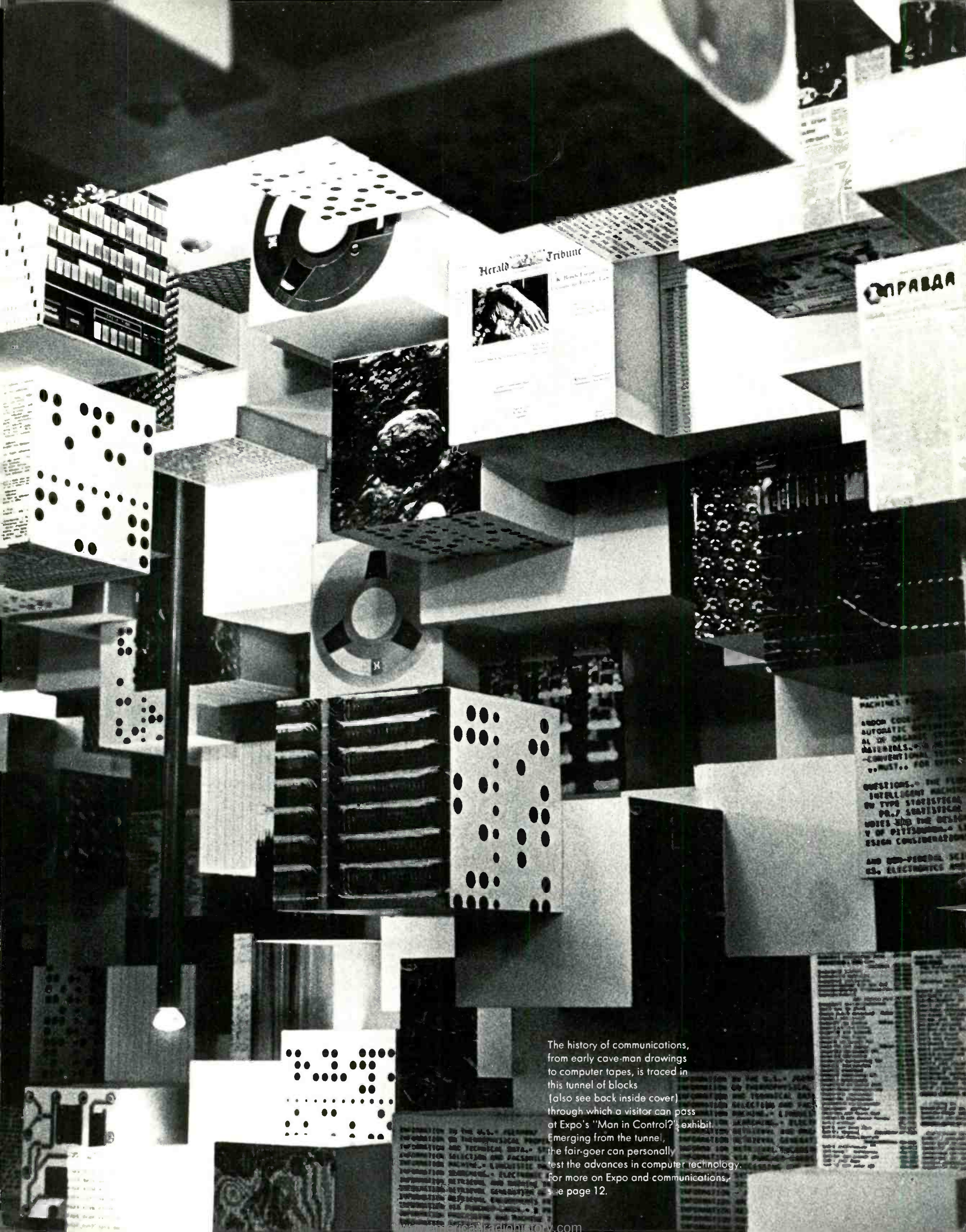
# Electronic Age



SUMMER 1967

RCA




The history of communications, from early cave-man drawings to computer tapes, is traced in this tunnel of blocks (also see back inside cover) through which a visitor can pass at Expo's "Man in Control?" exhibit. Emerging from the tunnel, the fair-goer can personally test the advances in computer technology. For more on Expo and communications, see page 12.

# Electronic Age



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Cover: Suspended from the dome of the United States pavilion at Expo 67 are three air-density satellites from the Explorer series of geophysical spacecraft. Twelve-foot spheres made of alternating layers of thin aluminum foil and polyester film, the satellites were used to study the density of the upper air by measuring the atmospheric drag on them. The photo relates to two articles in this issue: one beginning on page 7 that tells of the use of modern technological tools to predict the world's weather; and the other on page 12 that describes the communications exhibit at Expo.

# COMPUTER-BASED INSTRUCTION

Educators assign
a prominent place to computer-linked
instructional devices
in the classroom
of tomorrow.

by Patrick Suppes

*Editor's Note: Dr. Patrick Suppes, head of Stanford University's Institute for Mathematical Studies in the Social Sciences (IMSSS), is a leading authority in the rapidly developing field of computer-based instructional systems. He has lectured and written extensively on this important subject and has actively participated in developing instructional techniques, curriculum materials, and experimental computer-based systems. For four years, he has conducted experimental and developmental programs at several school districts in and around Palo Alto, Calif. In addition, he and his key IMSSS colleagues are consultants to the newly established RCA Instructional Systems activity, with headquarters in Palo Alto, which designs and markets multipurpose, computer-based instructional systems, including curriculum materials and programming as well as system hardware. In the following essay, Dr. Suppes explains some of the background, techniques, goals, and problems of such systems.*

To bring a certain historical perspective to a general survey of the potentialities and prospects of computer-based instruction, it might be well to begin by looking at the type of instruction given in a typical grammar school in the Middle Ages. What was the process of teaching like before books were introduced, and is there a parallel between the introduction of books and the coming introduction of computers as instructional devices?

In the 14th century, for example, a grammar school in England devoted to educating the children of burghers and minor nobility not able to afford private tutors had an instructional program somewhat like the following. On most days, the teacher would read selected portions of a text from a manuscript, usually repeating each sentence twice and explaining parts of the text as he went along. The students were expected essentially to memorize what the teacher said. On the following day, the work would begin with a recitation of what had been covered on the previous day. There were no printed books, of course, and even the manuscripts used by the teachers were rare. The process of education was almost entirely oral with only a very limited use of visual materials of any sort.

