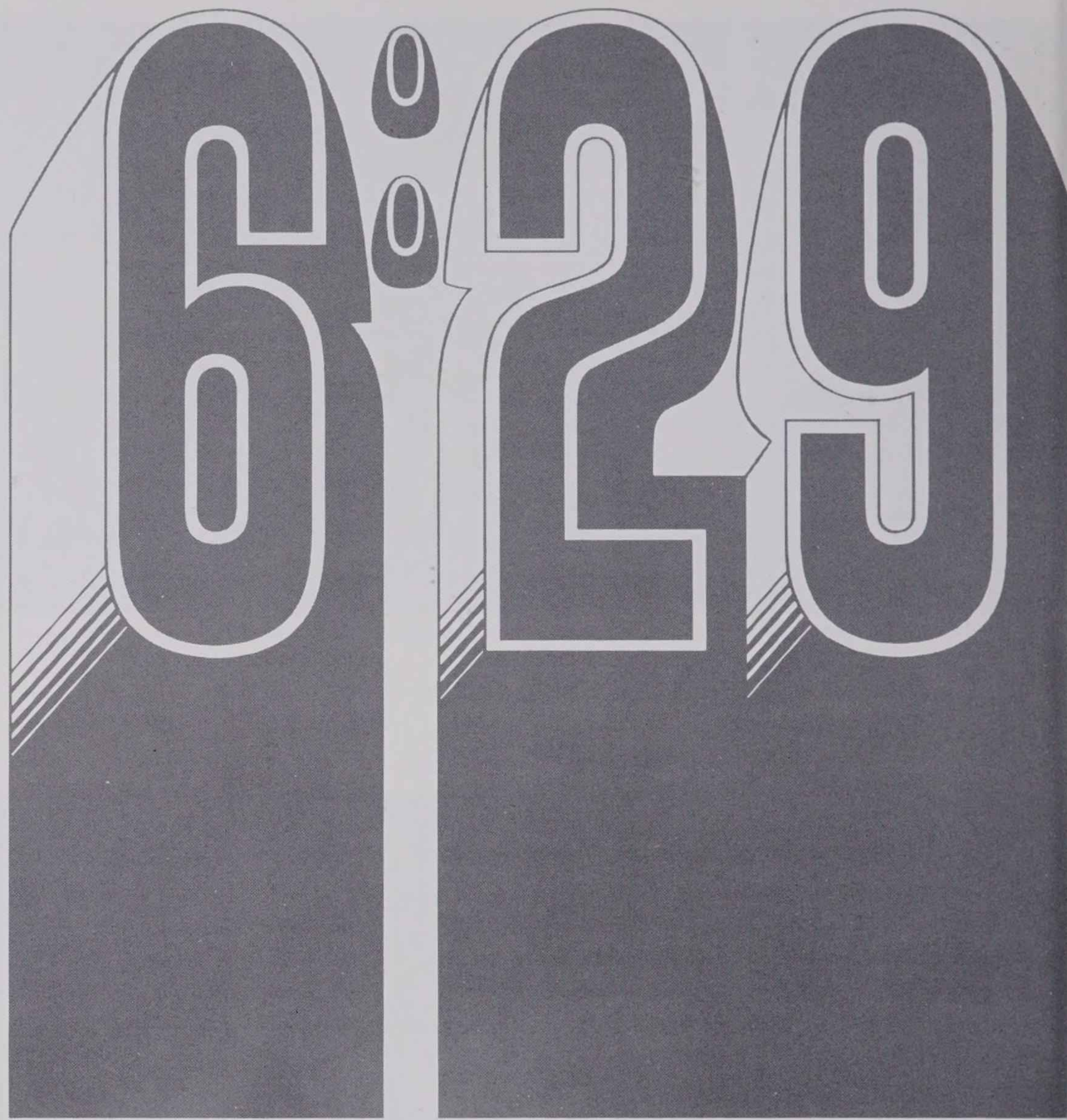
Westfeldt finds himself 1:10 minutes over and decides to drop Vanocur's piece on the Muskie press conference. The London film has arrived and is being edited on the ninth floor. Chicago calls. Researchers at the University of Chicago have just released new information about the dangers of the Pill. "Why do they always wait until now to announce?" sighs Westfeldt. . . .

Midgley is scrambling, too. He gave Dan Rather those extra 20 seconds, and now his Chicago bureau calls about the Pill. He decides to drop the SALT talks altogether to make room. . . .

Av Westin sits in his office, waiting. All is quiet, except for the gentle clicking of telex machines next door. The satellite color came in well, and now his staff has gone across the street to the studio and control room. ("If I watch from there, I get too concerned with the technical side. Here I get a better over-all view.") On the color monitor, Frank Reynolds clears his throat, looks up at the camera. "Good evening. . . ." Westin's phone rings. He picks it up impatiently. Chicago. It's about the Pill. . . .

The evening news goes out to stations the same way much of it came in—by telephone wires. At NBC and CBS, the first of two "feeds" to affiliates goes out at 6:30; at ABC the first of three at 6:00. Second and third feeds accommodate eastern affiliates that wish to take their

network news at differing times. (Western states, where the dinner hour is three hours later, get their shows from the Los Angeles affiliate of each network, which tapes the best feed and then rebroadcasts.) Subsequent feeds also give the shows a chance to update and correct.



Now it's Westfeldt's turn to sit alone. The last elevator load of staffers has gone up three floors to the control room. One hand rests lightly on the desk phone—just a switch away from Washington and the control room. He purses his lips, thinking about the Pill story. Chet will read a few sentences. . . .

Midgley also watches in his office. There are three color monitors hanging on the wall opposite his desk. He sighs, stretches, settling into position as avuncular Walter Cronkite opens the show with news of the Presidential veto. . . .

Westin, now waiting for the second feed, removes his glasses and rubs his eyes. He didn't like the first feed: Howard K. Smith was cut off by a piece of film. Anyway, he wants the show retaped to include news of the Pill that didn't make the first show. . . .

A half hour later, the shows are being aired in New York. The day is finished—almost. Forty-million Americans have seen Chet and David bid each other goodnight, or Frank and Howard sum up "the night's news and comment," or Walter intone once again: "That's the way it is. . . ." The producers finish up around the shop, watching their competi-

tors' shows, talking with their bureaus about tomorrow. Westfeldt hurries for the 8:20 train back to Irvington. Westin catches a cab to his East 90th Street apartment. Midgley gets into his car for the return trip to Westchester, his red colonial house, and his wife, Betty Furness.

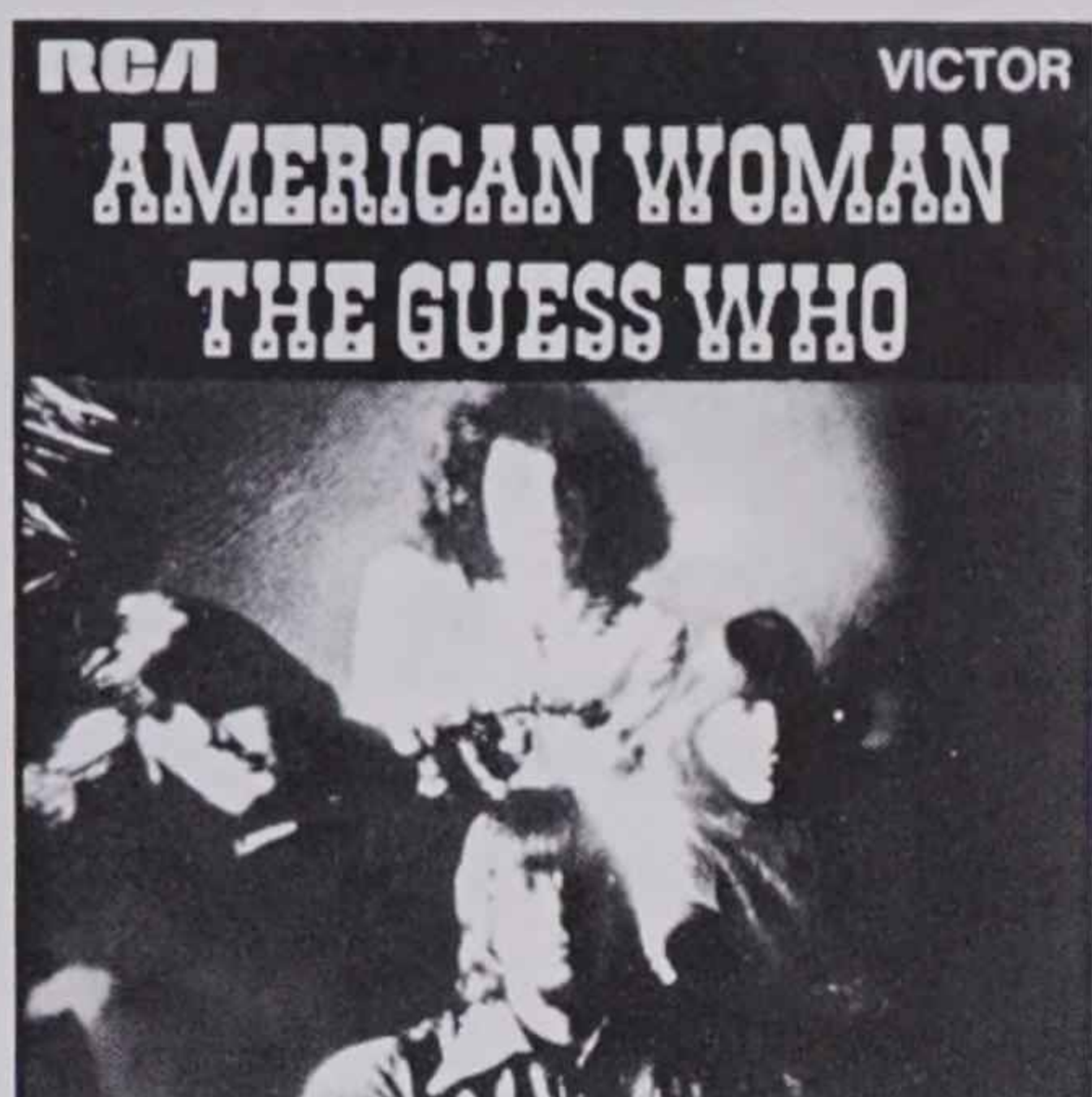
Hard day at the office? "No," he says. "Just routine. Just like everything else." ■



### Verdi: *Il Trovatore*

Leontyne Price, Placido Domingo, Sherrill Milnes, Fiorenza Cossotto, and Bonaldo Giaiotti  
Zubin Mehta conducting the New Philharmonia Orchestra LSC-6194

*Il Trovatore* is one of those rare operas, which, like *Carmen*, abounds with musical riches and often turns a stage performance into an evening of vocal display. This is the third Red Seal recording of the Verdi masterpiece in less than 20 years and the first that presents the complete score. Leontyne Price is cast in the role of Leonora, with Sherrill Milnes as Il Conte di Luna, Fiorenza Cossotto as Azucena, Placido Domingo as Manrico, and Bonaldo Giaiotti as Ferrando.



### American Woman

The Guess Who LSP-4266

The Guess Who, a popular Canadian group, has followed up its string of hit singles with a third album, "American Woman." The group recently received the Gold Maple Leaf Award as the top vocal/instrumental group in Canada. It performs eight original vocal numbers written by two of its members, Randy Bachman and Burton Cummings, and a ninth that resulted from the collaboration of all four members. Also included is an instrumental, "969 (The Oldest Man)," composed by Randy Bachman.



### Bartók: Piano Concerto No. 2 and Four Pieces for Orchestra, Op. 12

Alexis Weissenberg, pianist  
Eugene Ormandy conducting The Philadelphia Orchestra LSC-3159

This first all-Bartók Red Seal recording by The Philadelphia Orchestra has been released in commemoration of the 25th anniversary of the composer's death. It gives Eugene Ormandy an opportunity to demonstrate his interpretive sympathy for his countryman's music. Weissenberg performs as soloist for the Piano Concerto, as he did with the Orchestra in concert last November. The album also features the first recording of the Four Pieces for Orchestra, a relatively early Bartók composition.



### Real Friends

The Friends of Distinction LSP-4313

"Real Friends" brings together a new collection of top contemporary material—much of it written for and all of it performed by The Friends of Distinction, who were recently selected by *Cash Box* magazine as the best new rhythm and blues vocal group of 1969. The album features a half-dozen songs composed by Anita Poree and Jerry Peters, the writers of The Friends' recent top single, "Going in Circles." Among the Poree-Peters songs introduced here are "Love or Let Me Be Lonely," "Lady Mae," and "My Mind Is a Camera."



### Shostakovich: Symphony No. 13, Op. 113 ("Babi Yar")

Eugene Ormandy conducting The Philadelphia Orchestra  
Tom Krause, baritone  
Robert E. Page conducting the Male Chorus of the Mendelssohn Club, Philadelphia LSC-3162

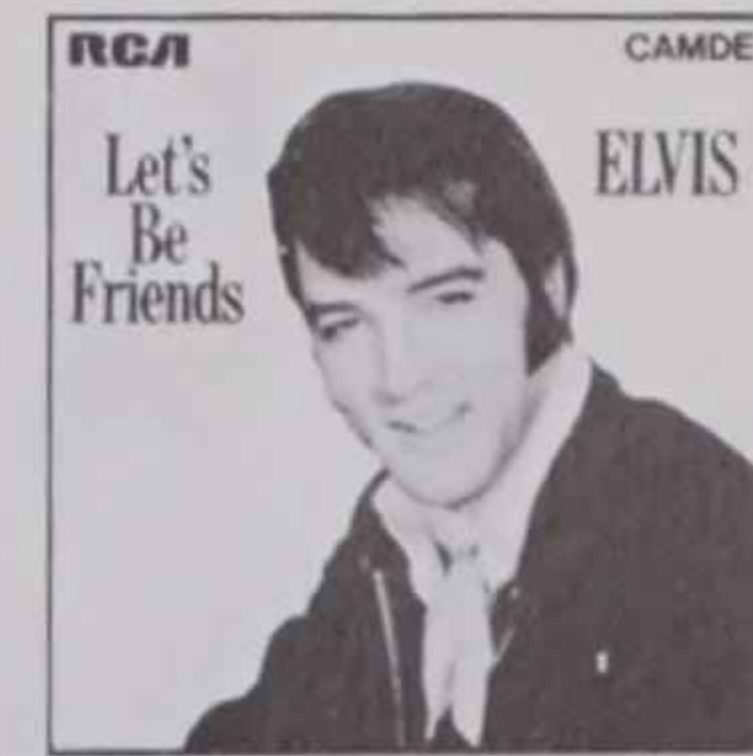
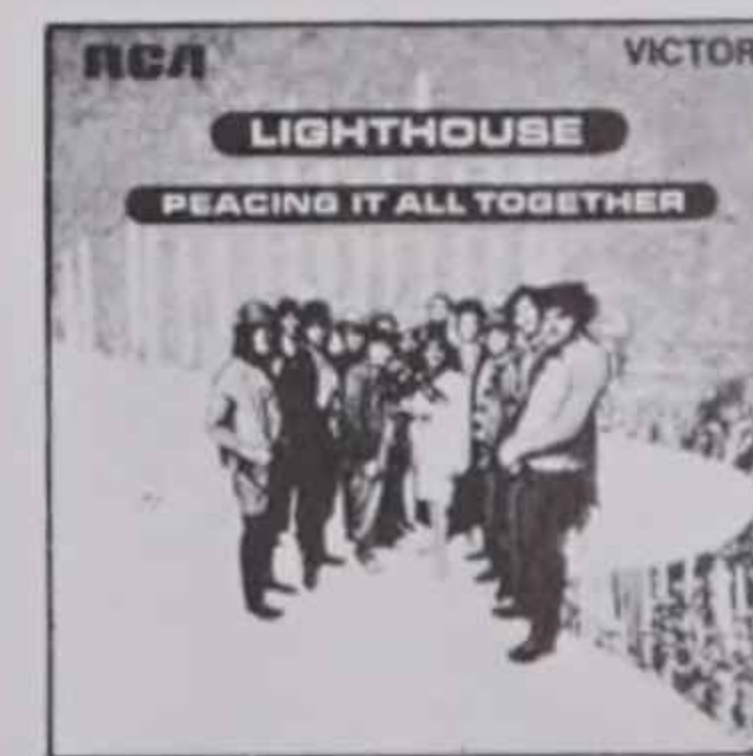
This is the first authorized recording of the controversial 13th Symphony of Dmitri Shostakovich. Based on five poems by the Soviet poet, Yevgeny Yevtushenko, the first movement is designed as a long memorial to the Jews who died at Babi Yar during World War II. The Symphony was first performed in Moscow in 1962 and has seldom been presented in the Soviet Union since that time.