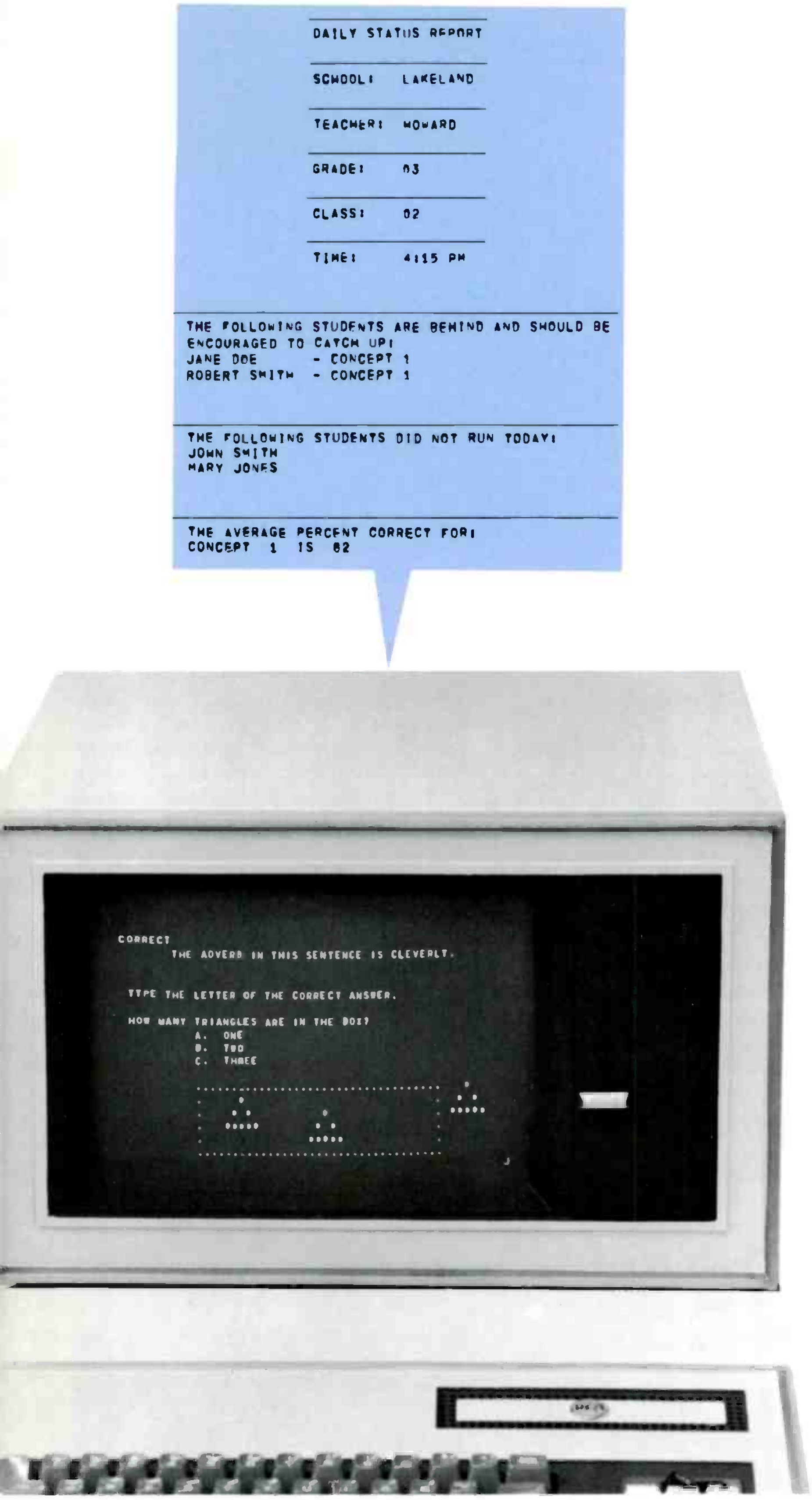
Today, printed matter dominates a large part of personal and mass communication and is central to regular school instruction. The place of books in our society is widespread and permanent, even though the printing of books on a large scale did not really get under way until the 18th century.

There is every reason to think that a comparable revolution has already begun in the use of computer-based devices as instructional aids. Even the most conservative forecast of developments during the next century must assign a prominent place to computer-based terminals in the predicted configuration of future classrooms.

It is of the greatest importance, however, to emphasize that the existence of the technology and the recognition of its possibilities are not in themselves sufficient to guarantee that it will be used or that it will be used with anything like maximum efficiency. In many respects, the deep and complicated problems only begin when it is recognized that the technology is ready for application and decisions must now be made as to how it should be used.

There are at least four major aspects of computer-based instruction that seem to offer great potentiality for education at all levels, particularly at the elementary school level. The

A student prepares to receive instruction from a computer-operated unit.




Questions or text material appear on the face of the television monitor. The computer also produces a daily status report on student performance.

first and most important is concerned with the well-known psychological generalization that there exist definite and clearly significant individual differences. The fact is that children enter school with remarkably different abilities; they will work at different rates and at different levels of accuracy and understanding. Nevertheless, for obvious economic reasons, schools are not able to offer a curriculum program to each child according to his individual needs. We simply cannot afford that many teachers. In the elementary school, the teacher is running a three-ring circus. She is not only teaching mathematics, she is teaching reading, related language-art skills, writing, social studies, and elementary science. She cannot give very much attention and accommodation to individual student differences in these various subjects, no matter how willing or able she may be. Because of the primary importance of reading, some attempt is made in the first two grades to diversify reading into three or four groups. Often it is quite successful; yet even within these small groups, it is not really possible to accommodate individual differences in any deep and serious way.

For the past three-and-a-half years, members of Stanford University's Institute for Mathematical Studies in the Social Sciences have been working with a homogeneously selected group of what are now second-graders from schools within 10 miles of Stanford. They are a group of very able children, selected from four different elementary schools. The IQ range is from 122 to 167, with a mean of 137.5. By breaking the students into four small groups of from eight to 10 members each, we hoped to be able to handle individual differences fairly satisfactorily. In actual fact, it has been extremely difficult, even with this very select and small group of students, to give them the appropriate attention their individual differences required. Furthermore, the academic spread of their sequential positions in the mathematics curriculum is now almost two years. Computer-assisted instruction can be expected to result in this kind of variation in achievement rates.

In a group of children in a more ordinary elementary school environment, the range in ability and achievement is greater. Yet there is little hope of accommodating this important psychological variable of individual differences in the usual classroom setting. Something like computer-assisted instruction is needed so that the presentation of the curriculum to each child can be individualized. The best single reason for using computers for instruction is that *computer technology provides the only serious hope for accommodation of individual differences in subject-matter learning.*

The other areas in which computer-assisted instruction has valuable potentialities are less important than this overwhelming one of accommodating individual differences; but as we begin to solve the tactical problems before us, they too are significant in the educational picture. One such area is the important matter of correcting responses, keeping records, and relieving the teacher of routine, so that she may teach her class as she would like to do. A group of first-grade teachers with whom we were working were asked, "How long would you need to spend on your students' workbooks in mathematics outside the class if you did an adequate job of marking?" "About an hour and a half a day," was the average response. This is simply too much to demand of teachers when other parts of the curriculum are considered as well.

In practice, the teacher can correct only a random sample on an occasional basis. In a computer-assisted environment, this correction can be done automatically, easily, and simply, and the teacher is relieved of an enormous chore.

Closely related is the matter of a systematic and straightforward introduction of many of the standard skills. As we study in detail how the children are learning and performing, computer routines can be developed that the teacher can use to introduce most of the children to many standard algorithms. The routine introduction of standard skills can be handled by computer-based terminals. The teacher can then move to the much more challenging and important task of trouble-shooting. She can help those children who are lagging behind, because it is inevitable that, in these early years, the depth of programming and the depth of the alternatives we can offer will be insufficient to cover all the children. When the child has run through all the branches of a concept, and has not yet met a satisfactory performance criterion, a call is made from the terminal to the teacher at the proctor station, and she can go to him and help. But these teacher-calls are something that require individual attention; they involve individual creative effort on the part of the teacher, not merely her routine introduction of, for example, how to divide two-digit divisors into three-digit dividends.

The fourth potentiality of computer-based instruction is that, for the first time, educators will have the opportunity to gather data in adequate quantities, and under sufficiently uniform conditions, to take a serious and deep look at subject-matter learning. Enormous gaps exist, for example, in the literature of elementary mathematics learning, even in elementary arithmetic. Almost all the research that has been done has centered around the learning of arithmetic. If you asked about slightly more advanced pieces of mathematics, you would hear a few romantic tales by some mathematicians who have become interested in the subject; but as for real analysis of how students learn mathematics, we as yet know very little.

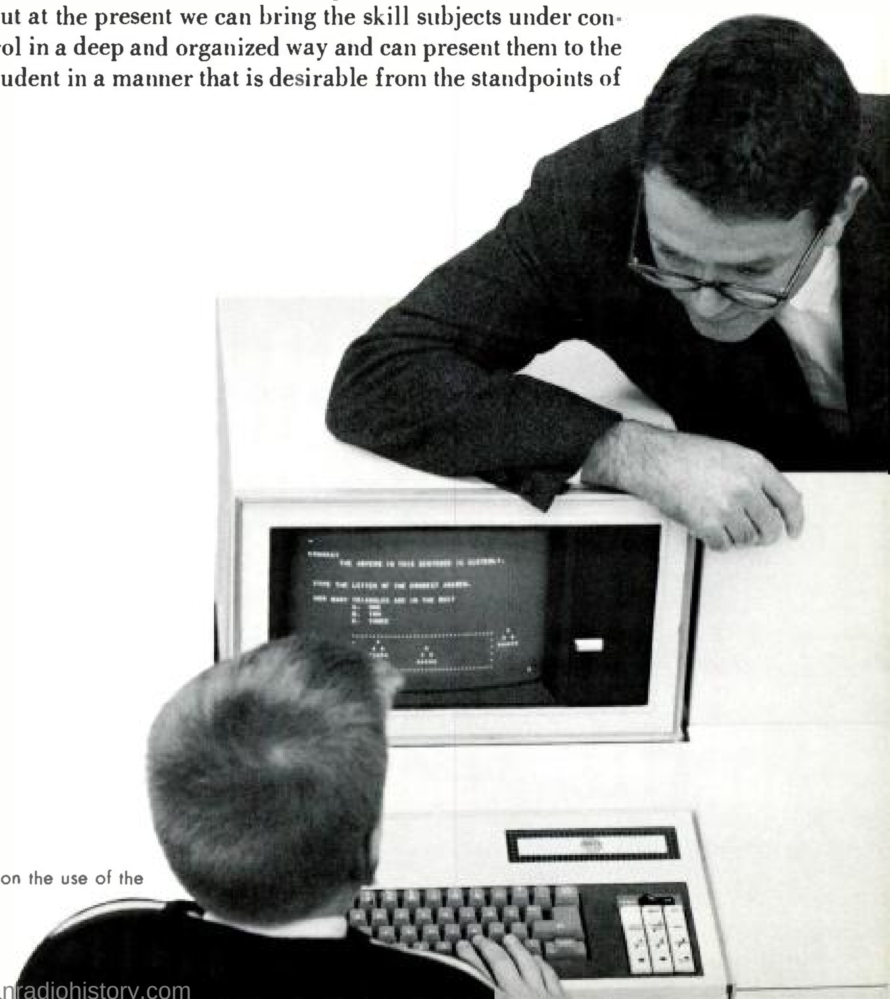
A number of pressing problems confront attempts to implement computer-assisted instruction. The first problem is that of reliability. The machines have to work, and they have to work right. The program has to be thoroughly debugged. Chaos is introduced if over a sustained period children are put in the terminal environment and the program and machines do not perform as they should.

The second problem is one that plagues all of us working in curriculum, not simply those in computer-assisted instruction. It is the problem of avoiding simple-minded curriculum preparation and programming. Because we have a new environment, because we are struggling to conquer technological side-effects that are not ordinarily present in the classroom, it is sometimes easy to settle for less than the best in curriculum and programming. It is far too easy to make the curriculum too simple or to forget important aspects of interest and complexity. This tendency to neglect curriculum content because of concern with the surface programming problems is pointed out in the literature of programmed learning, particularly the critical reviews that have appeared in the mathematical literature. *The Mathematical Monthly* has been one of the best sources of critical and perceptive reviews of programmed learning materials in mathematics instruction.

In psychological terms, the third problem is that of stimulus deprivation. In computer-assisted instruction, can the student be provided with a rich-enough stimulus environment? There is no doubt that this can be done in the beginning, but the second or third year may bring larger difficulties in this respect. Certainly mistakes will be made, and children may become bored. On the other hand, some people are too pessimistic. The problem is not psychologically as complex as many people would like to make it. There is no doubt that, other things being equal, the children have an enormous initial interest in using the equipment that is part of computer-assisted instruction. With proper nurture of that interest, the problem of stimulus deprivation and the associated problems of motivation can be overcome.

The fourth problem will become a pressing one with the universal use of computer-assisted instruction. This problem is how to make the cost reasonable for use on a very wide basis in schools throughout the country. Obviously, costs must come down very considerably before every elementary school or any reasonable percentage will have computer-controlled terminals available to children in the classroom or close to it. At the moment, our concern is to find out in more detail what the operational problems are in connection with this sort of instruction; we are not now attempting to deal directly with the problem of economic feasibility. For a variety of reasons, the economics of computer-assisted instruction will look much more feasible in a matter of two or three years. Perhaps the crucial point is to move to mass production of terminal equipment and away from defense-oriented conceptions of cost.

With respect to the future of computer-assisted instruction, there is no doubt that the skill subjects can be handled most easily and effectively in this environment, though other subject matter will eventually be presented successfully, too. But at the present we can bring the skill subjects under control in a deep and organized way and can present them to the student in a manner that is desirable from the standpoints of



Dr. Patrick Suppes of Stanford University advises a student on the use of the instructional device.

both psychology and curriculum. The subjects that would be particularly important are reading, mathematics, and foreign languages. A major effort in reading is being made under the supervision of Professor Richard Atkinson at Stanford and also by a group directed by Professor Duncan Hansen, formerly of Stanford and now at Florida State University. Concerning foreign languages, we are currently working on a computer-based, first-year course in Russian that will be used for the first time with students next fall. This effort is mainly under the direction of Professor Joseph van Campen, a member of the Department of Slavic Languages at Stanford. Foreign-language teaching is one of the most promising areas in which to apply computer-assisted instruction. The vast spread of language laboratories around the country is a move in that direction. There are two fundamental psychological criticisms of language laboratories, however. First, there is no individualization of instruction, the important variable mentioned earlier. Second, the student is not asked to make an overt response that is evaluated. There is not sufficient checkup on what the student understands or does not understand as he listens to material in the laboratory. Both of these criticisms may be met by the use of computer-based terminals.

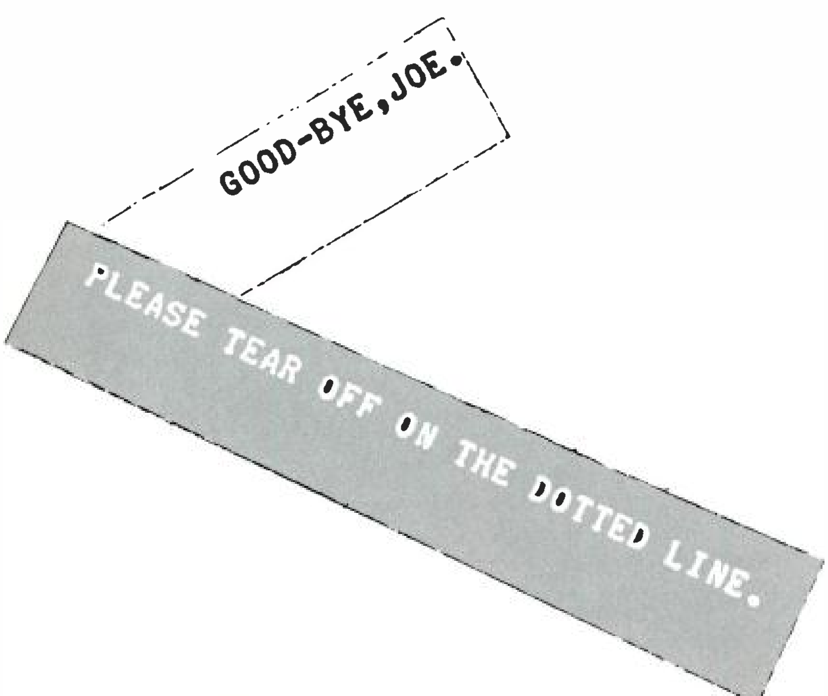
Another important prospect of computerized education is its ability to upgrade the standards of those aspects of elementary subjects that are concerned with drill and practice. From a psychological standpoint, we can control in a much deeper and more substantial way the kind of variables that learning theorists have talked about for decades. The computerized environment can be controlled with relative completeness; this is especially important with respect to timing variables. It is difficult to emphasize enough the impact that widespread use of computer-assisted instruction can have on the mastery of skills: elementary skills in mathematics, for example, and in reading and foreign languages.

Research on drill-and-practice methods and approaches dates back to the 1920s. One of the basic studies was by Guy M. Wilson in 1925, and he concluded that, to be effective, a drill should have the following seven attributes:

1. It should be on the entire process.
2. It should come frequently in small amounts.
3. Each unit should be a mixed drill.
4. It should have a time limit.
5. Examples in a drill should be in order of difficulty.
6. Drills should include verbal problems.
7. Drills should facilitate diagnosis.

In the construction of drill-and-practice materials in elementary school mathematics, we have tried to use most of the features emphasized by Wilson, and, in addition, to put considerable emphasis on the individualization already discussed. In the program that will be run in 1967–68 on RCA terminals under control from a Spectra 70/45 computer, the drill-and-practice material will be organized in blocks at each grade level. On each concept block, the student will begin with a pre-test. On the basis of his pre-test score, he will be placed in one of five levels for five days of training. He moves up and down in these five levels depending upon his score on each day. If, for example, he makes a score between 60 and 79 per cent, he remains at the same level. If he makes 80 per cent or above, he is moved upward. If he makes below 60 per cent, he is branched downward. At the end of the five days of training, the student is then given a post-test, which is entered in his record for that concept block. At the same time that he is working on this concept block, he is also being individually reviewed on previous concepts on which his work was the least satisfactory. The concept block on which his work was the least satisfactory is determined from an examination of previous post-test scores. Review items on the concept block with the lowest past post-test score are then selected, and this review work constitutes approximately 30 per cent of the daily work. Individualization in this drill-and-practice material is thus occurring in two ways. The first way is to adjust the difficulty-level of exercises according to student performance. The second way is individually to review the student on those past concepts on which his performance has been the weakest. Fairly elaborate plans for evaluation of the efficacy of this drill program have been laid and will be reported in 1968. However, it should be emphasized that the general conception of drill-and-practice work is not one that originates with the advent of computer-based instruction. It is rather that a concept that has been present for some time can receive the appropriate and proper kind of application. Computer-based approaches to instruction open the possibility of bringing to drill-and-practice portions of instruction a level of standard and analysis that simply has not been feasible previously for even the richest and best-equipped school systems.