### Elizabethan Lute Songs

Julian Bream, lutenist  
Peter Pears, tenor LSC-3131

This Red Seal collection of songs from the "golden age" of English music, the time of Elizabeth I, again teams the renowned English tenor Peter Pears with the world's foremost lutenist. For this recorded recital, the works of Thomas Morley, Philip Rosseter, John Dowland, and Thomas Ford were chosen as the best examples of the delicate musical style of the early 1600s. The themes are divided between two subjects—love and death—in elegantly written poems set to expressive music. The works on this album make up much of the repertoire currently performed in concert by the two artists.



Other Current RCA Releases

# Switched-On Sports

Electronic "umpires." Computerized boxing. Quarterbacks wired for sound. These are the signs of changing times, as the world of sports meets the world of technology in the 1970s.

by Norman H. Solon

On a chilly May afternoon in 1939, Princeton University invaded Columbia's Baker Field for a baseball game that normally might have made the local sports pages as a two-line filler. At stake was fourth place in the Ivy League; what resulted was a metamorphosis of major spectator sports in the United States.

A switch was turned at the RCA Building in midtown Manhattan, activating an iconoscope TV camera perched on a wooden platform to the left of home plate, and Station W2XBS began the first telecast of a sporting event in history. The audience, however, could have been measured in dozens, since at that time there were only about 400 TV receivers in existence. Thirty years later, the picture had changed substantially.

Some 60-million fans watched the New York Jets upset the Baltimore Colts in the Super Bowl of January, 1969. Later in the year, as many as 40 million tuned in to

World Series games between the victorious New York Mets and the Baltimore Orioles.

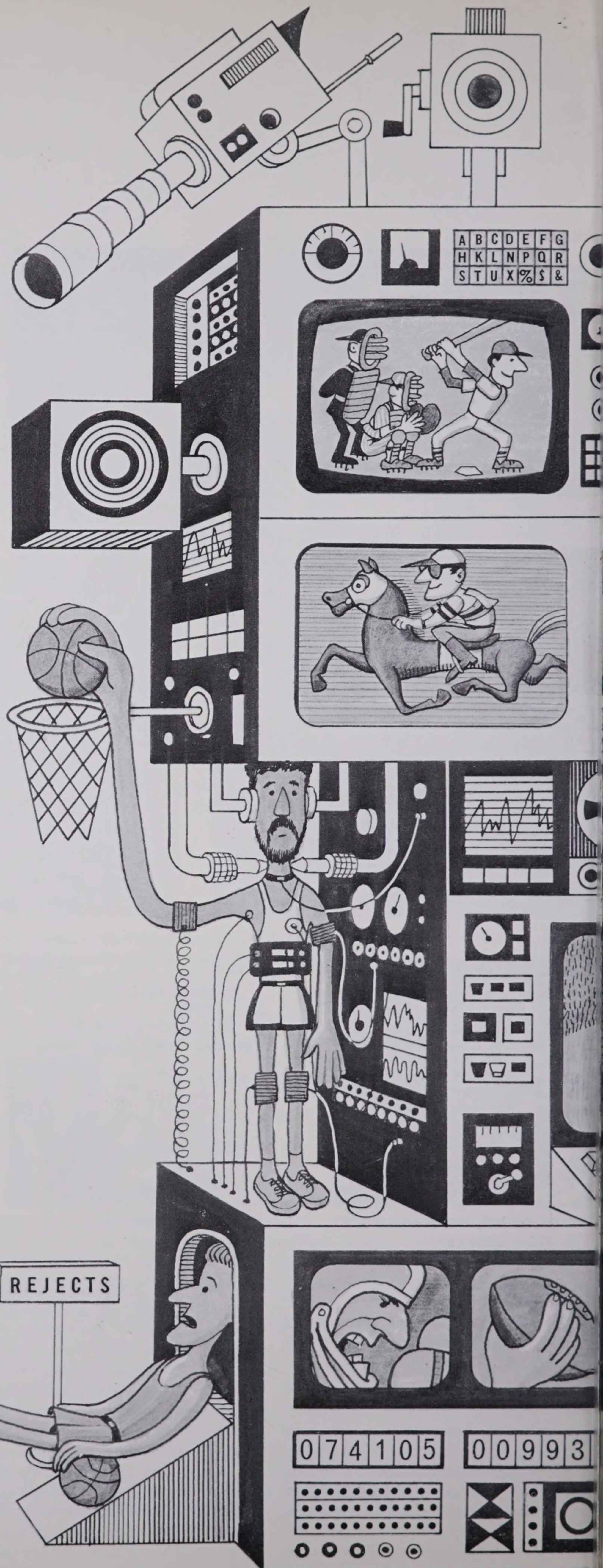
During subsequent autumn weekends, tens of millions of vicarious athletes settled down to enjoy TV football—24 million for college games alone. This fall, the football weekend will stretch into Monday night, when 13 National Football League games will be televised during prime time.

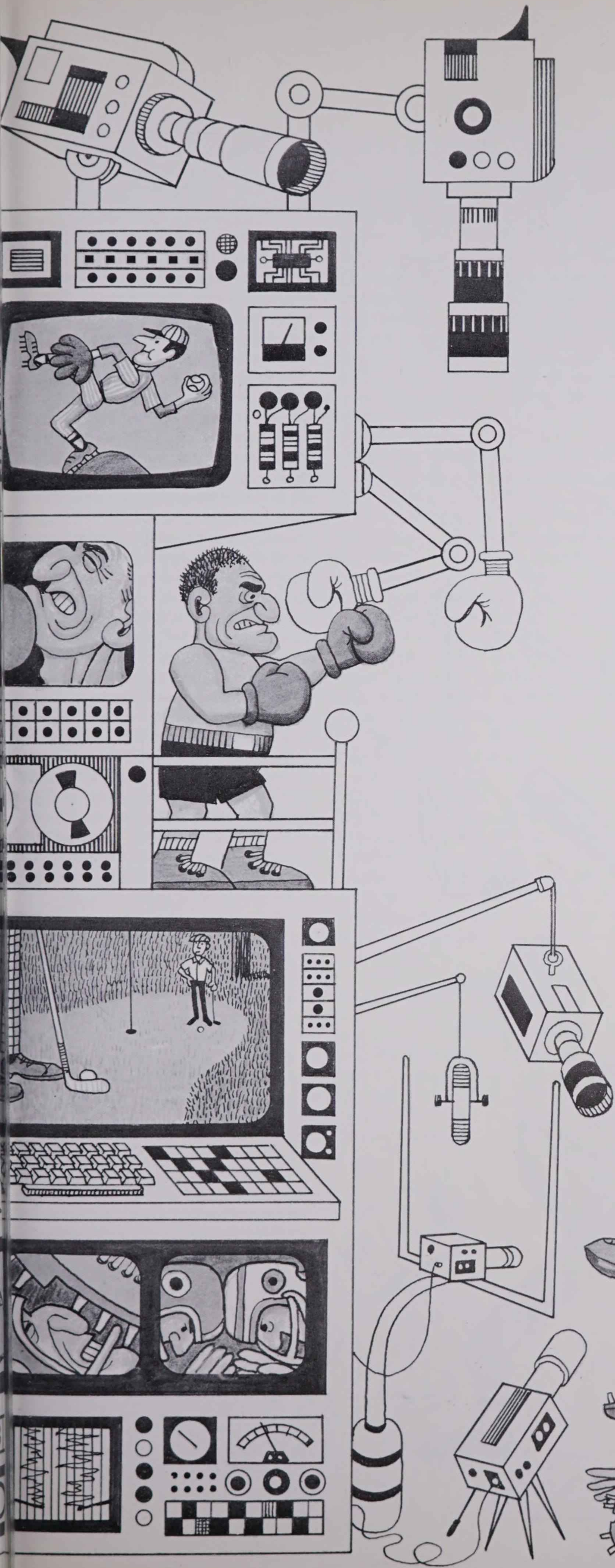
Pro football continues to be the glamor sport among TV viewers. Hence, the enlarged NFL (incorporating the old American Football League) will garner some \$45 million of the \$150 million allotted by the three major networks for rights to televise all major sporting events in 1970.

The role of TV is especially important to pro football at a time of rising payrolls and increased operating costs. Says Vince Lombardi, head coach of the Washington Redskins: "Given today's budgets, there wouldn't be a single franchise left in the National Football League without television." Television has also proved a boon rather than a deterrent to game attendance. Nearly 8.5-million fans passed through turnstiles of both pro football leagues in 1969, while only half as many attended games at the time of the first regular telecasts in the 1950s.

Similarly, the medium has boosted all major sports. By the end of 1970, there will be 93 major league franchises for football, baseball, hockey, and basketball. A decade ago, there were fewer than half as many.

Production techniques have more than kept pace with advances in the telecasting of sports. During that 1939 Columbia-Princeton game, a single camera was used to follow the baseball in flight. The result was usually an incomprehensible





blur, and viewers relied heavily on play-by-play commentary in order to follow the action. The announcer himself was unaware of what the camera was picking up.

Today, at a World Series game, NBC usually employs about 10 cameras. Each is equipped with several lenses to give a variety of views. Split-screen techniques allow the viewer to watch the base runner as well as the pitcher, catcher, and batter.

The telecast of a game may be compared to the filming of a motion picture. Although exact job responsibility varies from network to network, it is the TV director who decides what specific views, shots, and angles are to be used. The producer is responsible for the over-all content and flow of the telecast.

Technical improvements have made a rarity of program blackouts lasting more than a few seconds. In the early days, the "please stand by" slide seemed as inevitable as half-time commercials. In 1951, the telecast of the Walcott-Charles championship fight went blank when a youngster inadvertently kicked the lever of a fuse box as he climbed up a utility pole. And millions of fans almost missed the overtime period of the 1958 NFL Championship game between the New York Giants and the Baltimore Colts when a crowd of excited fans yanked loose a vital cable under Yankee Stadium. (NBC repairmen worked swiftly, and the only loss to viewers was a single commercial.) In the same year, a World Series game went off the air for five minutes when a teen-ager in northern Wisconsin used a microwave relay unit for target practice with his .22-caliber rifle.

The role of the TV sports announcer has changed with production improvements. Today, the announcer's job is to supple-

ment what the viewer sees—to provide background information and player identification—rather than to act as a continuous play-by-play reporter. His eyes are fixed not on the field but on the monitor, so that he is always describing the game as seen by the viewer. Announcer Jack Brickhouse once described what, from the press-box monitor at Chicago's Wrigley Field, looked like the longest home run in baseball history. The ball was "going, going, going..." Too late did he realize that the cameraman had focused on a high-flying sparrow.

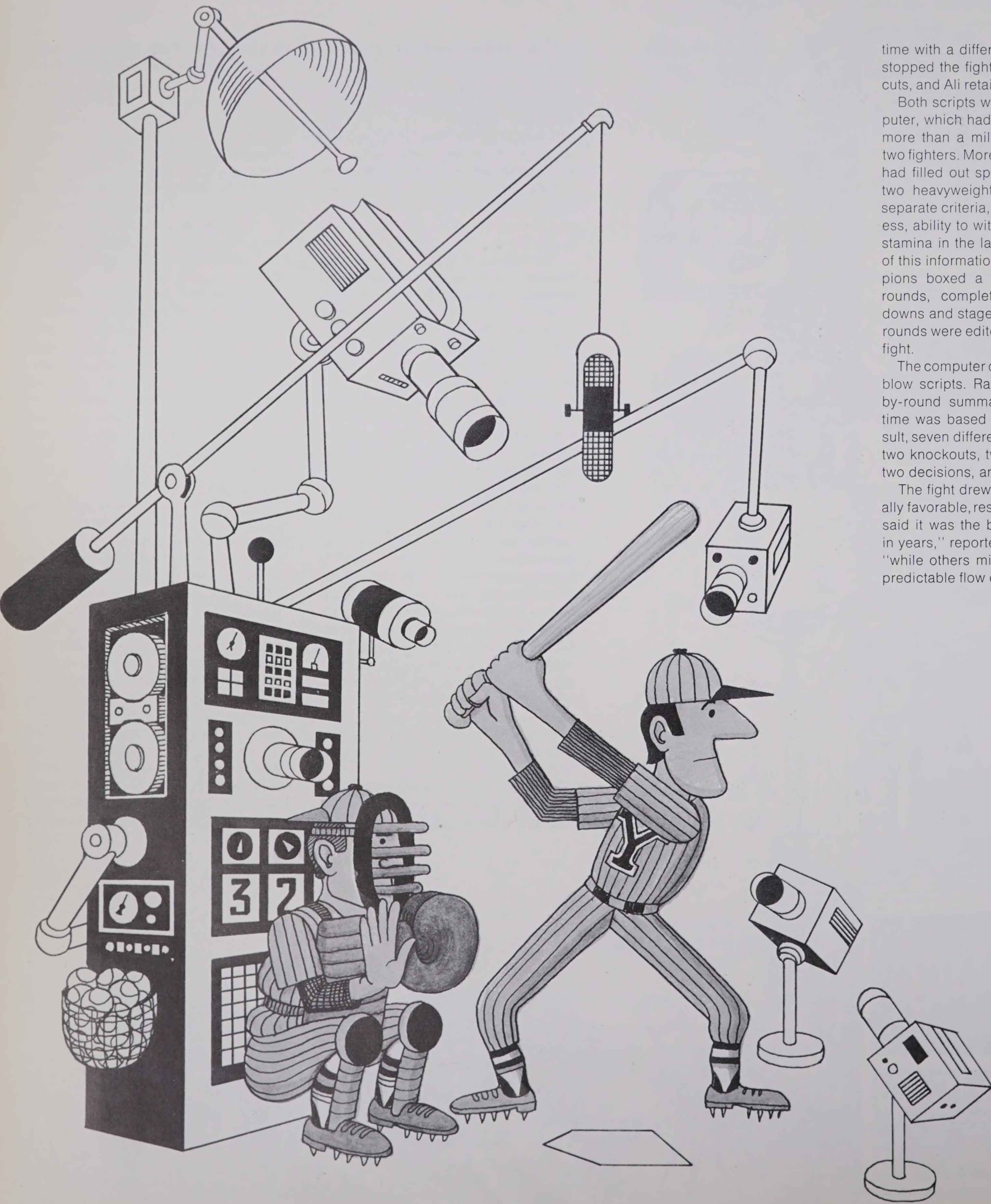
Televised sports are not entirely keyed to the living room. Nineteen major race-tracks across the country employ closed-circuit television systems at key vantage points. These comprise banks of videotape recorders and color or black-and-white cameras supplied by Video Projects Company of New York. The systems permit judges to watch reruns of a photo finish or any other part of the race only seconds after the horses cross the finish line.

Track patrons also benefit from the use of television. At New York's Aqueduct, for example, some 65 color and 150 black-and-white monitors have been located strategically throughout the grandstand and clubhouse to offer a good view of the entire race. Instant reruns of the race as well as odds and other pertinent information are also displayed on these monitors. At some tracks, there are even commercials shown between races.

In early 1970, closed-circuit television enabled boxing fans to see an aging Rocky Marciano, bleeding cosmetically from cuts under both eyes, rally in the 13th round to deck Muhammad Ali, né Cassius Clay, and capture the world's electronic heavyweight "championship."

A month later, in London, British fight enthusiasts saw the same bout—but this

"Says Vince Lombardi, head coach of the Washington Redskins: 'Given today's budgets, there wouldn't be a single franchise left in the National Football League without television.'"



time with a different ending. The referee stopped the fight because of Marciano's cuts, and Ali retained his crown.

Both scripts were prepared by a computer, which had been programmed with more than a million bits of data on the two fighters. More than 400 boxing writers had filled out special charts judging the two heavyweights on the basis of 129 separate criteria, such as punching prowess, ability to withstand body blows, and stamina in the late rounds. On the basis of this information, the two former champions boxed a total of 70 one-minute rounds, complete with staged knock-downs and stage makeup. Films of these rounds were edited into the one 13-round fight.

The computer did not print out blow-by-blow scripts. Rather, it provided round-by-round summaries. The winner each time was based on probability. As a result, seven different endings were staged: two knockouts, two technical knockouts, two decisions, and a draw.

The fight drew a mixed, though generally favorable, response from fans. "Some said it was the best fight they had seen in years," reported *The New York Times*, "while others missed the quick and unpredictable flow of action."

The computer is also giving an electronic opinion as to the greatest baseball team of all time. NBC has inaugurated an eight-team elimination tournament to be played by computer before seven of its "Game of the Week" telecasts. The initial game is between the New York Giants of 1951, who overcame a 13-game deficit to capture the pennant, and the New York Mets of 1969. Participating teams were selected by the votes of fans and players who rated them according to actual game performance. Highlights of each of these computer games are shown by presenting film clips of baseball greats who played with each of the contending teams.

Electronics has become increasingly important to the coach and scout as well as to the spectator. The tactics of a major college or pro football game are largely derived from information radioed or phoned to the bench from scouts and assistant coaches seated high up in the stands or in the press box. From those vantage points, the field resembles a giant game board on which all the moves are visible.

Radio receivers have also been used on the field, at least once. That was during an NFL divisional playoff game between the Cleveland Browns and New York Giants in 1958. Paul Brown, the Cleveland coach, secreted a transmitter inside his shirt to broadcast play instructions to his quarterback, whose helmet had been wired for sound. However, the Giants' coach, Jim Lee Howell, learned of this electronic strategy and was ready at game time with a receiver of his own, this one camouflaged as an equipment box. The Browns' offense sputtered all afternoon. When mechanical problems finally forced the Browns' mentor to shut down his transmitter late in the game, Howell cupped his hands about his mouth and shouted across the field: "Hello, Browns. This is the Giants calling. We just want to say how much we've been enjoying your broadcast." Immediately after the game, NFL Commissioner Bert Bell issued a dictum against built-in communications equipment.

As long ago as the late 1940s, Charlie Caldwell, who was then football coach of Princeton, began using punch-card data processing to test the effectiveness of his varied single wing offense. Each play in each game was recorded and then evaluated to determine its effectiveness against specific opponents and defenses.

During the 1963 season, the University of Maryland became the first team to use a computer in order to break down game films of their opponents into usable information. Today, almost all major college and pro teams exchange films with their opponents. Contrary to popular belief, coaches primarily look for general patterns of offensive and defensive play rather than for the strengths and weaknesses of individual players.

Does the team pass or run on third down and short yardage? Does the quarterback throw to a backfield man or flanker on long yardage situations? Does the defensive team tend to "blitz" (with backfield men charging) on first-down plays?

To determine these patterns from viewing films is a tedious, repetitious job. With electronic data processing, all pertinent data are taken from a film in the course of a single showing and then programmed into a computer. According to one supplier, a program dissecting an opponent's system can be prepared in just four hours.

In 1964, the NFL's Washington Redskins employed cybernetics for game preparation, and by 1966 many other pro and college teams had added computer systems to their coaching staffs. Recently, the University of Pennsylvania began using an RCA Spectra 70 computer to diagnose electronically the strategy of its Ivy League opponents.

At least one head coach believes the computer will eventually be used for troubleshooting during an actual game. Dick Nolan of the San Francisco 49ers envisions a feed line connecting the bench or the press box with an outside computer. The computer would be fed pertinent data during the first half of a game and would print out answers in time to revise game plans during the half-time intermission.

Professional football and basketball also utilize electronic data processing for scouting college players. The NFL has three regional computer combines. Each member shares the costs and data, and each supplies scouts for the system. These scouts grade the qualifications of some 1,000 players on a 0-to-5 reverse scale (a perfect score would be zero) and feed their findings into the computer. Although the American Football League was not involved in the 1970 combines, its teams are expected to join as the merger of the two leagues takes effect this coming season.

This year, the Philadelphia 76ers inaugurated the use of computer scouting among pro basketball teams in the annual college player draft. The 76ers' system analyzes the progress of a player throughout his career—and rates him on the basis of its own team's needs. As with the football draft, this system cannot be any better than the scouts who provide the data. But, by grouping all the known variables in graded form, the computer can be a tremendous aid in helping a general manager select from among hundreds of options.

Computers are beginning to play a role in golf, as much a game of statistics as any game can be. At most major tournaments, computerized message boards give spectators, the press, and the TV audience concise, up-to-the-minute reports on the golfers.

Each green is connected to the computer truck by radio. As each group of golfers completes a hole, results are radioed into the computer. The computer has been programmed with general

information about the individual golfer—how many major championships he has won, the number of subpar rounds he has shot in a particular tournament. When the message board director presses a numbered button, representing one of the golfers, the data are flashed on the board. At the end of each day's play, the computer also prints out complete statistical data for the press.

Computerized scoreboards are also in use at two major league baseball parks, the Oakland (Calif.) Coliseum and Metropolitan Stadium in Bloomington, Minn. In addition to posting basic data—strikes, balls, outs, and line scores—these scoreboards, which are operated from the press box, display batting averages, runs batted in, and even the number of pitches a hurler has thrown up to that time. The Oakland board also features "computerized" cartoons, animated scenes drawn with an energizing pencil on a cathode ray tube and stored for sequential use by the computer so that the entire scene does not have to be redrawn each time.

Even sports in the home may soon be computerized. RCA has demonstrated a pool table on which shots are made by means of an electronic pencil; the computer determines, by the angle of the hit, where the balls will fall. And a Philco engineer has programmed a computer to play faultless bridge.

In coming years, sports will continue to be tied to electronics, although the knot will probably be rather loose. An electronic "umpire," for example, can probably be built to call balls and strikes for baseball games. However, one skeptical former player is positive that the national pastime will never become an electronic sport. "Sure the computer is smart," he acknowledges. "But can it hit?" ■

## Art, Technology, and the Creative Process

In a continuing search for new means of expression, the modern artist seizes upon the artifacts of technology—and, in some cases, creates his own—to project his vision of the world today.

by Earl Reiback

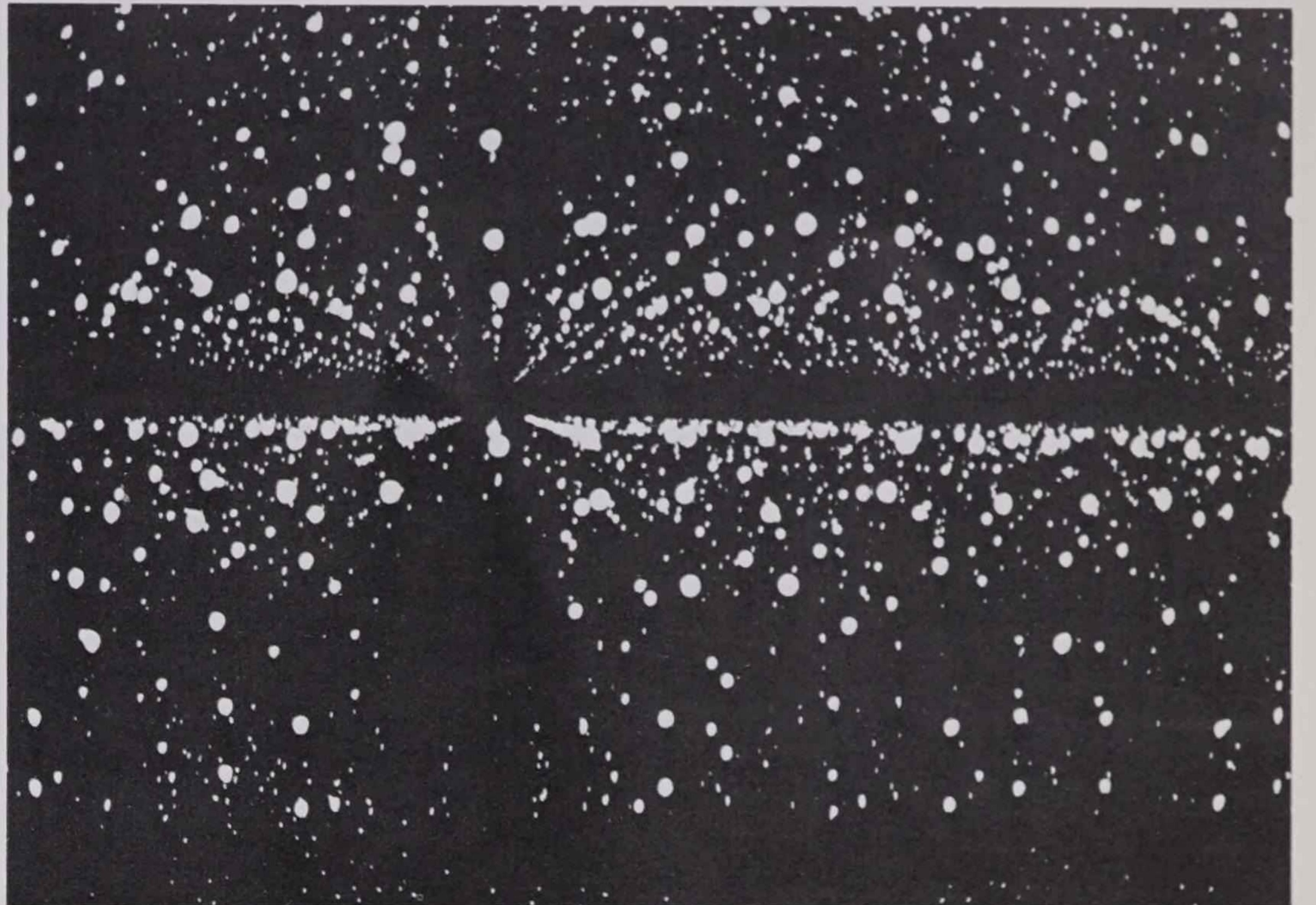
I invite you to share an experience—an experience of creation, unfettered by anything but the laws of the physical world and your own ability to work with them. I invite you to share the experience of being an artist.

To be an artist in today's world does not necessarily mean to apply oils to a canvas. It does not mean to work within the confines of a picture frame or to deal with any of the conventional art media. Today, the most sophisticated technologies—cybernetics, communication dynamics, automation, nuclear physics, optics—are employed in the creative arts. Imagination interacting with technical know-how, together with an understanding of the potentials inherent in our abilities to deal with nature, greatly enlarges the scope of the contemporary artist.

To be an effective technological artist, you must be an inventor with a well-developed aesthetic sense and perhaps a sense of humor. It may also help to be a philosopher, an alchemist, or a naive optimist, but these are not requirements.



"The successful technological art of the past—of men like Cellini and da Vinci—always had as its goal the inner vision and aesthetics of the artist, not the simple exercise of technology."



Left: Light emphasizes the complex and delicate structure of Preston McClanahan's "Cobweb," an eight-foot-high, 15-foot-long sprayed vinyl sculpture.

Right: Detail from Stanley Landsman's "Infinity Chamber." The walls, floor, and ceiling are made of mirrors, reflecting 6,000 miniature lights like stars in endless space.

Below: In Earl Reiback's kinetic light sculptures, called "lumias," graceful, vividly colored patterns evolve upon a screen. These patterns are programmed to repeat their sequence, depending on the lumia, every 10 to 30 hours.



What is important is the ability to view the world around you with the wonder of a child.

Although the artist is an inventor, his creativity contains a significant extra degree of freedom. An invention traditionally has to be something not only new but useful.