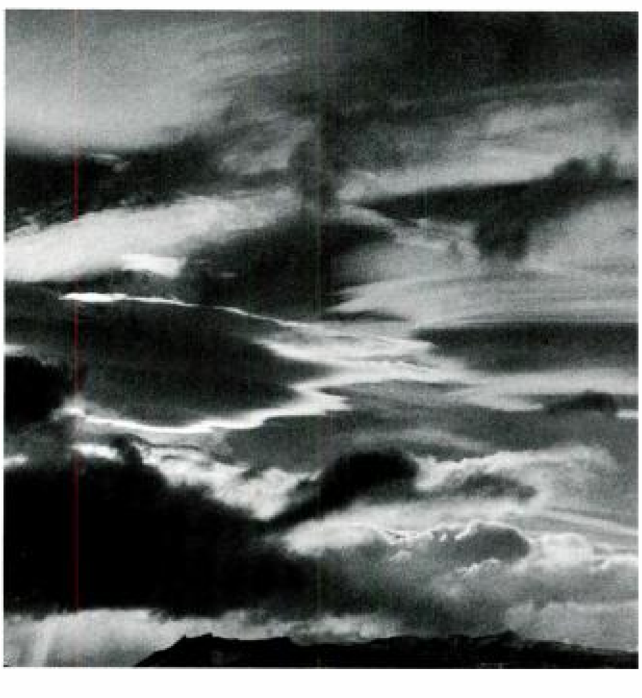
Finally, a question is often raised regarding the prospects for teachers in this new environment. Are we trying to eliminate the teachers? No move in the history of education in this country has led to a reduction of teachers, and I think exactly the same thing is true of computer-based instruction. The cost of instruction or the number of teachers will not be reduced; rather, the quality of education will be raised. Nearly all teachers regard textbooks as an indispensable aid to good teaching. It seems to me a reasonable prediction that the same will be true of computer-based teaching terminals in the not very distant future. ■



# Keeping Track of the World's Weather

Assisted by satellites and computers, the meteorologist is gaining a clearer insight into the behavior of weather.

by Louis F. Slee



Globally, during a 24-hour period, 100,000 observations of surface weather conditions are made, 11,000 upper-air observations are recorded from balloons, and more than 200 cloud-cover pictures of the entire earth are taken by satellites from outside the atmosphere. This collection of data is performed at some 8,000 land stations in every country, from 4,000 ships at sea, and by five ESSA weather satellites circling 800 miles above the earth. Yet, for all this activity, only 20 per cent of the world's weather is adequately observed for the purpose of forecasting, according to meteorologists.

Stirring in a gigantic "pot" of some 4 billion cubic miles, weather is such a dynamic "brew" that even 100,000-plus reports a day cannot keep up with its oscillations and variations. Scientist and farmer alike are challenged to determine where its changing face will turn up next, when it will arrive, and in what form it will appear.

Now, with such modern tools as the weather satellite and the computer, with sophisticated analytical techniques, and with better organized and more extensive reporting systems, the meteorologist is gaining a better grasp of the dynamics of weather. Together with his counterparts in other countries, he has embarked on a World Weather Program whose ultimate objective is an accurate long-range forecast. Eventually, he hopes to exercise some control over the weather and thus bring enormous economic and social benefit to a rapidly expanding world population.

The most important task of highly skilled meteorologists is to prepare a forecast of the weather and interpret its potential impact on the daily activities of mankind. To do this routinely and with precision, they need information on all the weather elements—clouds, precipitation, temperature, humidity, wind, pressure, and visibility—from all over the world and in a hurry, for weather data are highly perishable.

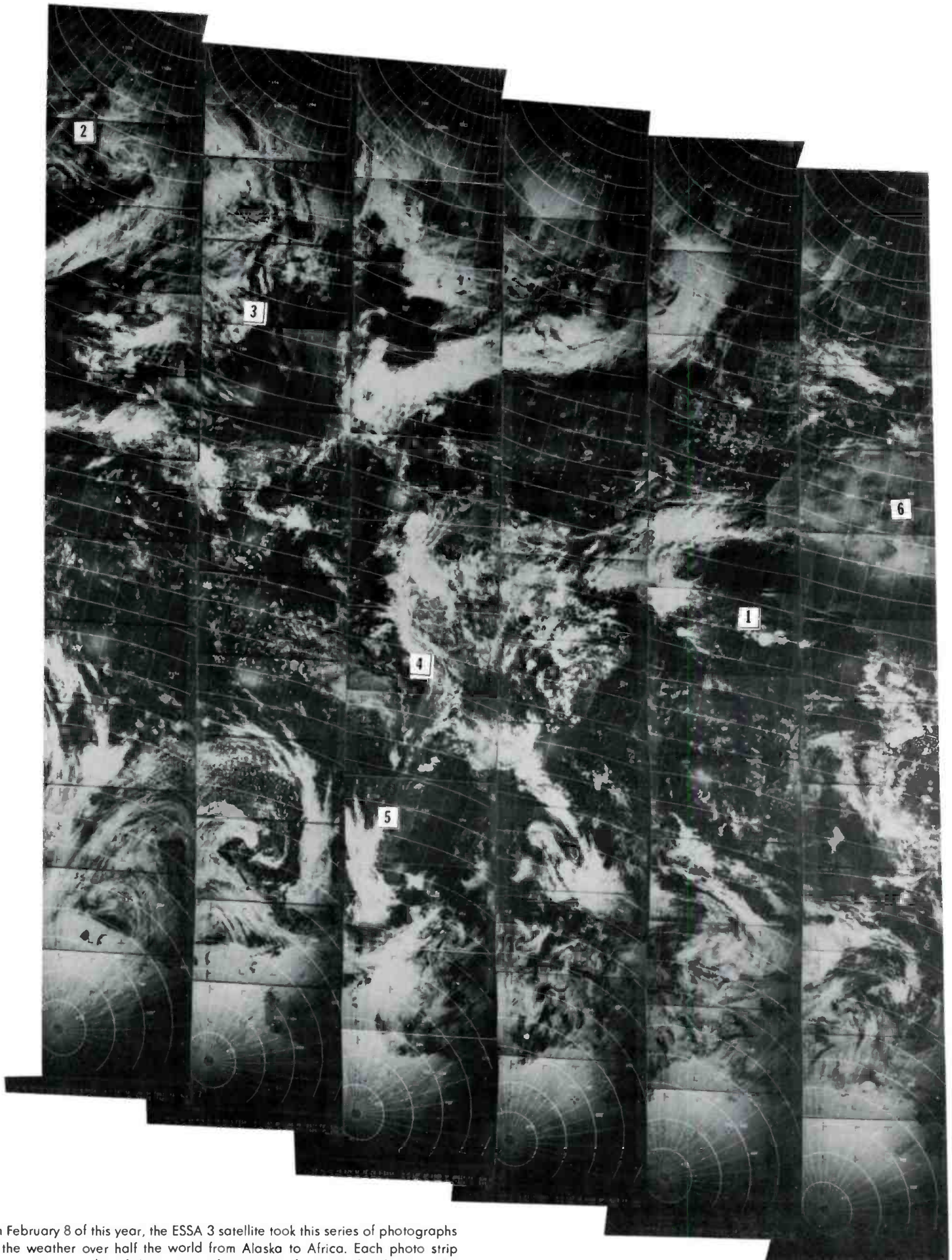
The international exchange of weather information is handled through a global meteorological communications network. In the Northern Hemisphere, there are weather data relay centers in New York, Tokyo, Moscow, New Delhi, and Offenbach, Germany, connected by radio weather circuits. The network is operated by international common carriers such as RCA Communications, Inc., which provides facsimile transmission lines between Washington and Moscow, as well as to Offenbach, Honolulu, and other points.