In art, the requirement of usefulness is replaced by a special quality — aesthetics. This is the basic difference between the development of technological art and the thrust of technology itself. Technology is directed at solving practical problems. The needs dictated by aesthetics, unlike the needs dictated by products, originate within the psyche of an individual and are

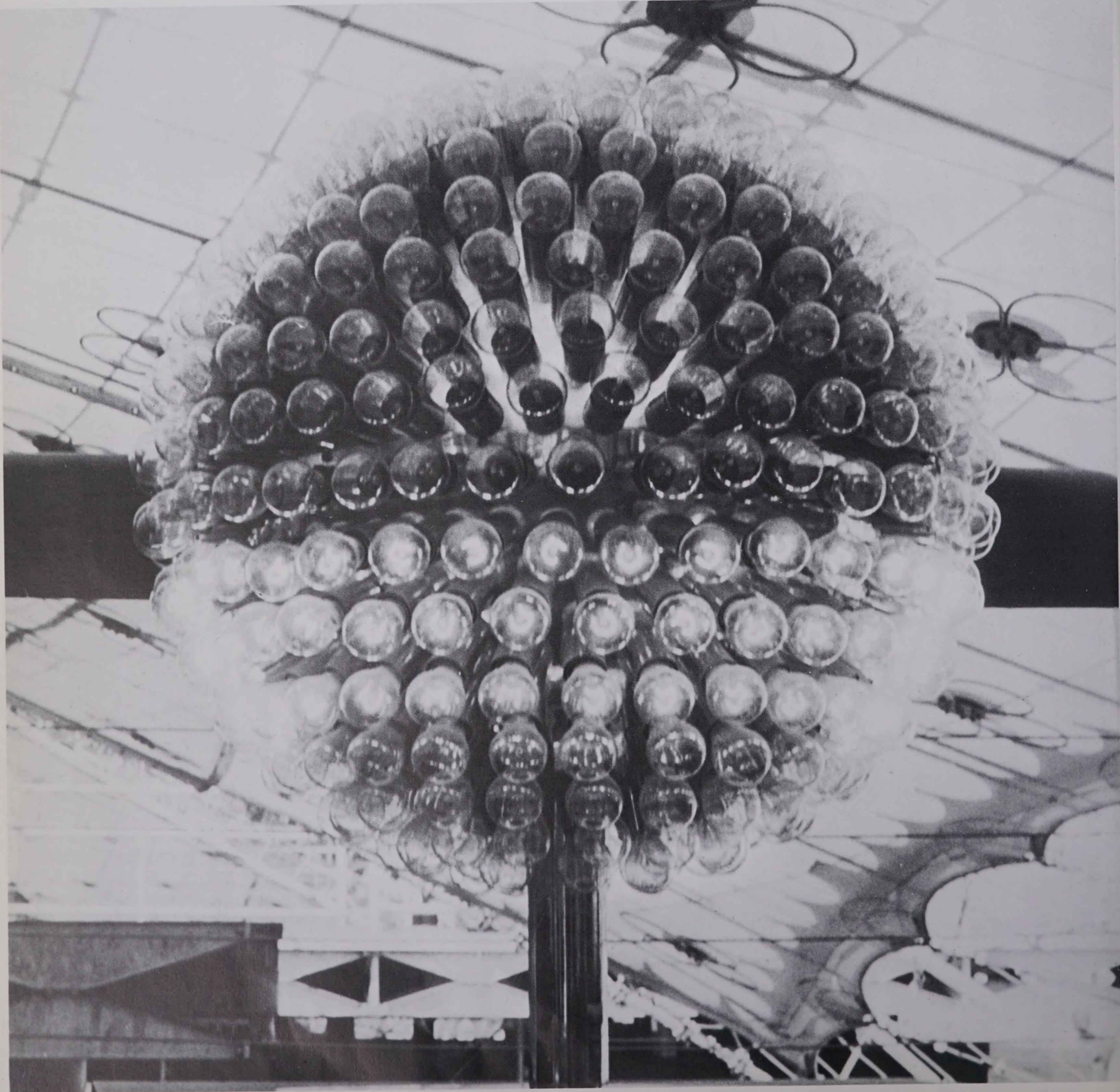
congruent with a man's inner consciousness, with the inner environment of his imagination.

If a combination of materials, or juxtaposition of matter or equipment, produces something inherently fascinating to you, or if it produces a sense of wonder in you, then the idea may be worth rendering into reality.

As an artist, you observe the things around you that you find intriguing, arrange them in a way that appeals to you, and interrelate them in a way that you find exciting, letting your imagination run as far and wide as it wishes. In short, you create.

In my own experience, which included

Otto Piene's "Corona Borealis" is a light sculpture that glows in a programmed sequence.



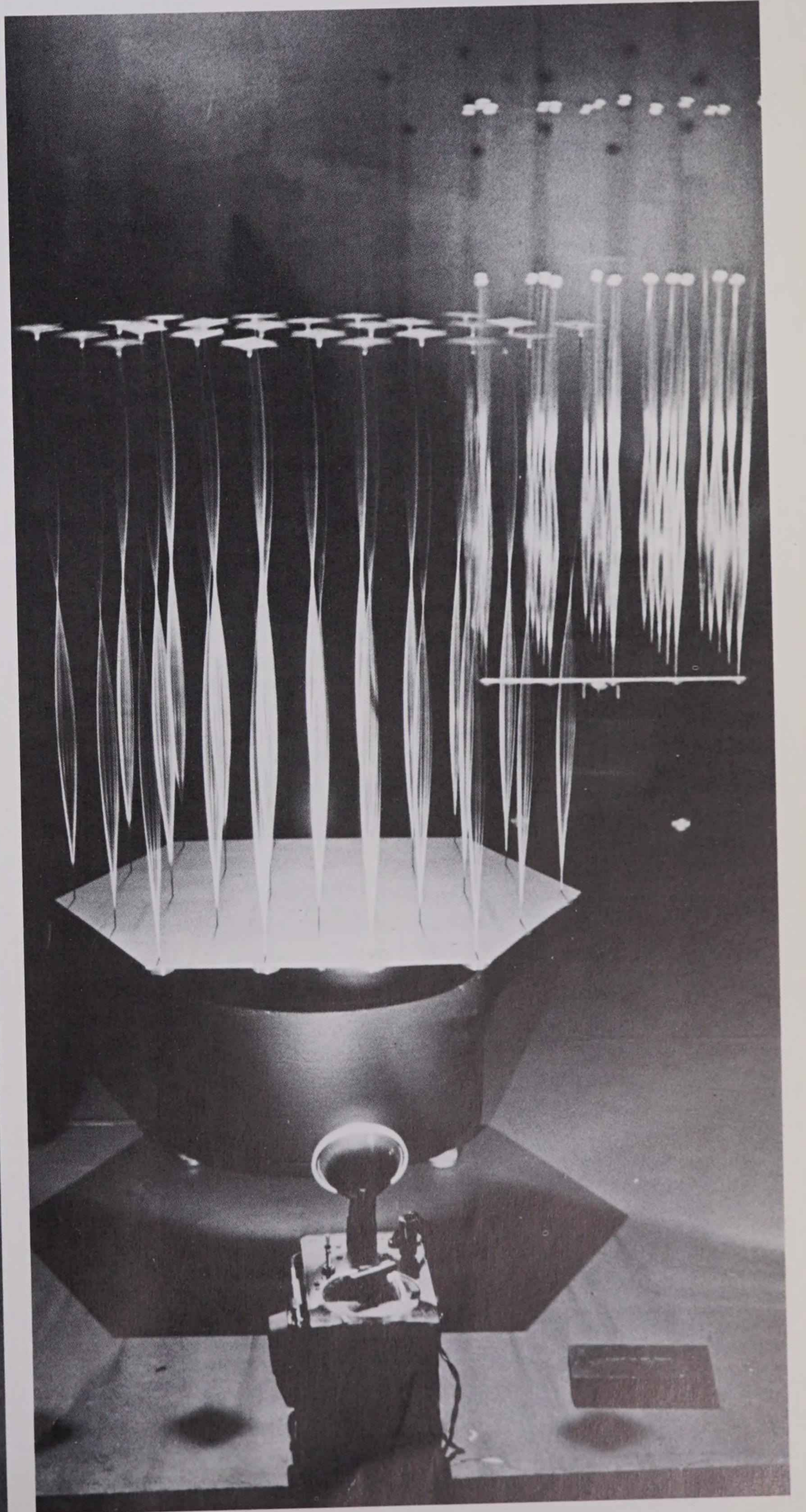
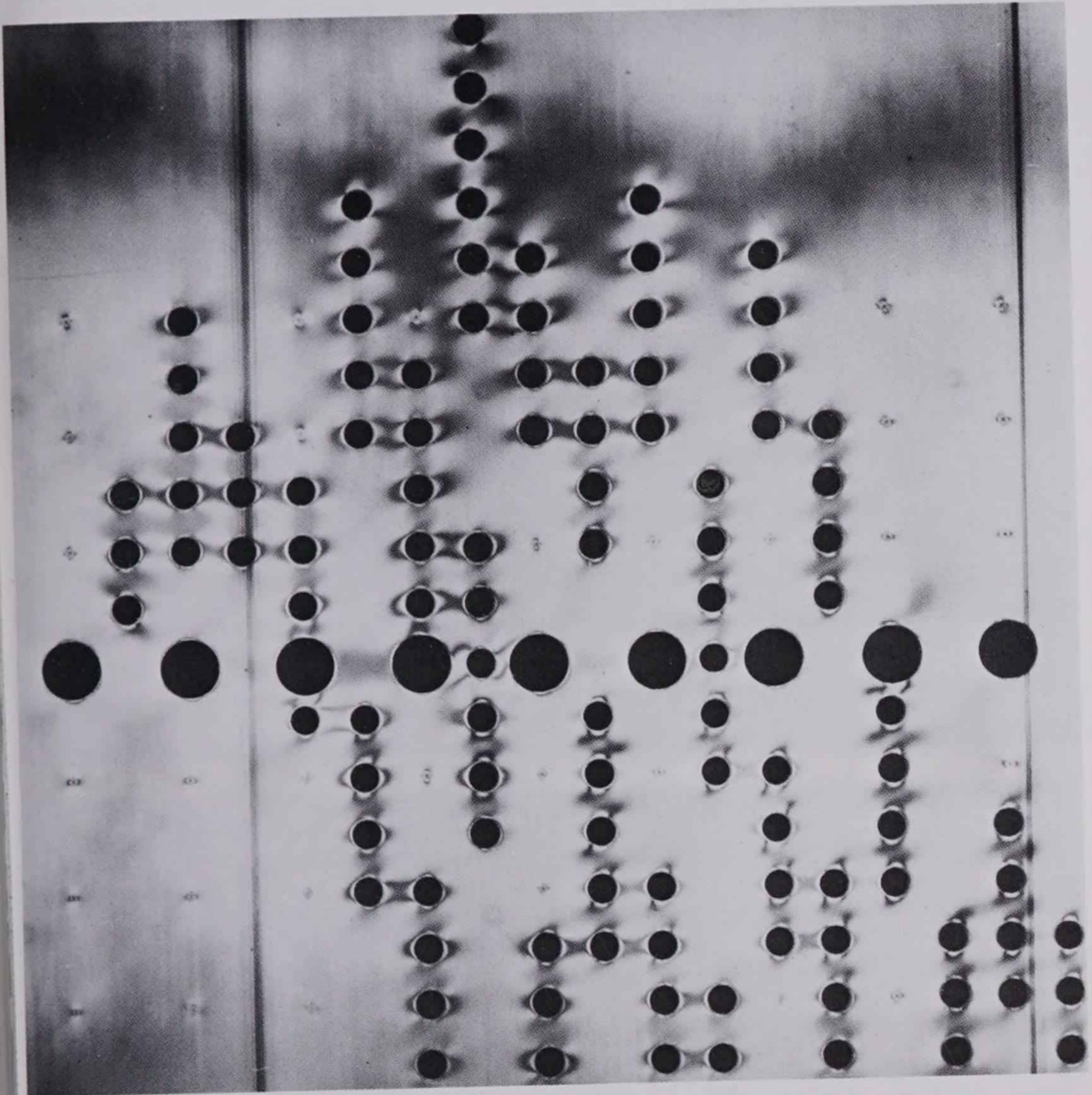
becoming a nuclear engineer before becoming an artist, I found that science contained an inherent beauty that could be abstracted and turned into art.

There is, for example, a certain beauty inherent in crystal structure. But how can this be expressed in an art form to communicate the wonder of that structure? Certain crystals exhibit birefringent properties — that is, they rotate the plane of polarized light passing through them as a function of the wavelength of the transmitted light. This effect produces brilliant colors throughout the entire spectrum without the use of pigments. The crystals can be grown in multiple layers on glass slides and placed in the focal plane of a

projector. A polarizer can then be turned in front of the projector to give the whole composition an illusion of motion when it is shown on a screen. The technological exercise was turned into art by experimenting with hundreds of crystals in different combinations to achieve the effects I found most aesthetically valid.

In another technological art form, which I call "lumia," I have created light sculptures that can show, through rear projection, a constantly changing light image. The image slowly evolves in shape and color, moving in a variety of directions. Each lumia has a programmed sequence that will not repeat itself for 10 to 30 hours, depending on the lumia. These

Top left: Transparent plastic sheets placed between polarized screens of "Photoelastic Floor," by Gyorgy Kepes and William Wainwright, change color under the stress of footsteps. Bottom left: Tall, ominous black silk flowers slowly swell and collapse in Otto Piene's "Fleurs du Mal." Below: Stainless steel rods vibrate in response to sound in Wen Ying Tsai's "Cybernetic Environment."



**“The basic activity man uses in adapting his environment... is his creativity, his ability to put diverse entities together into something new. This is what an artist's work is all about.”**

works utilize a system of distorted lenses, prisms, dichroic mirrors (specially coated to reflect selected wavelengths of a light beam), and abstract paintings done with epoxy pigments on heat-treated glass. Here again, technology is the means to an aesthetic end. The result is an abstract, expressionistic image flowing from one composition to another.

Technological art is more than mere technical proficiency. In order to succeed, such art—as, indeed, all art—depends upon the inner vision of its creator and the way he translates that vision through his medium.

The successful technological art of the past—of men like Cellini and da Vinci—always had as its goal the inner vision and aesthetics of the artist, not the simple exercise of technology. Today's technological artists work with a wide assortment of materials. But they transform them from something ordinary and prosaic into something that conveys a sense of wonder and beauty.

Consider the familiar television set. All you normally see of this is its flat surface, something that resembles a movie screen. The wonder of the electron beam painting a picture on that screen is forgotten. The void of the tube is never seen. Part of the wonder of the medium can be symbolized by making the void of the tube apparent; and the mind can be led to dwell on the vacuum, on the emptiness, on the electrons themselves.

But electrons cannot be seen. Only their interactions with matter are visible. Thus we introduce matter into the tube. Various possibilities come to mind to show how the electrons interact. A trace of neon gas may be added so that when the electrons ionize the gas they may be seen. The shape of the television tube can be emphasized by painting the inside walls with phosphors; when the scattered beam caroms off the walls, the whole work is illuminated with flashing color. Thin grids, transparent glass plates, or phosphorescent paintings also may be placed inside the tube.

To perform experiments of this type requires laboratory equipment and a wide range of specialized skills and knowledge. Last year, I worked with technicians and engineers at RCA's Lancaster, Pa., plant. I outlined the scope and philosophy of my goal and asked them to help me improvise.