Within the United States, some 25,000 observations are made each day of both surface and upper-air conditions at 1,000 stations throughout the country. All of these data flow over teletype circuits into the National Meteorological Center (NMC) at Suitland, Md., just outside of Washington, D.C. Some 200 pictures from the ESSA satellites also are transmitted each day to the National Environmental Satellite Center (NESC) at Suitland via microwave link from ground stations in Alaska and Virginia. Some of these pictures come directly from ESSA satellites as they pass over the NESC facility.

Both centers are part of the Department of Commerce, Environmental Science Services Administration (ESSA), headed by Administrator Dr. Robert M. White. In addition, the Suitland facilities serve as one of three World Meteorological Centers in the United States, Australia, and Russia, designated by the U.N. World Meteorological Organization.

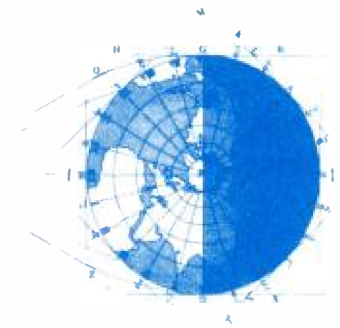
Scientists at Suitland are developing some novel and remarkable computer techniques for improved weather fore-

LOUIS F. SLEE is on the staff of RCA's Astro-Electronics Division.




On February 8 of this year, the ESSA 3 satellite took this series of photographs of the weather over half the world from Alaska to Africa. Each photo strip represents one orbit of the spacecraft. Weather features identified are: 1) thunderstorms on the equator between Africa and South America; 2) storm off the Aleutians; 3) clear weather over Mexico and Lower California; 4) clouds following the contour of the Andes Mountains and thunderstorms over the Brazilian rain forest; 5) a clear summer day over most of Argentina with a disturbance approaching southern Chile; and 6) clear weather over North Africa with the dark areas in the lighter-shaded Sahara indicating vegetation on mountains and plateaus.

casting. At NESC, for example, they have applied skills in mathematics, meteorology, and photogrammetry to develop a computer program for automatically processing ESSA 3 satellite cloud pictures. ESSA 3, with a pair of Advanced Vidicon Camera Systems (AVCS), delivers 150 TV pictures of the earth every day to NESC computers. Converted to digital format, they are processed to produce a rectified photo mosaic of the Northern and Southern hemispheres and a region around the equator compatible with the 1-to-20-million scale maps of the world used at NESC.



This daily computer output depicts cloud data covering 200 million square miles; the total surface area of the earth. The mosaic of Northern Hemisphere pictures is transmitted in facsimile format to weather stations throughout the United States. This provides forecasters with a look at global weather patterns for consideration in long-range forecasting.

In addition to the computer display, analysts at NESC produce a global nephanalysis based on ESSA 3 pictures. A nephanalysis is a graphic representation of clouds. The analysis group receives pole-to-pole strips of AVCS pictures gridded with latitude and longitude lines. Each strip is a view of weather from the satellite's most recent orbit. Using the information from these strips, the analysts prepare a nephanalysis of the Northern Hemisphere, adding to it some information from conventional weather analyses obtained from NMC. It is then sent to forecasters via teletype and facsimile circuits.

Pictures from the ESSA 4 satellite, equipped with Automatic Picture Transmission (APT) cameras, also are received and processed at NESC. APT pictures can be received anywhere in the world with simple ground receiving equipment as ESSA 4 orbits overhead. The unique, RCA-built APT camera provides meteorologists with a weather picture covering 4 million square miles a few minutes after the picture is taken. Analysts prepare a mosaic of APT pictures every day of all of North America from the Western Atlantic to Hawaii. The mosaic is gridded with latitude and longitude lines and turned over to the NMC to supplement surface and upper-air observations. Also, the section of the mosaic showing weather over the United States, overlaid with an outline map and with a written description of the features depicted, is sent out at 2:00 P.M. each day to news wire services.

"Meteorologists all over the world are excited about the APT weather pictures," according to David Holmes, Chief of the Ground Systems Branch, NESC Office of Operations. Some 45 nations are receiving instant weather pictures directly from ESSA 4. In addition to foreign national weather services, universities in many countries and a host of television stations in the United States, such as the NBC affiliate WSM-TV in Nashville, Tenn., are receiving APT weather pictures. The Free University of Berlin publishes a daily mosaic weather map of APT pictures it receives. The French weather service distributes a similar APT weather map, and the French government has installed an APT station at Tahiti in the South Pacific. In Kenya, the meteorological service built its own receiving equipment using a ship's mast and scrap copper tubing for an antenna and adapted a facsimile recorder to be compatible with APT picture transmission.

In many parts of the world, weather observation networks are partly or completely inadequate. Even areas with

adequate networks still have the problem of obtaining observations of weather conditions over sea areas upstream in the weather pattern. Detecting a tropical storm in advance of its approach to land is difficult without satellite observation.

The enthusiasm with which meteorologists welcomed APT pictures and the international good will expressed toward the United States for its policy of making the pictures available to all on an equal basis were reflected in many cables and letters received at NESC when ESSA 2, the first APT satellite, was orbited last year.

The Australians cabled: "Local advisory bulletin of tropical cyclone at 15 South, 118 East issued on basis APT picture 30 March, although no supporting evidence at this time from other sources. APT proving of great value Australian region."

From Tananarive, Madagascar, came this message: "On first pictures acquired, APT equipment recorded presence of strong tropical disturbance in Indian Ocean. This disturbance was suspected but not located and data from APT pictures caused great excitement in local meteorological service. APT equipment has followed and permitted plotting position of storm on daily basis."

The usefulness of APT pictures for aviation is being demonstrated every day at the Weather Bureau High-Level Flight Forecast Center at Kennedy International Airport in New York. There, satellite pictures are used daily in the preparation of operational aviation forecasts for flights bound for Europe, Africa, and the Caribbean.

A special base map compatible with APT pictures is prepared by the center's cartographer. Pictures received at the center are superimposed on the map along with pilot reports and forecasts of winds, icing, and turbulence for each of the three destination routes. This becomes a master which is photographed to produce copies of three separate route sections for distribution to departing pilots. APT weather maps afford pilots a more comprehensive picture of in-flight weather. The center at Kennedy also is experimenting with the computer mosaics of AVCS Northern Hemisphere photos, relayed from Suitland, to supplement the APT air route weather maps.

While satellites keep watch on the atmosphere from above, ground-based observers below send instruments aloft aboard balloons to radio back weather data such as pressure, temperature, and humidity, measured at specific altitudes. With thousands of these and other observations pouring into NMC every hour, the center operates on a three-shift, 24-hour schedule, seven days a week. It requires rooms filled with communications and computer equipment to handle the data, and the equipment is manned by specialists who work at an intense pace to meet established deadlines.

The surface and upper-air observations from around the nation are fed to a pair of computers at NMC which read, identify, evaluate, and analyze the information. Part of the output goes to a third computer for numerical forecasting of upper-air and surface conditions. These forecasts range from six hours to six days.

The computer has been responsible for the greatest advance in weather forecasting in the past 10 years, according to David J. Stowell, Staff Assistant to the NMC Director. In another of its uses, the computer has been programmed to simulate the equivalent of air at ground level being lifted to 18,000 feet. The computer compares the relative temperature of the parcel of air raised from the ground with the surrounding air at high altitude to see whether the raised parcel of air will rise or sink back in the simulation. If it rises, the computer output chart will show the rise—an indication of an unstable condition in the region where the ground air sample was taken. To the forecaster, this means a probable occurrence of thunderstorms. This is accomplished by feeding measurements of the air at different altitudes to the computer which is programmed with a thermodynamic model of the atmosphere. The output data, called a lifted index measurement, then is sent from Suitland to the Severe Storms Forecast Center.

Another job done by this computer is to predict rain by forecasting the three-dimensional motion of the atmosphere, combined with measurements of atmospheric moisture con-

"The day may come when man's knowledge of the weather will be so complete that he will be able to control it much as he has learned to control some of nature's other resources."

tent. When the model indicates moisture saturation of the air at a given time and place, it simulates clouds and precipitation. At that point, "numerical rain" will "fall out" of the computer on a precipitation chart.

ESSA is working on improvements in data processing as well as data distribution. Currently, the quantity of weather information available to the Suitland computers exceeds their capacity. Looking toward the future, ESSA scientists anticipate better ground display equipment for satellite pictures, automatic plotting equipment, higher resolution satellite television cameras, and synchronous weather satellites as well as better computers.

All of these technological improvements are required to implement the concept of a new World Weather Program, described by Dr. Richard E. Hallgren, Director, ESSA Office of World Weather Systems, and Don M. Hanson, Weather Bureau Coordinator for World Weather Systems, as "probably the largest and most complex scientific program ever attempted internationally."

The World Weather Program has two major goals for the period 1968 to 1971. One is the development and operation of a World Weather Watch, an idea of the World Meteorological Organization (WMO). Through a plan presented at the WMO Congress at Geneva in April, the new tools of meteorology—satellites, computers, automatic weather stations, and the global communications network—will be linked together through international cooperation to observe and report on the earth's atmosphere as a whole. This will update and modernize the present world weather system for improved forecasting and permit a global meteorological experiment to compile comprehensive atmospheric data on a scale never before possible.

The second goal is a great research program leading to accurate simulation of the physical processes of the atmosphere for long-range forecasting and a theoretical study of weather modification. Biggest obstacle here is the lack of global observation data. Thus, the achievement of the first goal will be important to the implementation of the second and an understanding of the forces that create weather.

Initial steps in the program call for the distribution of weather data among the three World Meteorological Centers (Washington, Moscow, and Melbourne) and national weather services around the world. A number of regional meteorological centers with computer facilities will be established to serve groups of nations. One such center in Miami, to serve Latin America, has been proposed by the United States. Consideration also will be given to a new multipurpose satellite capable of point-to-point weather data communication, collection of weather data from surface and upper-air stations, and global picture coverage.

The World Weather Program will increase the weather services available to the community of nations, according to D. A. Davies, Secretary-General of the WMO. "However, the undertaking is much more than a purely scientific endeavor—it also involves many practical aspects which are expected to bring significant economic, social, and other benefits to its supporters and to the world as a whole."

These benefits depend on weather forecasting. A knowledge of future weather conditions is important for maintaining the health of a nation's economy. Safe and economic operation of ships and aircraft depends on weather forecasts. The daily operation of large dams calls for decisions on how much water should be released for hydroelectric power generation, irrigation, and flood control. Snow and rain forecasts upstream from such dams are crucial to making these decisions.

Weather forecasts are equally important to all farming operations. Being able to anticipate weather that affects building and road construction leads to obvious economic benefits. In fact, any economic activity of man that is weather-sensitive can benefit from improved forecasting. The objective envisioned by meteorologists is an accurate two-week forecast. Further downstream in time, the day may come when man's knowledge of the weather will be so complete that he will be able to control it much as he has learned to control some of nature's other resources. ■

# THE COMMUNICATIONS STORY AT EXPO 67

The key role of communications in man's effort to control his environment is dramatically told in Expo's "Man in Control?" exhibit.

by Clell Bryant

Two views of Expo. Below, the "Man the Producer" pavilion with Montreal in the background and, right, the geodesic dome of the United States pavilion silhouetted by the setting sun.

Probably the most jolting experience at Montreal's Expo 67 is to be found not aboard the $1-a-ride Gyrotron, with its simulated space voyage, but rather unexpectedly in the Christian pavilion. Put up by a group of ecumenically minded Canadian churches, it venturesomely sets out to portray, in effect, an earthly heaven and hell—or, as the sponsors prefer to put it, positive and negative experience. The positive mood is set with films and photographs, plus several soundtracks, illuminating the happy daily round of family life and man's achievements. A ramp leads away, through gradually intensifying sounds of family bickering and quarrels, to an underground pit and scenes of hunger, war, and pestilence, accompanied by a brutal Babel of sound. The visitor emerges into a soaring white room with a checkerboard of images of good and evil and confronts, mirrored in among them—himself.

One of the striking comparisons at Expo is that man's responsibility for the best and the worst in his world is no less inescapably pointed up on a secular and scientific level, and most specifically at an exhibit called "Man in Control?" Located in one of the pavilions erected by Expo itself to illustrate its lofty theme of "Man and His World," the exhibit carries what might be described as the central message of the fair: that the difference between earthly heaven and hell is due less to man's nature than to his failure to use to the full the tools at hand to communicate. In "Man in Control?", the question mark is the most important part of the title, more vividly expressed by the exhibit's title in French—*L'apprenti sorcier*.

"The history of civilization," the visitor is told as he ascends to the exhibit on the third floor of the "Man the Producer" pavilion, "is the story of man's struggle to control his world." The result of a successful struggle is to be seen all around, in back-lit transparencies flashing in time to gay, carefree music, showing bountiful crops, laughing, healthy children, and man's proudest technological advances. In the next area, the music remains the same—but jarringly so, since the scenes are now of starving children, the dead in battle, crashing planes and trains; in short, a world careening out of control. As the Christian pavilion raises the question of man's responsibility for the state of his world, "Man in Control?" goes on to show how control can be achieved—and the question mark eliminated.

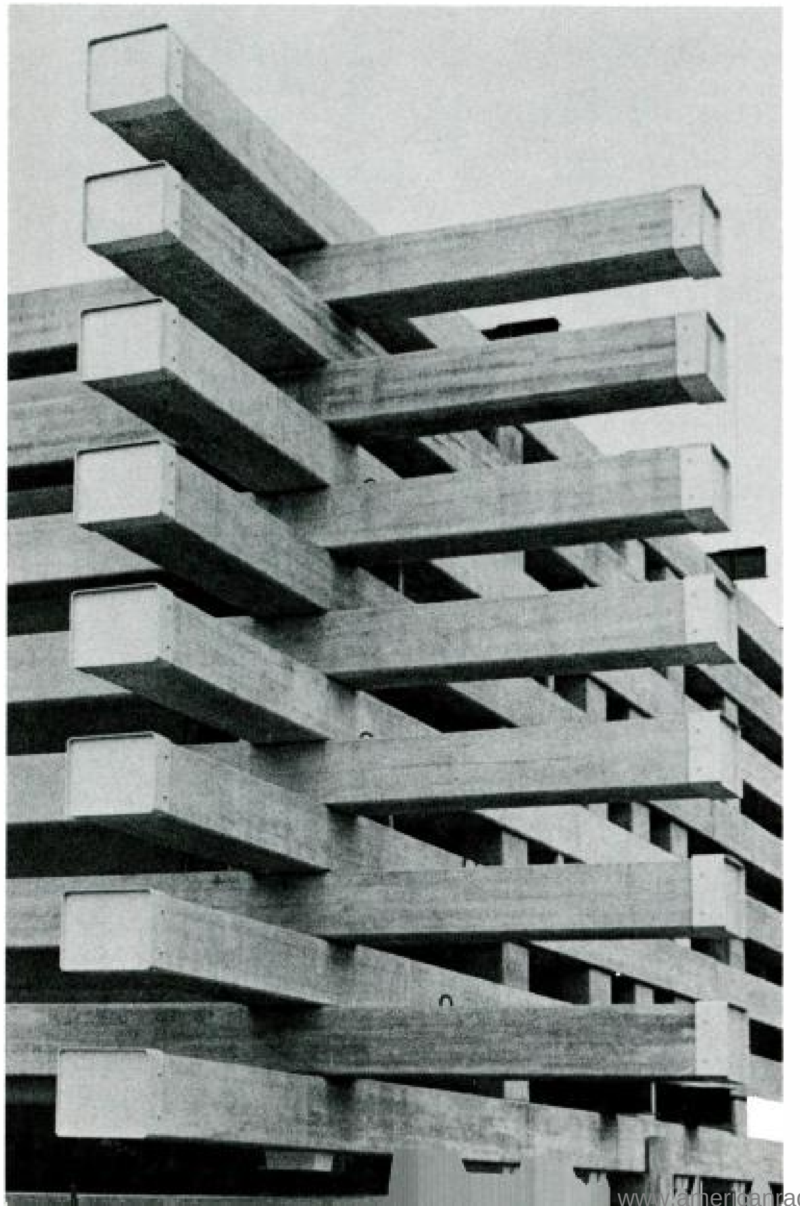
The key, of course, is communications, and it is no less a truism that the history of civilization is the story of the development of communications. By way of illustrating the point, the visitor is shown a film evoking four historic disasters—chosen because they "demanded instant, spontaneous reaction by media," explains Project Manager Charles Austin Hughes, Administrator of Planning for the RCA Victor Company,Ltd., Montreal, general contractors for the exhibit. In the case of the first disaster, the assassination of Julius Caesar in 44 B.C., the strain on media was physical; the news reached neighboring cities by relays of chariots that could cover about 100 miles a day, and even so took as long as two years to reach the farthest outposts of the Roman Empire.