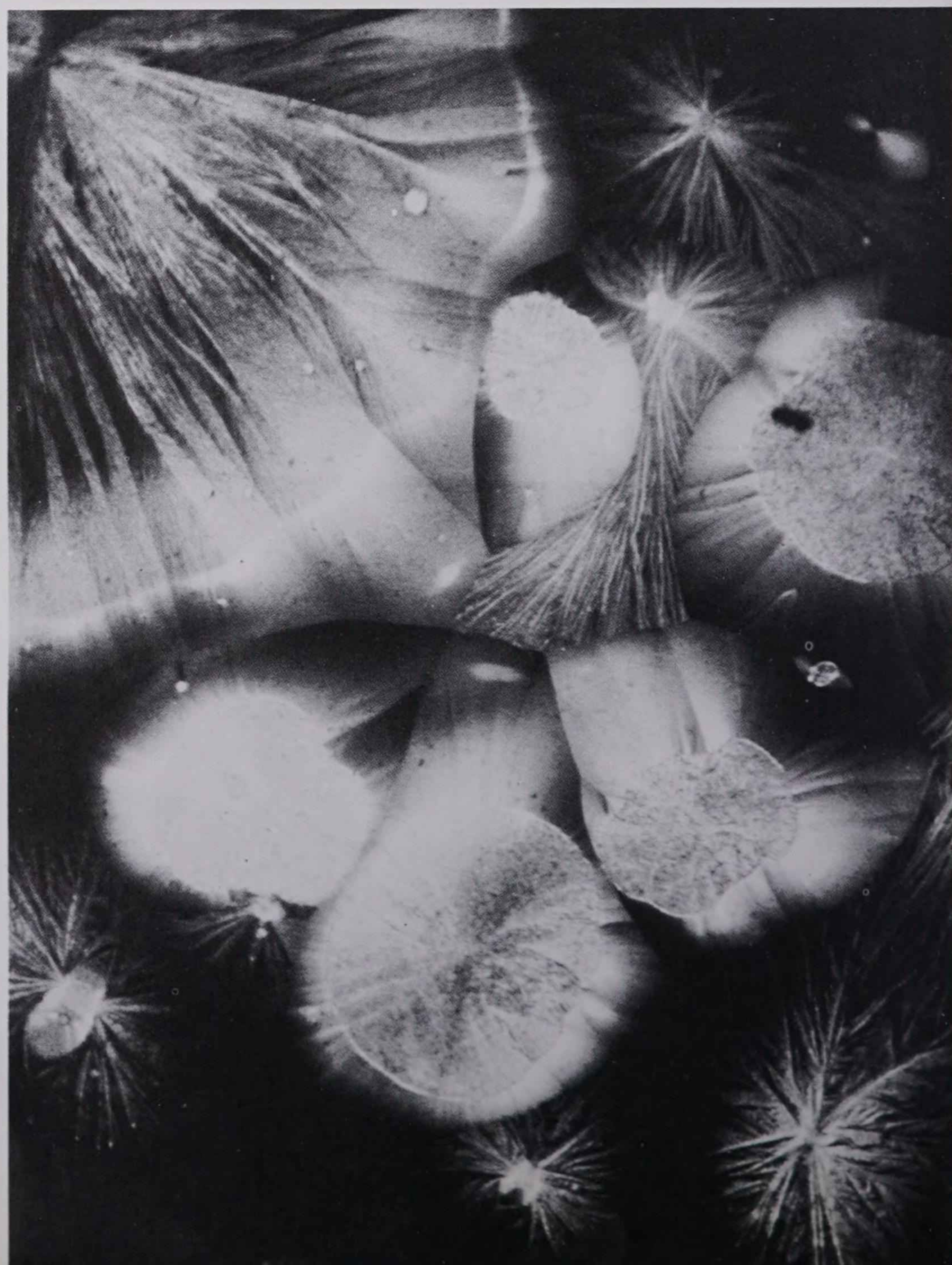
Our collaboration had a remarkable effect almost immediately. The chance to help shape both the process and the

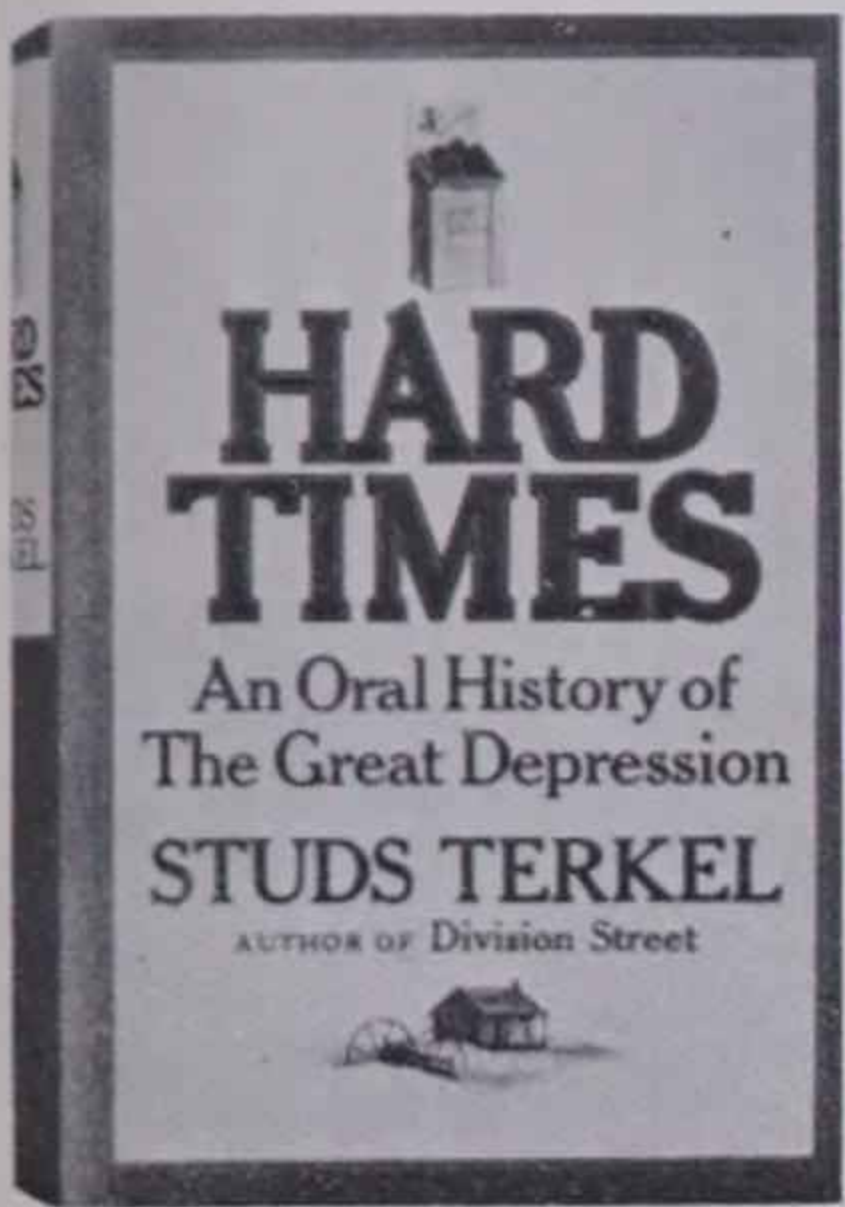
goal stimulated the imagination of those working with me. The entire project was exciting. The people who were helping me became enthusiastic and contributed greatly to the final results. They began to look at this product—which they were used to working with—in an entirely different way. They were amused and fascinated, and their outlook was broadened. Because they were interested in the project, they became creative.

Creativity is one of the most valued abstractions in our contemporary society. Yet, for something as highly prized as is this side of man's intellect, we do very little to encourage its development and stimulate its growth. Art, as a process of training the mind, may be the most neglected area of man's intellectual and constructive activity. Technological art, in particular, develops creativity, for the mind is working with the outer reaches of man's ability to deal with his environment.

The ability of a biological species to survive in the world has always been based upon its ability to adapt to its environment. Man has been the most adaptable of all creatures, but he also has gone one step further. His intelligence and intellect permit him not merely to adapt to his environment, but to adapt his environment to himself. The basic activity man uses in adapting his environment—that which distinguishes him more than any other characteristic—is his creativity, his ability to put diverse entities together into something new. This is what an artist's work is all about. ■

Crystals grown on glass slides are projected on an eight-foot movie screen in Earl Reiback's "Luminage." The crystals, each one uniquely shaped, refract the light into images of brilliant color. A rotating polarizer then creates a pleasing sense of motion by making the images appear to dissolve into one another.

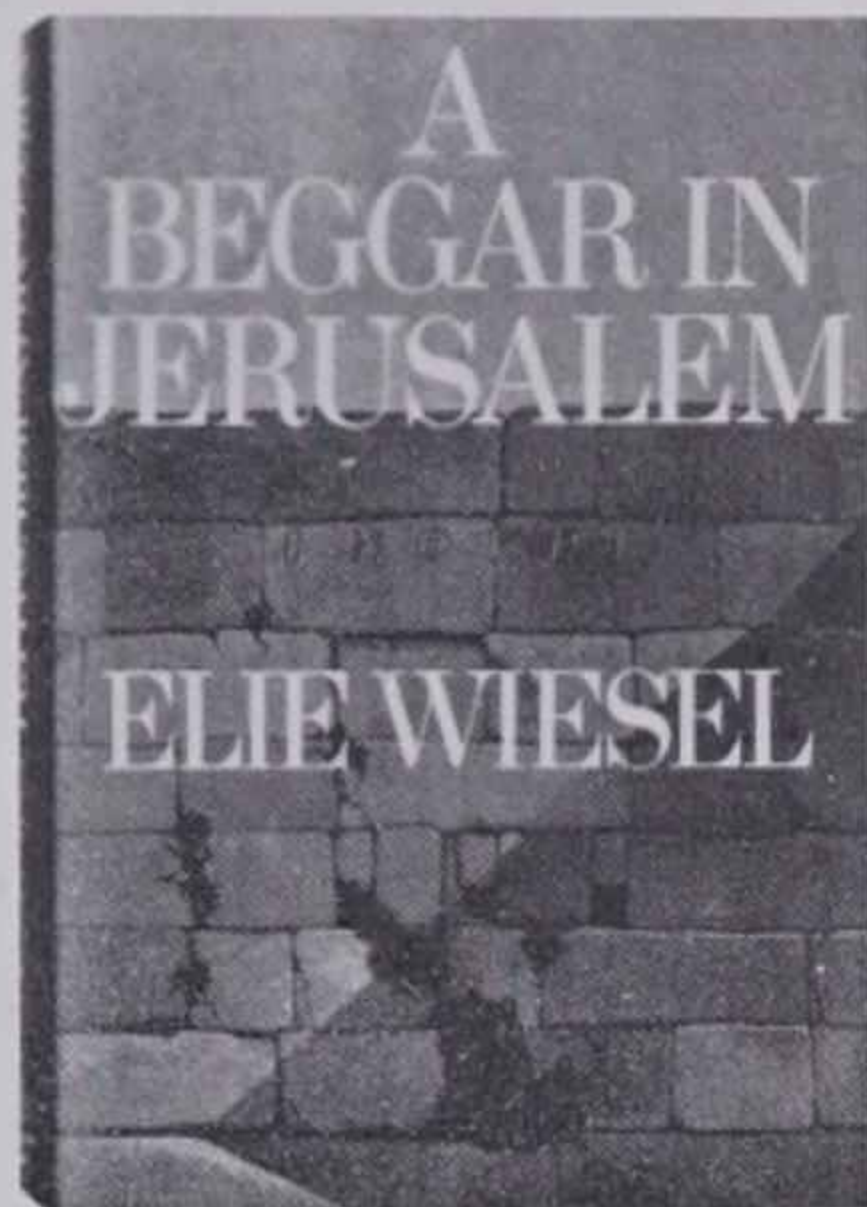




## Hard Times: An Oral History of the Great Depression

by Studs Terkel (Pantheon)

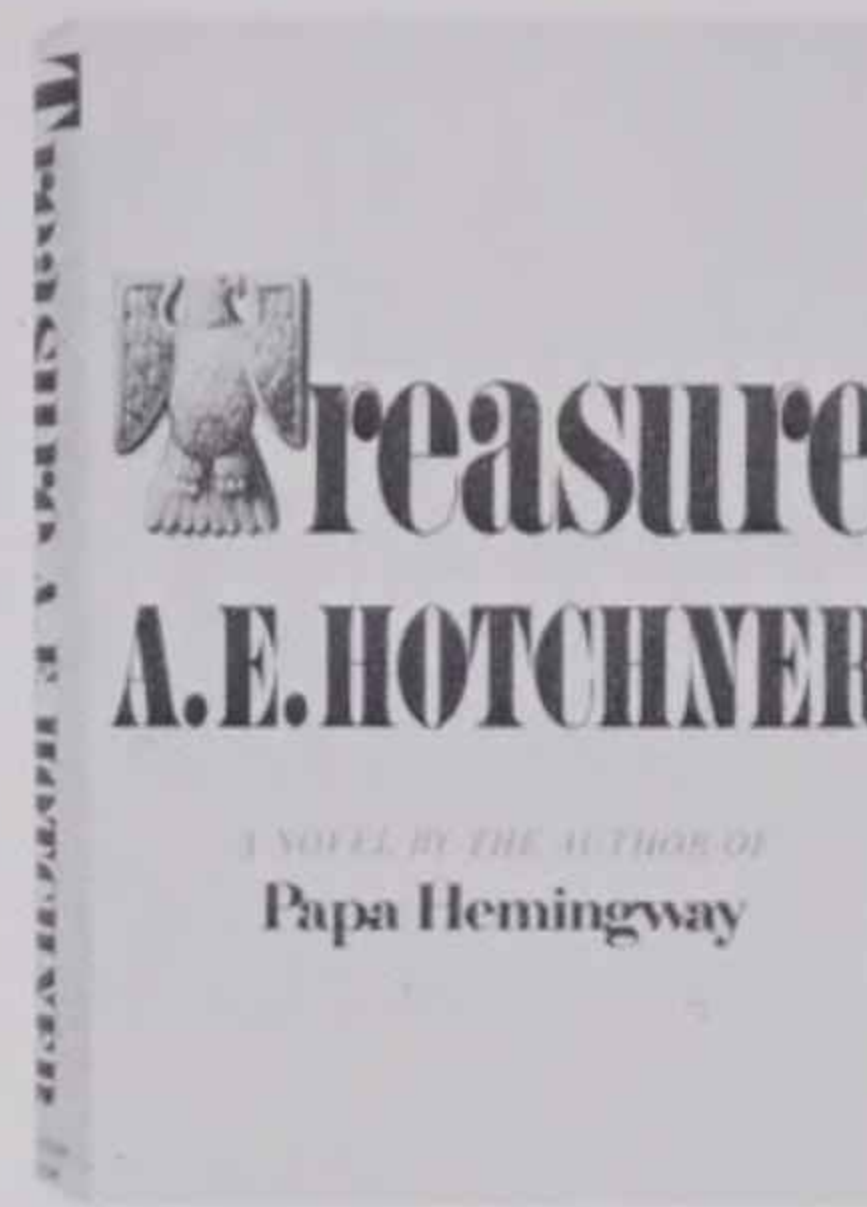
*Hard Times* is a unique re-creation of one of the most dramatic periods in American history. The author uses the same tape-recorded interview techniques with which he captured the feeling of contemporary America in his earlier work, *Division Street: America*. He obtained more than 160 personal recollections of the 1930s. In the introduction to *Hard Times*, Terkel refers to his work as a "memory book, rather than one of hard fact and precise statistics." Yet the real history of the period is woven into these reminiscences in such a way that the reader is able to feel what the Depression meant to those who lived through it.



## A Beggar in Jerusalem

by Elie Wiesel (Random House)

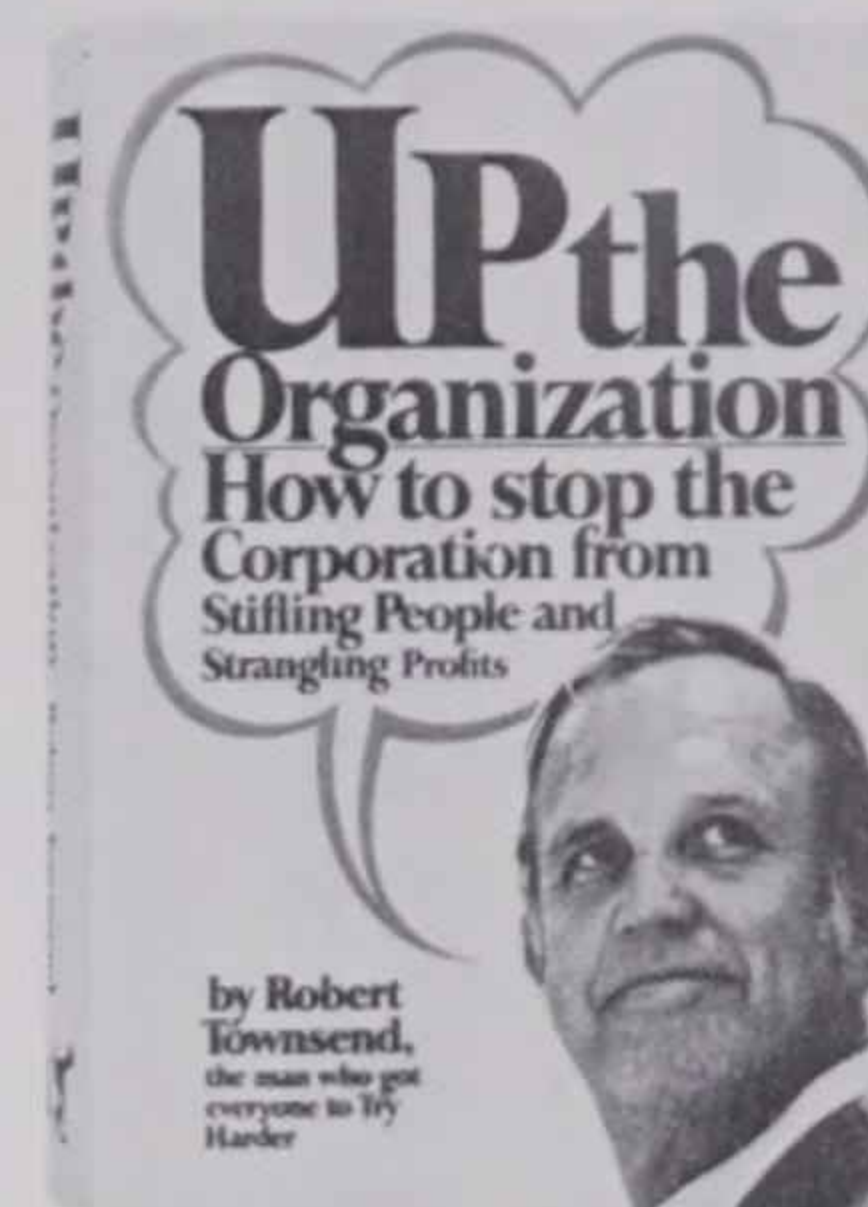
In the 12 years since publication of his first novel, Elie Wiesel has become one of the most important literary figures of our time. His eight books (seven of them novels) reflect not only the personal and spiritual anguish of his early life but also the tragedy-filled history of the Jewish people. Born in Hungary in 1928, Wiesel was deported with his family to a concentration camp at the age of 16. He alone survived. That survival is chronicled in *A Beggar in Jerusalem*, the story of David, a former Auschwitz inmate suddenly caught up in the Six Day War of 1967.



## Treasure

by A. E. Hotchner (Random House)

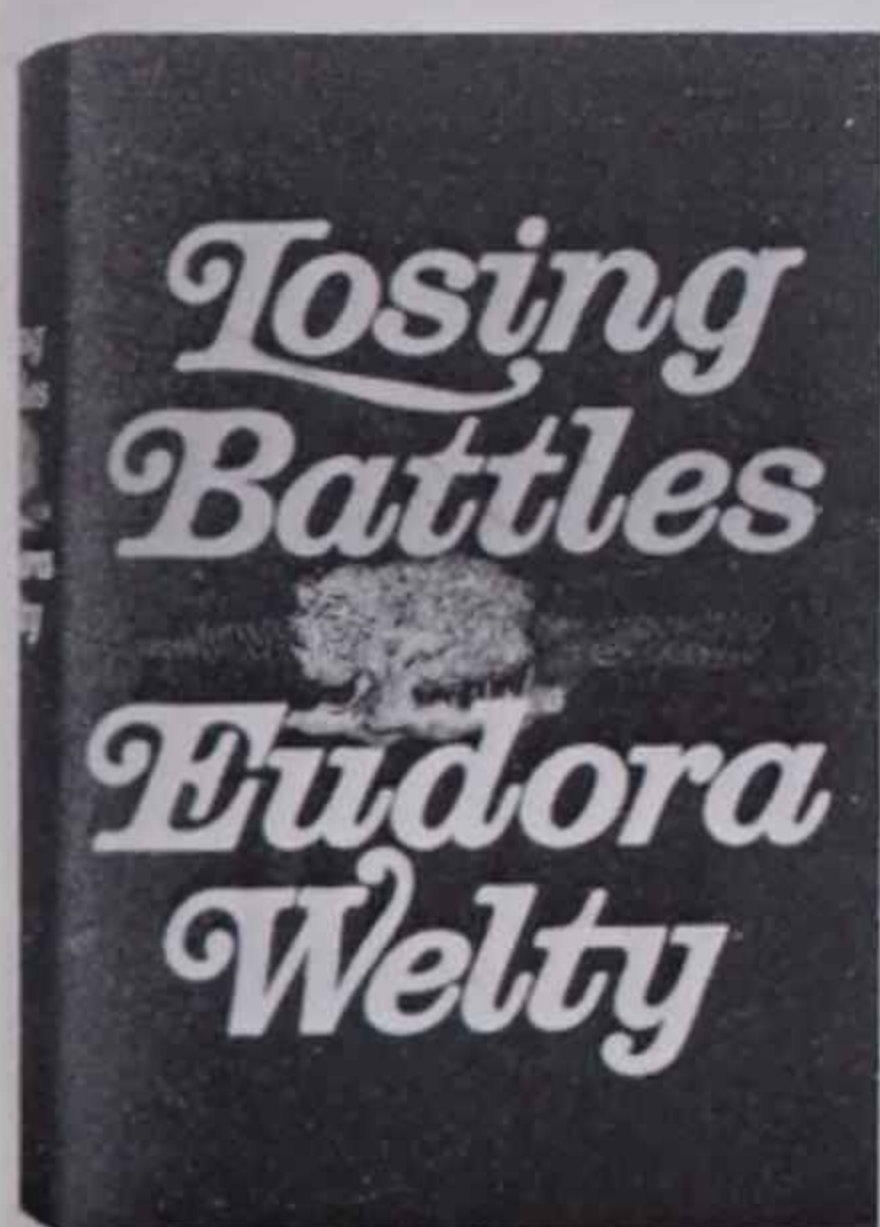
In the spring of 1945, Benito Mussolini fled toward the Swiss border with some \$80-\$120 million in currency, gold, jewels, and historical documents. He was captured and executed by Italian partisans in the northern Italian town of Dongo. Following a careful investigation, the treasure mysteriously disappeared. Today, despite investigations into the disappearance, that treasure is still missing. It is against this factual background that Hotchner's new novel is set. The author has interwoven actual and fictional characters with details of this mystery. He brings the narrative to a dramatic climax in which both the place of the treasure and the plot behind its confiscation are revealed.



## Up the Organization

by Robert Townsend (Alfred A. Knopf)

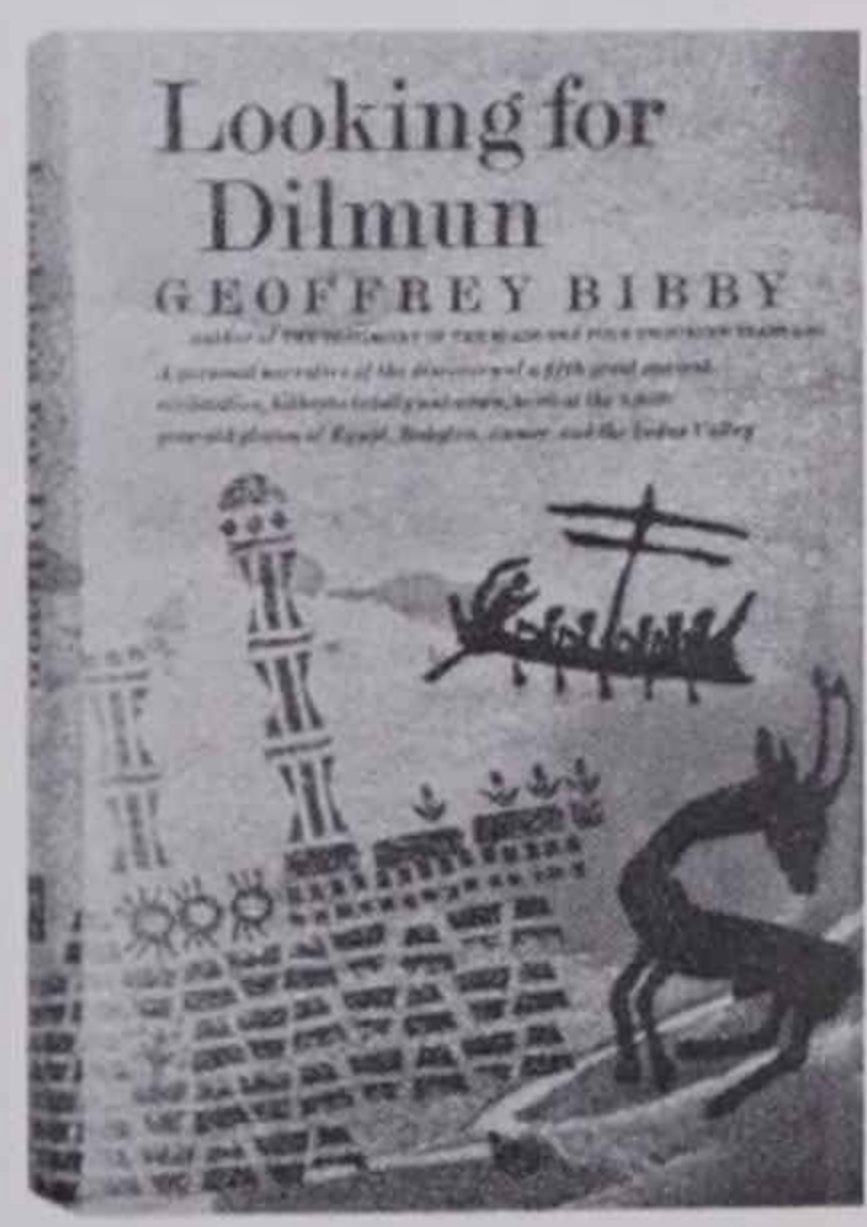
Robert Townsend has written an amusing "survival manual" for American business. In a light and irreverent manner, the author describes how a corporation can reorganize itself—and reorient its thinking—in order to maximize profits and efficiency while humanizing the day-to-day operations of its business. Among the subjects Townsend discusses are Computers and Decision Making, Bonuses, Lawyers, and Personnel Departments. Many of the author's observations and recommendations are based upon his 16 years of experience with such firms as American Express, Dun and Bradstreet, and Avis.



## Losing Battles

by Eudora Welty (Random House)