Nineteen hundred years later, when Abraham Lincoln was assassinated, the news traveled to New York via the newfangled telegraph, then by ship to Ireland, where it was again telegraphed to London. It reached there so relatively quickly that, in the ensuing stock market chaos, the so-called

CLELL BRYANT is a Montreal magazine writer who has written extensively on Expo 67.

"The visitor to 'Man in Control?' cannot escape its central theme—now that man has total communications, he cannot use that as an excuse for failure to control his world."

The Japanese pavilion



smart money bet that news traveling at such speed had to be untrue.

Everyone was accustomed to the telegraph by the time the *Titanic* sank in 1912, but now there was another medium, radio, to report the sinking, and surviving passengers were met by the first newsreel cameramen. So rapid was the pace of subsequent technological advance that, at the time of President Kennedy's assassination in 1963, the world watched the scene in Dallas by television satellite. The film hardly needs the final touch, a spotlight on models of Sputnik, Telstar, and Relay, to make its point that man's failure to control his world is not due to any lack of the technological means for communication.

Yet vital as communications are, the medium is not the whole message. To control his environment, "man must understand it," the visitor is told. "To understand, man must observe and find new ways to see, measure, and learn the nature of things"—or, put another way, the basic elements of control are observation, evaluation, decision, and action. In order better to observe and measure the world about him, man has learned to enlarge and amplify his own senses by electronic means.

Thus, the fair-goer is invited to peer into an electron microscope, to put his finger on a section of railway track and see how much he can bend it, measured in millionths of an inch, or to hold his hand to an infrared sensor that will tell him its temperature. To understand how man can now see in the dark, or through fog, the visitor can watch a radar constantly scanning the fairground. Synchronized with it is a television camera, which the fair-goer is invited to stop and zoom in on any particularly interesting view.

It is, of course, just such electronic extension of man's ability to measure and observe, and to accumulate and disseminate information, that has brought about the information explosion—a point imaginatively driven home by the most striking exhibit of all. It is a brightly lit cave or tunnel of blocks which are large at the entrance and covered with cave-man drawings. The visitor enters to the accompaniment of a stone-age voice speaking in a primitive language. Past the entrance the blocks gradually diminish in size, and now are covered with early writings. The soundtrack carries voices reciting three early Greek plays, simultaneously, in Greek. Further on, to illustrate the invention of printing, the still-smaller blocks are covered with reproductions of early newspapers, and the sound is a babble of many voices. In the final stage, a great number of smaller blocks display computer tapes, and the soundtrack is an unintelligible jumble of hundreds of voices and the high-pitched beeps of the electronic age.

Emerging, like man himself, from the tunnel, the visitor can personally test the advances in computer technology and, for that matter, enjoy the benefits. To illustrate a storage and retrieval system, a computer was programmed with a wealth of information on Expo itself; thus, the fair-goer can, for example, call on the computer's help in deciding where to have lunch and be presented with a choice of pavilions, menus, and prices. The larger implications of the computer age are also there to be seen. In the center of the exhibit is an automated factory, piercing the floor from the "Man and Progress" exhibit below, and turning out home movie projectors and television sets.

Around the factory, the fair-goer can see displays of how an elementary computer works, or how a computer is used in architectural design. He can test his knowledge of the universe at a teaching machine or, exploring the very frontiers of technology, can pose questions to the computer and be answered—albeit slowly and tonelessly—in a human voice, from a memory tape drawing on recorded syllables. By then, if any emphasis is needed to bring home how far along computer and communications technology has advanced, it is supplied by the fact that the computer itself is not even there. It is in the Canadian pavilion, Katimavik, nearly 2,000 feet away, communicating with him by means of modulated light reflected from the Canadian pavilion to the console by mirrors.

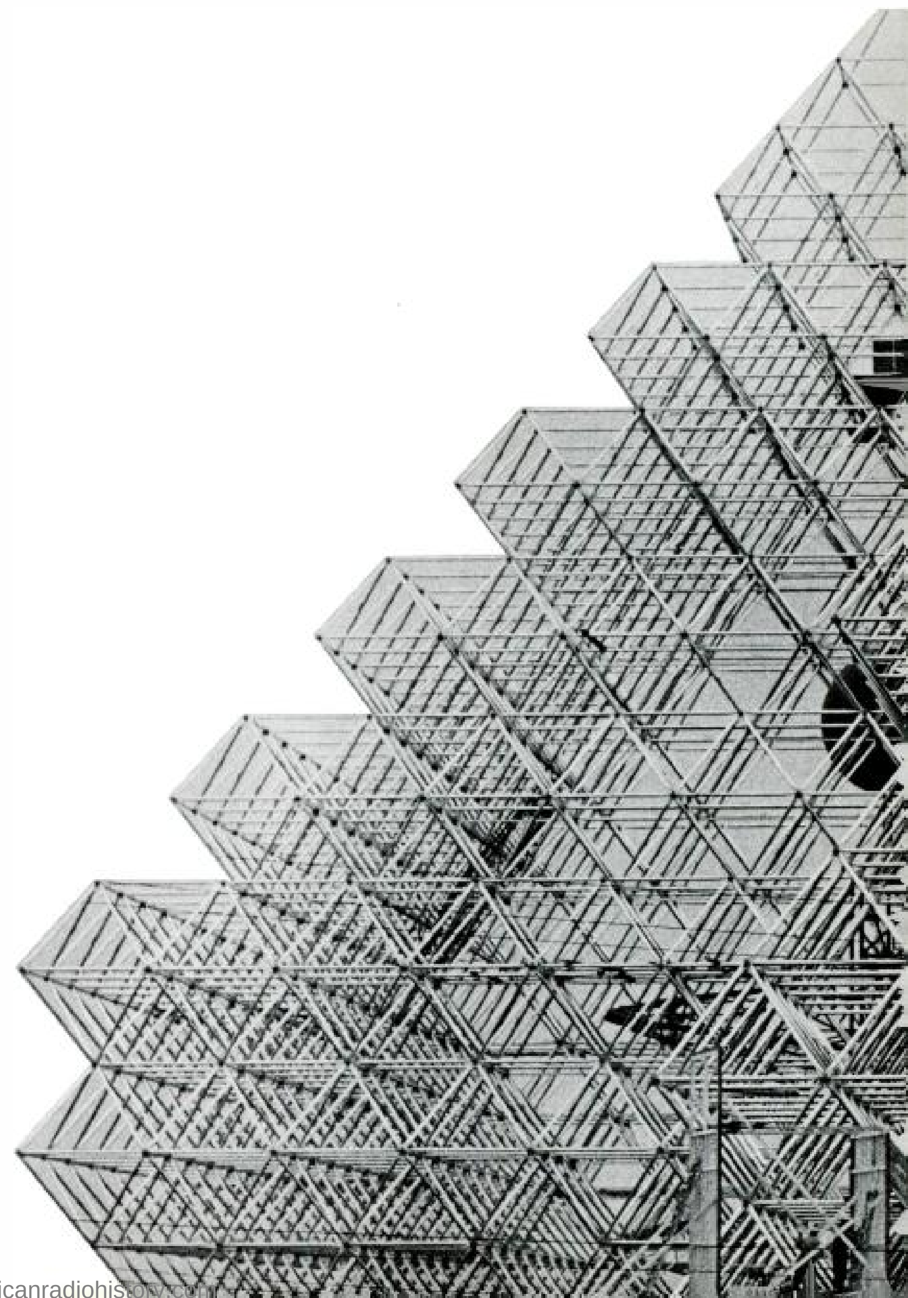
Having seen how man can observe, measure, evaluate, and communicate at the most advanced level of technology, the visitor is shown how all can be brought together to control—in this case to make the increasingly crowded airways safe by means of computerized air traffic control. In an exhibit supplied by the International Civil Aviation Organization, the fair-goer can see how radar and a computer together could automatically give warning of storms or collision in the airlanes around Montreal.