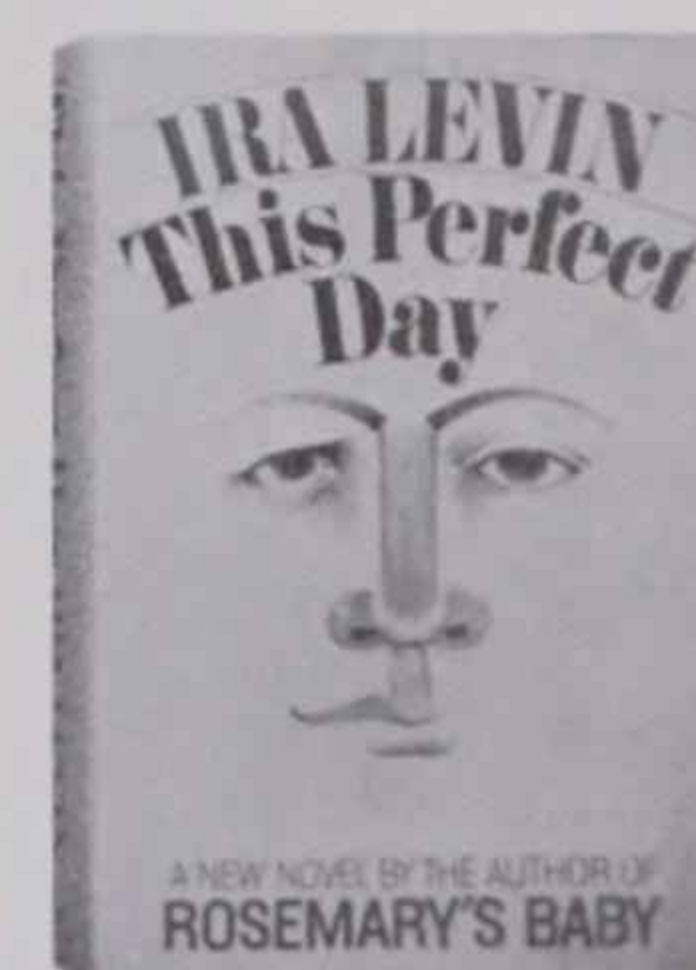
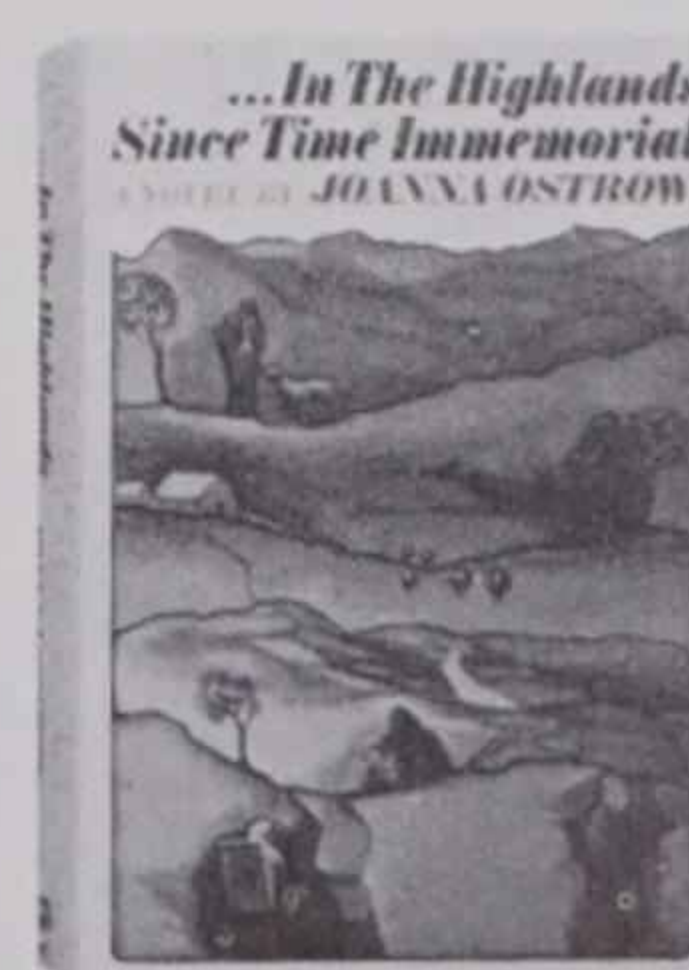
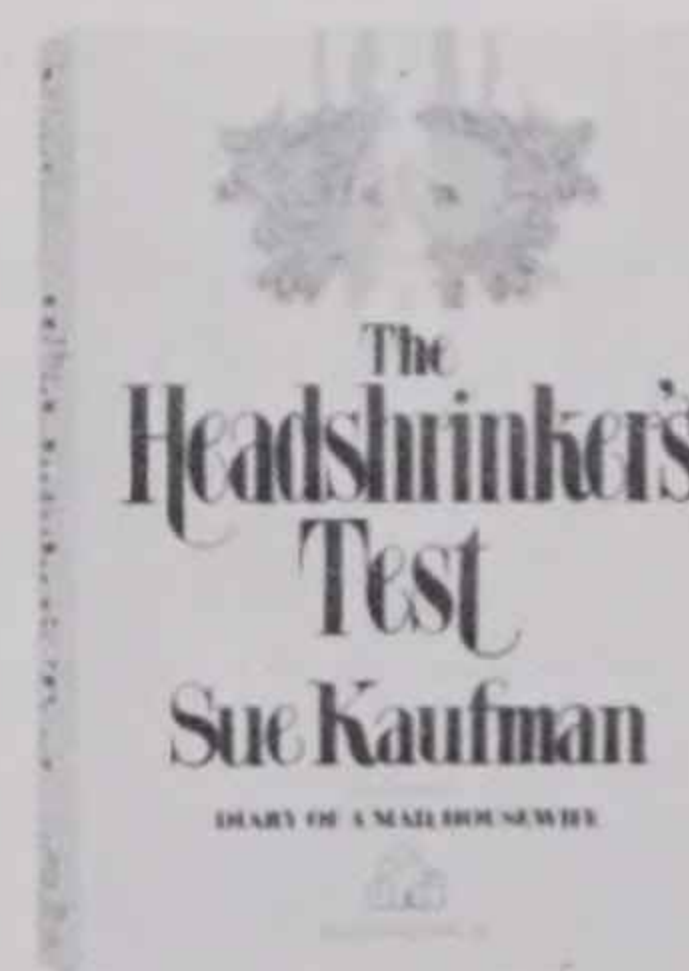
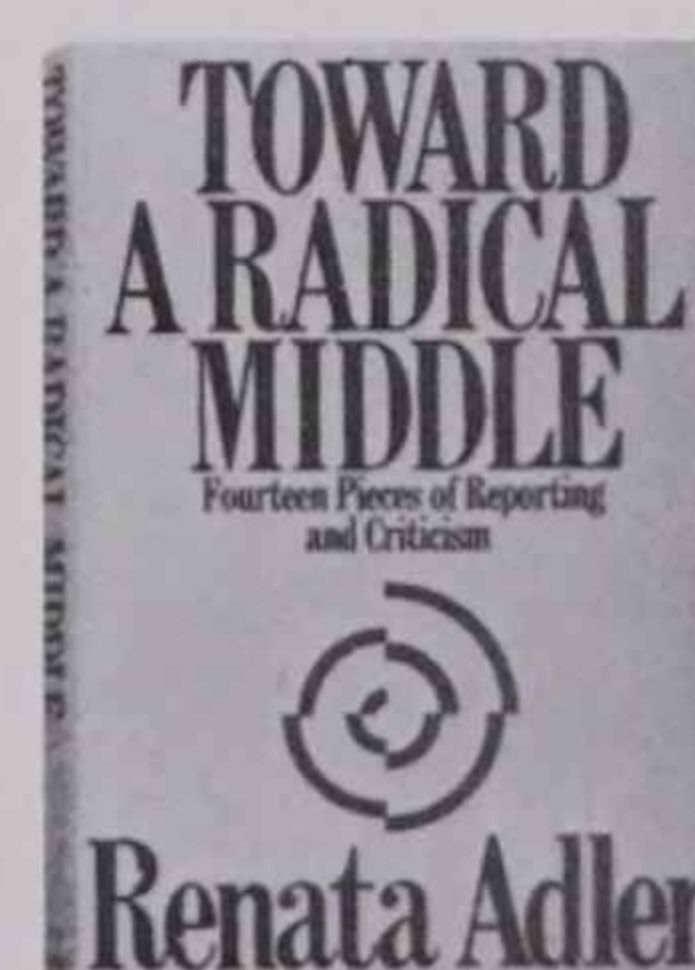
Publication of this novel, the author's first in 15 years, is a major literary event. The book is a touching, honest portrait of life in rural Mississippi during the Depression, focusing on the family reunion that surrounds Granny Vaughn's 90th birthday and the return of her great-grandson Jack from the state penitentiary. The action covers two days, but, since many members of the enormous Vaughn family are great tale-tellers, the reader experiences much of the past as well. The dialogue and events are often funny, but underneath them are serious, even somber, tones.



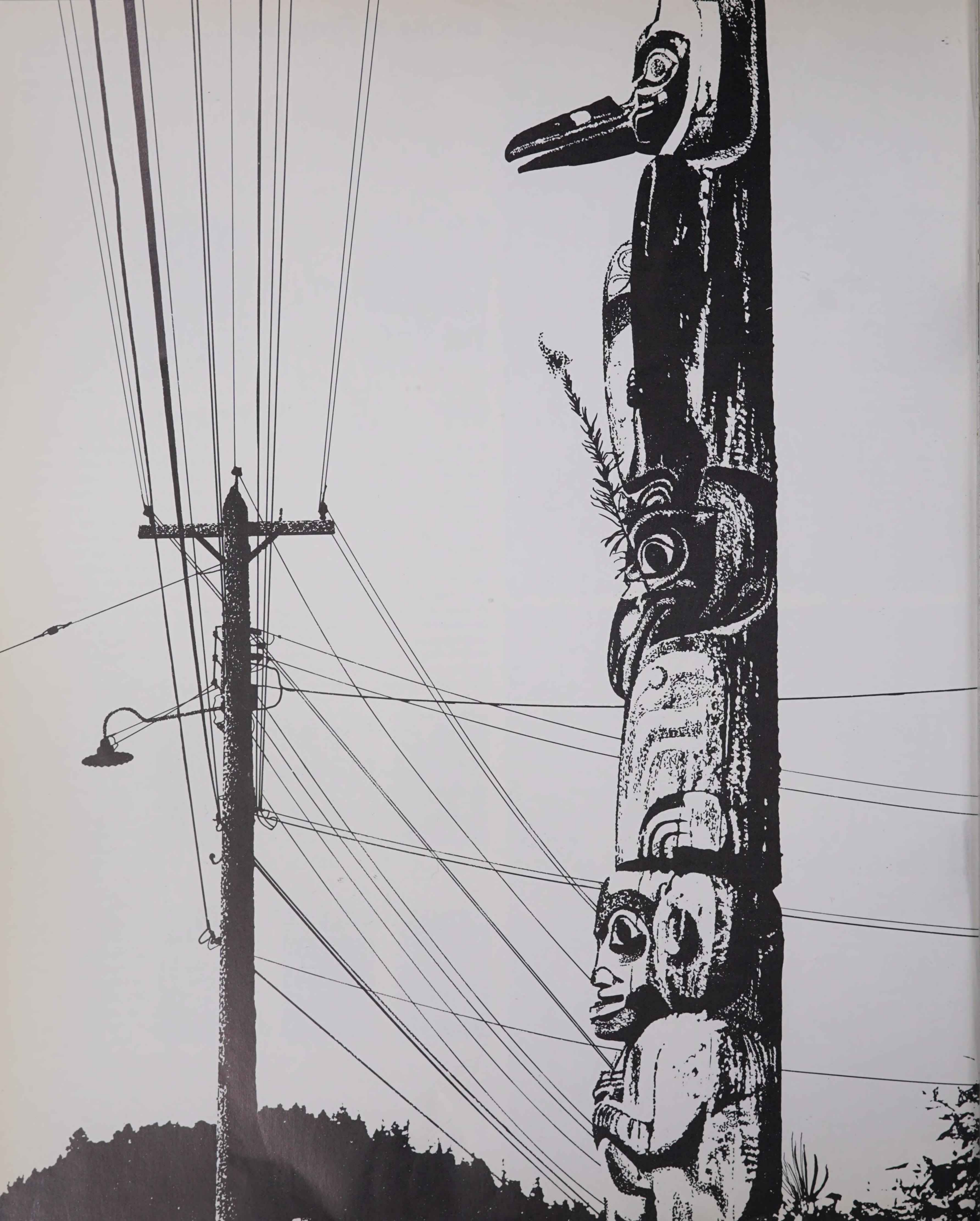
## Looking for Dilmun

by Geoffrey Bibby (Alfred A. Knopf)

One of the most unexpected and important archaeological finds of modern times is the subject of this book, a first-hand account of the discovery of the legendary civilization of Dilmun. Digging along the Persian Gulf, Bibby and his colleagues were astonished to find their first clues to the actual existence of the kingdom of Dilmun, lost for the past 3,000 years. Prior to this discovery, scholars had thought there were only four great ancient civilizations—Egypt, Babylon, Sumer, and the Indus Valley, the so-called "fertile crescent." The unearthing of Dilmun gives rise to speculation that it was there that the birth of civilization really occurred.



Other Recent Random House Books



# Alaska

## Alaska – Transportation and Communications

The frontier spirit is fading fast as people turn increasingly to science and technology to meet the demands of modern society.

by H. M. Hershberger

"It's the same country," Alaskans are fond of saying, "but it's a different world."

Alaska is where the aurora borealis lights up and telephone service statics out. It is where the longest road in the state thaws, melts, and disappears when spring comes.

Alaska is where moose bring railroad trains to a halt. It is where a man can jump into his airplane after work and fly to good trout fishing—but can't drive to a homestead 10 miles out of town.

The story of America's 49th state has traditionally been one of isolation. Land area of the state totals 586,412 square miles—more than twice that of Texas and one-sixth that of the entire United States. The coastline is more than 33,000 miles long. The distance between the two farthest points is equal to the distance between Seattle and Miami.

Yet, in all of Alaska, there are only about 6,600 miles of road, including highways (Federal Aid Routes) and nonfederal trade routes. Most of the road system connects Fairbanks either with Anchorage and the Kenai Peninsula or with the Canadian border. The rest consists of connecting roads between small towns and villages in southeastern Alaska.

One route of major importance is the

Alaska Highway, a 1,523-mile road extending northwest from Dawson Creek, B.C. (near the Alberta border), to Fairbanks. This highway is linked with Seattle, Wash., and Prince Rupert, B.C., by the Alaska Marine Highway, a two-day ferry ride through the "Inside Passage" along Canada's west coast.

Another major route is the Hicikel Highway, a winter haul road from Livengood, 50 miles north of Fairbanks, to Prudhoe Bay. The road, actually a 400-mile stretch of scraped and compacted snow, allows truck transport of vitally needed equipment for oil drilling on the Bay. It was opened in March, 1969, but saw only one month of actual service before spring thaws took out the ice bridges on the Yukon and other rivers and rendered the road useless. Extensive repairs delayed use of the road again this winter, and prospects for the future are not certain.

Some state officials, though, see this crude, icy path as the beginning of a fully developed "transportation corridor" to the north. Such a corridor might consist of a railroad, adjacent highway, and even pipelines for transporting petroleum and electrical conduits.

Since the first major oil discovery was made in the Bay area in early 1968, petroleum companies have paid the state nearly \$1 billion for drilling privileges on 450,000 acres of the North Slope. Indications are that they will locate more than 50 billion barrels of recoverable oil before they are done—possibly exceeding the total amount of oil known to exist in all the other states combined. The problem, however, is to get the precious liquid to market.

One proposal calls for construction of a \$900-million Trans Alaska Pipeline System running 800 miles south from the Bay to Valdez on the Gulf of Alaska. The pipe itself would be four feet in diameter, and conservationists object that any break in the long line could virtually destroy the countryside. Even without a break, many argue, there might be serious dangers. The passage of a steady stream of thick, hot oil (which hits the surface of the North Slope at 160° F) would suddenly melt the permafrost, or soil and subsoil that have been permanently frozen, thus causing ecological damage of unknown proportions.

The corridor project, incorporating as it does several means of transportation, takes advantage of a single path across nature's many obstacles: sand, gravel,

H. M. Hershberger is a free-lance writer based in Anchorage.

**"Before installation of a wireless telegraph system...it sometimes took a full year for official messages to get from Alaska to Washington, D.C., and back."**



muskeg bogs, tundra, permafrost, glacial rivers, and towering mountains. Nowhere in Alaska have those defenses ever been breached by man.

Instead, Alaskans have relied heavily on the airplane for everyday transportation. One person out of 67, in fact, is a pilot (compared with one out of 278 for the United States as a whole), and most of the others fly regularly as passengers. (Only one out of every five persons in the United States has ever traveled by plane.)

Businessmen in Alaska fly to luncheon meetings; many do business with clients from the floats of planes parked on water beside canneries, fishing boats, and docks. Sportsmen fly to hunting and fishing sites. Construction crews fly to their jobs, oilmen fly to rigs, and housewives fly to bridge games. Moose, buffalo, and musk-oxen are frequent passengers in cargo planes.

Today, there are 468 airstrips, one in nearly every village as well as in each of the major cities. Lake Hood, in Anchorage, is the world's largest floatplane parking area for general aviation. Nearby Merrill Field logs some 350,000 landings and takeoffs a year.

Since 1959, passenger traffic at Anchorage International Airport has quintupled to more than 1.3 million passengers a year. And growth projections indicate that, by 1979, the total will surpass the 5 million mark.

One reason for this increasing traffic is the booming oil industry itself. Another is the city's strategic location along the Polar route to both Europe and the Orient. In January, the Russian government granted permission to Alaska Airlines for its proposed run from Anchorage to Siberia. (Ten charter flights are scheduled for this summer, at prices of \$849 and up.)

Transportation difficulties, however, constitute only one facet of the picture of Alaska's isolation. The other involves the problem of communications. Before installation of a wireless telegraph system in the early part of this century, it sometimes took a full year for official messages to get from Alaska to Washington, D.C., and back.

The need for faster communications became immediately apparent with discovery of gold in the Canadian Klondike. That was in 1896, and the find spurred tremendous interest in the territory.

The massive immigration that followed posed great problems. Civil administration was inept. Lawlessness was rampant.

The U.S. Army quickly established a string of forts and garrisons throughout the territory of Alaska, linking them in 1903 by a newly constructed military telegraph and cable system. Congress had appropriated \$450,000 for actual construction, with the provision that "commercial business" could be done over the lines "un-



der such conditions as may be deemed, by the Secretary of War, equitable and in the public interests."

An Army signal officer at the time described the difficulty of the job: "The seasons have seemed to conspire against telegraph constructions, the ground being almost impassably boggy in the fall, the cold intense (-72) in the winter, the snow soft and deep in the spring, and in the summer, hordes of appallingly ferocious mosquitos drive the men of the working parties to the verge of insanity."

By summer, the United States had connected military Alaska to Washington via Canadian government lines. A year later, submarine cables were laid. In October, 1904, the U.S. established a telegraph communication service that operated entirely through its own Alaska Communication System.

ACS facilities today consist of a multiple network of radio, microwave, open-wire pole lines, and submarine cables. These provide standard toll telephone, telegraph, leased private line, and program broadcast services.

The ACS telegraph network has two relay centers, in Anchorage and Juneau. The former serves central Alaska and connects at Portland, Ore., with Western Union's nationwide telegraph network. The Juneau center is a relay point for all communities in southeastern Alaska. It also ties these communities into the WU lines; and it connects with the Canadian National Telecommunications center in Vancouver, B.C., for service between Alaska and Canada.

Government facilities for long-distance service interconnect with 55 telephone exchanges operated by 16 local telephone companies and serving nearly 80,000 users.

Interstate service is routed over three separate systems: (1) The Air Force White Alice System and a microwave system interconnecting with Canadian National Telecommunications facilities at Whitehorse, Yukon Territory; (2) The American Telephone and Telegraph Company undersea cable interconnecting Ketchikan and Port Angeles, Wash.; and (3) a tropospheric scatter radio system operated between Annette Island in southeastern Alaska and Port Angeles and owned jointly by General Telephone of Alaska and the British Columbia Telephone Company.

Prior to completion of the White Alice System in 1957, all strategic and tactical military communications circuits were

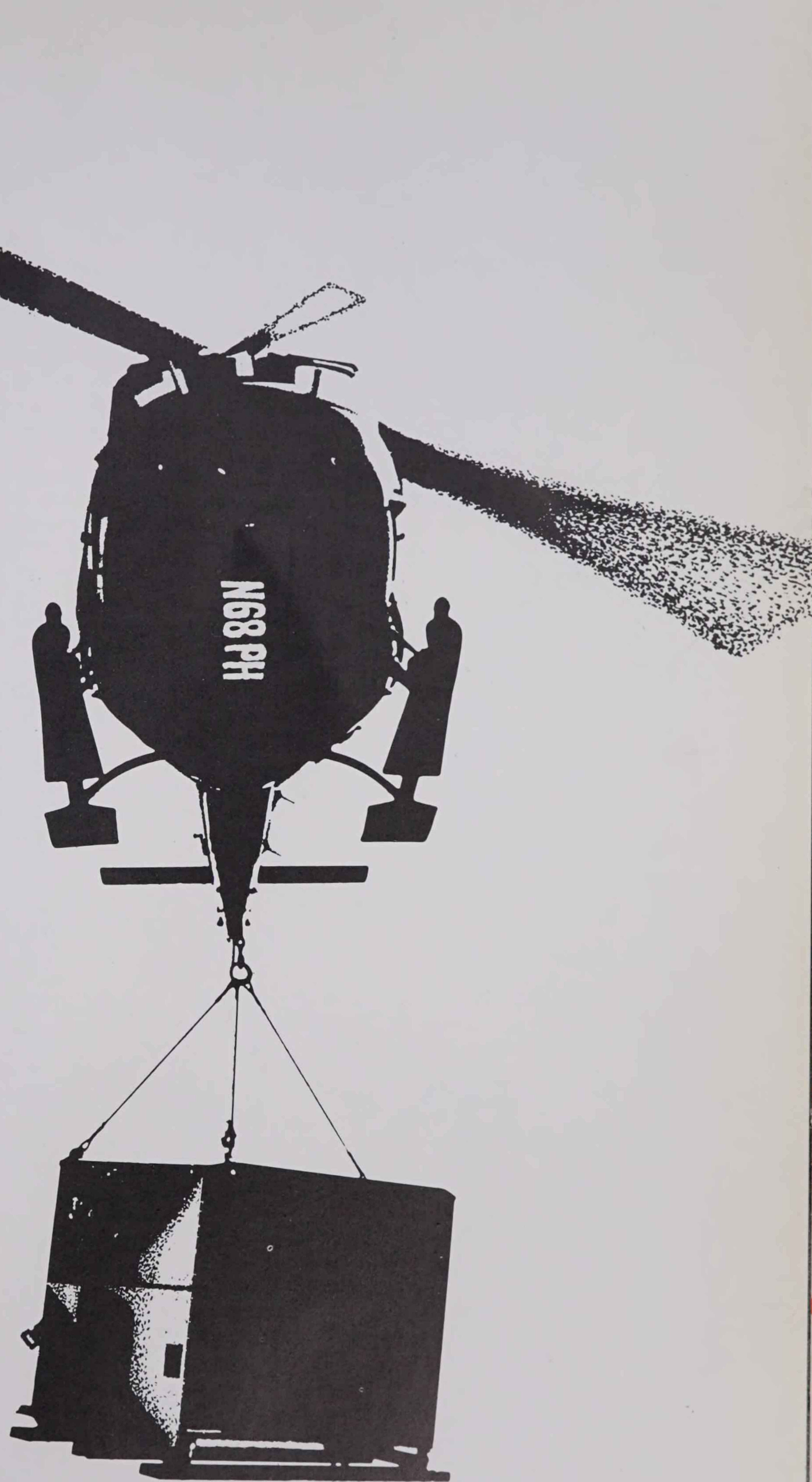
combined with commercial traffic in ACS. At that time, ACS became the primary common carrier for civilian message traffic.

By 1969, however, that traffic had increased to the point at which it severely strained existing facilities. And government resources did not seem to allow for necessary development of the System. As a study group for the Federal Field Committee bluntly put it at that time, ACS "is unable to satisfy requirements, and the basic communications system is aging and obsolescent."

Arrangements have been made, therefore, to transfer operation and development of the system to private industry. In an agreement reached last year, RCA will purchase the system for some \$28.4 million and modernize and expand its operation under a newly created subsidiary, RCA Alaska Communications, Inc. An additional \$27.6 million will be spent to improve existing services (which will permit substantial reductions in interstate and intrastate telephone rates), inaugurate an extensive capital plant program, and furnish new types of communication services.

As a part of its improvement program, RCA Alascom will install a modern, automated message-switching and toll-ticketing system. This will permit, for the first time in Alaska, customer-dialed long-distance calls both within the state and outside. In addition, Alascom will extend full telephone service to 142 isolated communities not presently served by adequate communications. Also included is implementation with Comsat Corporation of a ground satellite station at Talkeetna. The station will provide, through INTEL-SAT 3 and 4, an additional high-capacity route to the outside as well as the capability to transmit and receive on a regular basis live network television programs.

The frontier spirit still lingers, but it is fading fast. The colorful lore and legend of bygone days must give way now to vast modernization projects, which hold great promise for the further development and growth of our 49th state: no longer a "different world" but an integral part of all the United States. ■



# Electronically Speaking...

## News in Brief of Current Developments in Electronics

### The Moon Above, the Earth Below

Some of the secrets of the moon and earth and their relationship to each other are being sought by scientists with the aid of a special photomultiplier tube developed by RCA. One of the most sensitive in the industry, the Quantacon tube is being used in the Lunar Laser Ranging Experiment to receive and amplify the laser signal reflected from the moon.

The experiment began last July, when Apollo 11 astronauts placed an 18-inch-square retroreflector array on the moon's surface. Formerly, the irregular surface from which the beam was reflected had spread out the arrival time of the returning signal. Since the returning signal now originates from a single point, the time it takes it to travel to the array and back can be measured to an accuracy of several nanoseconds. From these data, the distance traveled can be determined within six inches.

The purpose of the laser experiment is to determine variations in this distance over several years. A study of these variations is expected to yield answers to age-old questions about the motions of the moon and earth and to newer questions concerning gravitation and the effects in the moon's motion predicted by the general theory of relativity. Lunar librations—the irregular rotations of the moon about its center—also will be measured, providing data on the distribution of mass within the moon and thus a clue to its history.

As more observing stations are built on earth, lunar-distance measurements will establish their longitudes with such high accuracy that motion associated with continental drift may be observed. Other measurements will determine the position of the North Pole, which is not fixed but may move nearly 200 feet a year along a roughly elliptical path. The cause of this "wobble" is not known, although one hypothesis suggests that it may be related to mass shifts in the earth's crust. If this proves true, scientists also will gain a better understanding of earthquakes.

### Steering by Electronic Stars

Imagine a system of 21 satellites spaced regularly in orbits so as to provide precise, worldwide navigation aid for all kinds of users—from supersonic air transports to commercial fishing vessels. Extensive studies recently completed for the Navy by RCA indicate that such a system is practical and economically feasible.

A fishing fleet may use the navigation satellites to locate a productive fishing area and be able to return to it. Pencil-and-paper calculations with the data would be adequate. On the other hand, a supersonic transport crew would need

continuous navigation fixes. These could be handled by a small computer linked to the signal receiver, eliminating manual calculations. The navigation satellite system would also fulfill a vital military requirement, since a user would receive rather than transmit the signals and thereby use the system without revealing his own position.

Each satellite in the system will continuously transmit data on its position. A user could determine his own position with data received from any three of the satellites, using a fourth to synchronize his clock. The satellites would be small enough that seven could be launched by one rocket. Seven in each set would be equally spaced, with the sets separated in orbits 60 degrees apart. This would place the spacecraft on courses so that four satellites would be in range of any given point on earth 90 per cent of the time—ample to provide navigation aid to a user and to keep his receiver clock synchronized with those of the satellites.

### SIT Sets Sights

RCA has developed a new television camera tube that can "see" in almost total darkness and also can transmit continuous views of the sun without being damaged. In the past, televising scenes that had such an extreme range of light intensities called for the use of several types of tubes. Using the new tube, clear television pictures can be obtained in a room lighted by the glow of a cigarette or of a scene illuminated by a light level equal to that of a 100-watt bulb two miles away.

The new silicon intensifier tube (SIT) consists of a vidicon-type scanning electron gun with an image intensifier section and a special silicon target with an integrated circuit array. The image intensifier converts light from a scene into a flow of electrons that is greatly accelerated by an electrostatic "lens" and then imaged on the silicon target. This target, the heart of the system, provides the gain that results in the ultrasensitive performance of the tube at low light levels.

Eventually, the tube may be used to transmit telecasts in the extreme low and high light conditions on the surface of the moon and detect flashes of light associated with various nuclear, astronomical, biological, or oceanographic phenomena too dim or too brief to be seen by any other photomultiplier. Police patrol cars could be equipped with compact closed-circuit TV systems using the SIT tube for surveillance after dark. The system also could be used for night observation at industrial plants or freight terminals.

At present, however, the tube is in-

tended for specialized industrial and government markets. It may be ready for commercial color broadcasting in three years.

### Swing Low, New Satellite

One of the problems besetting satellite research in the atmosphere below 100 miles is that the greater density of the air slows down the probe, forcing it to descend until it burns. Few satellites with orbits in this area have lasted more than a month. Balloons, sounding rockets, and aircraft have been sent to this height, but unlike satellites they cannot study the atmosphere under repeatable conditions over a long period of time. Hence, at present, there is considerable interest in developing satellites that can swing both low and long.

One approach RCA is studying for recommendation to NASA combines an extremely elliptical orbit—a perigee of about 75 to 93 miles and an apogee of about 2,500 miles—with small rocket motors to adjust the orbit. These satellites, called Atmosphere Explorers, would be designed to spend a year in orbit.

The mission of the Explorer satellites would be to gather data in the lower atmosphere, where most of the sun's ultraviolet radiation is absorbed. Here, chemical processes take place that determine the composition of the upper atmosphere. Information the Explorers will gather also may help meteorologists better understand the processes that affect weather at lower altitudes. Thus a study of this critical layer will lead to a better understanding of the whole atmosphere.

### A Ranging Rendezvous

When the Skylab space laboratory workshop, now scheduled for 1972, goes into orbit, ranging data will be a critical factor in the astronauts' maneuvers to reach and rendezvous with the workshop.

In this space research program, the third stage of a Saturn 5 rocket will be converted into a scientific laboratory. A crew of three astronauts will live and work in this laboratory for 28 days. After they return to earth, two other three-man crews will be sent to the laboratory for two separate 56-day periods.

The astronauts, approaching the workshop in an Apollo Command/Service Module (CSM), will use a VHF ranging system developed by RCA for high-precision distance measurements between their spaceship and the Skylab. This ranging system will be virtually identical to the one RCA developed for the Apollo lunar missions. It works by transmitting tones to the Skylab, which are instantly retransmitted back to the CSM. Range is determined by measuring the time from

the transmission of the tones to their return to the CSM. The information will be displayed on the CSM entry monitoring unit, which also will display reentry data when the CSM is returning to earth.

### An Eye on the Clouds

ITOS 1, the new-generation weather satellite, is returning excellent nighttime and daytime views of the earth's cloud cover. Developed by RCA under the direction of NASA's Goddard Space Flight Center, the satellite is the first of a new series designed to provide worldwide weather coverage every 12 hours. Its predecessors, the TIROS series, provided coverage only once every 24 hours. Much of the success of the ITOS missions has been due to the precise stabilization of the satellites. This is necessary so that the sensors can be aimed accurately toward earth.

Photo credits: cover, page 12 (bottom), and page 13, Tom McCarthy; page 10 (top right), page 11 (bottom and center right), and page 12 (left), Wolf van den Bussche; page 11 (top center), George S. Zimbel for Educational Facilities Laboratories; page 11 (top right), Arnold Hinton; page 10-11 (bottom left), Thomas Lemm; page 11 (top left), Karen Tweedy-Holmes; page 10 (left), page 12 (top), and pages 18-20, Erich Hartmann for RCA; page 28, Linda Wheeler—*The Washington Post* (sculpture shown at the "Explorations" exhibit jointly mounted by MIT's Center for Advanced Visual Studies and the Smithsonian Institution's National Collection of Fine Arts); page 29 (right), Museum of Contemporary Crafts, New York; page 29 (bottom), page 32, and inside back cover, Earl Reiback; page 30, Otto Piene, MIT; page 31 (top left), Nishian Bichajian, MIT; (right), MIT; page 31 (bottom left), Joan Wexler; page 35, Martin Litton—Photo Researchers, Inc.; page 36, Bruce McAllister; page 37, *Our Sun*, Sun Oil Company.

Correction: Drawings on pages 12 and 15 of the Winter 1969/1970 issue should have been credited to Urban America, Washington, D. C.

Using light as a sculptural medium to create a "lunia"—a light box in which an abstract, ever-changing composition slowly evolves upon a screen—artist Earl Reiback worked with a system of lenses, prisms, and mirrors. He describes his experiences in turning the materials of technology into works of art in an article that begins on page 28.



**RCA**

# Electronic Age

Spring 1970