The pity is that a far more effective demonstration of the computer's capabilities will not be seen by the average fair-goer. Expo itself—a symphony of "frozen music," as the German philosopher Friedrich von Schelling once described architecture—is the most computerized fair in history. For the exhibition to open on time, every stage of construction was computed on a "critical path" giving step-by-step deadlines; Logexpo directs fair-goers to available accommodations by computer, Reservexpo finds them seats at the shows. Eleven electric information display boards, 40 feet by 20 feet, give visitors up-to-the-minute information on line-ups at pavilions and planned events.

But the heart—or, more correctly, the brain—of Expo is a Strangelovian Operations Control Center with a control board, 54 feet by 18 feet, shaped like a cinerama screen. In the center of it is a map of Expo dotted with lights that can signal an emergency in any area of the fairground. Around the board are eight television sets fed by 32 closed-circuit cameras spotted around the site, and by a mobile team of reporters roaming Expo with portable television cameras and radios. Thus, with the help of 11 control branches, connected by computer-controlled teletype, an operator can deal with an emergency without leaving his seat—by, for instance, organizing a helicopter rescue of a state visitor stricken with a heart attack, an exercise performed in simulation before Expo opened.

Even without seeing the control room in operation, the visitor to "Man in Control?" cannot escape its central theme. Before descending to a final exhibit on economic control, which shows a map of how the world's wealth is distributed—a huge U.S.A., for example, and a tiny India—he confronts again the photographic evidence of a world controlled, and a world out of control, this time juxtaposed. Appropriately, the exhibit is entitled "Man Has the Means." Or as Designer David Croft puts it, "now that man has total, instantaneous global communications, he cannot use that as an excuse"—which is not all that dissimilar a message from that of the Christian pavilion. ■

The Gyrotron



# COMING: MACHINES THAT THINK?

Scientists strive
to develop machine processes
that one day may lead
to the creation of
artificial intelligence.

by Bruce Shore

Having learned to amplify the power of our muscles by means of machines, scientists are now trying to amplify our intelligence the same way.

At the Massachusetts Institute of Technology, for example, Dr. Marvin L. Minsky presides over a group working on a machine comprising a stationary TV camera "eye" and a sophisticated mechanical "hand." In front of the machine—a computer—is a table with a child's building blocks scattered over it at random. Purpose of the project is to develop a program of instructions that will make it possible for the camera to direct the hand to build a tower out of the blocks just as a child might do.

In a similar undertaking at Stanford University in California, Dr. John McCarthy is trying to develop a set of procedures for use by a related "eye-and-hand" machine that would enable it to assemble simple artifacts from printed instructions. He still has much to do, but already the machine is accomplished enough to pour tea—if you hold a cup in front of it.

At Stanford also, Drs. Edward Feigenbaum and Joshua Lederberg are working to develop an "automatic chemist" employing a computer-controlled mass spectrometer. They foresee such a machine being landed on Mars where it would conduct experiments automatically to determine the composition and molecular structure of that planet's surface.

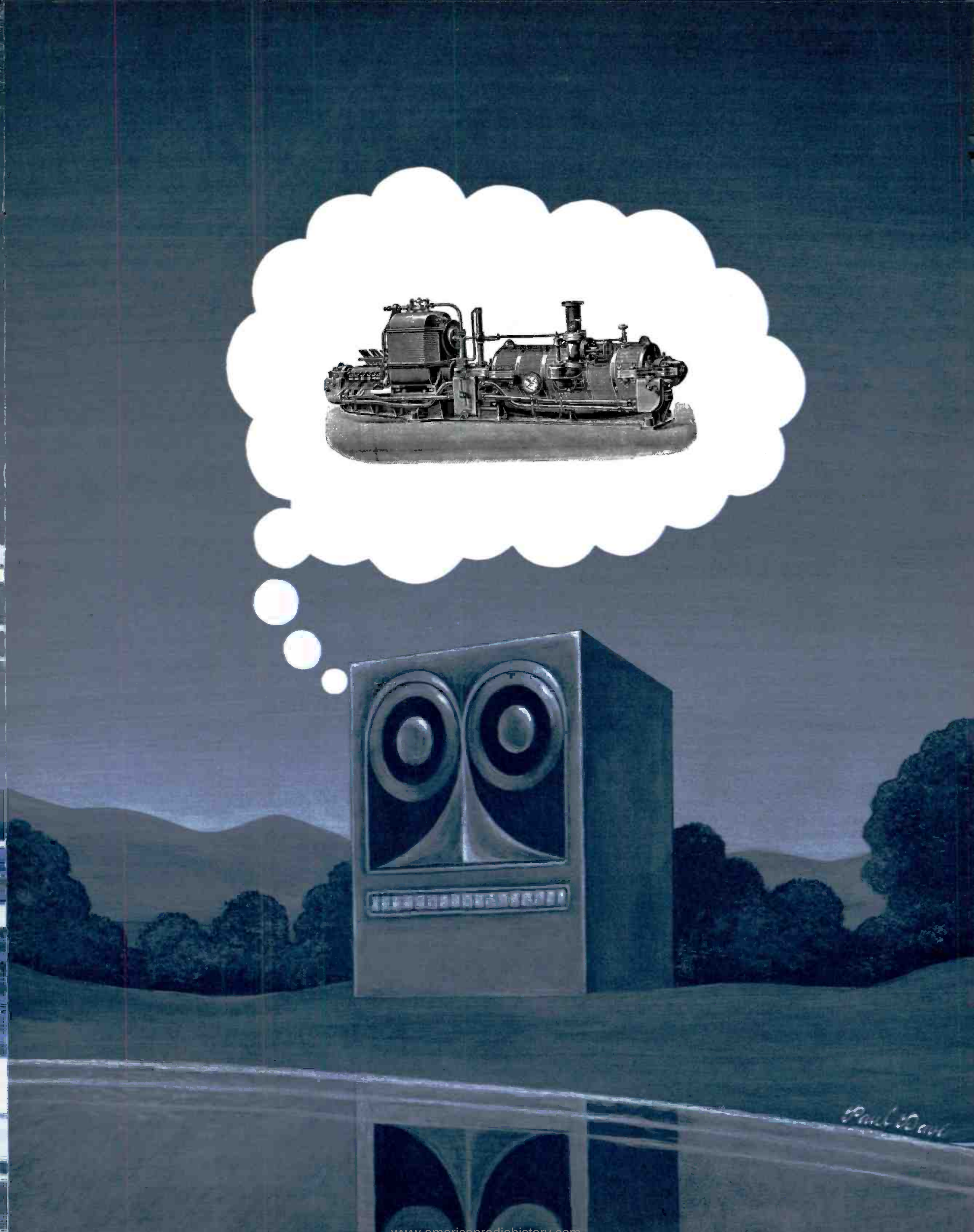
At RCA Laboratories in Princeton, N.J., still other work of this type is going forward on such projects as that of Dr. Saul Amarel to develop computer procedures that will make it possible for machines to reason and to form theories about things; that of Dr. Ivan Sublette to conceive programs that will enable computers to read English characters even when they are blurred or only partially formed; and that of Dr. Paul Ross to build a machine that can be trained to recognize and respond to any voice, like a faithful dachshund.

Suffusing all of these experimental programs is the desire to amplify man's intelligence with machines that can help us absorb, control, and use more effectively the avalanche of information being generated by the muscle-amplifying and communications-amplifying machines that are presently reshaping society. Implicit in all of them is the assumption that machines may one day be able to think.

Is that a reasonable assumption? Probably not, if "think" is meant in the sense of to have feelings, to experience love, hate, pain, and the other emotions. On the other hand, if "think" is meant in the sense of to display intelligence—to choose the best of several alternatives, to do mathematics, and to act logically—there is mounting evidence that the assumption is valid.

The idea of a machine that really thinks is a difficult one to accept not only because of its unfamiliarity but also because of semantics. What is meant by "think"? Do carbon atoms think? Do hydrogen or oxygen atoms think? Most people would say they do not. Yet, it is these very nonthinking atoms, plus others, that constitute the thinking brain. The only way that sense can be made of this is to conclude along with the experts in machine reasoning and machine intelligence that it is not the elements of the brain but the way they are organized—the logic of their association, if you will—that accounts for human thought. If that is so, may not machines also be organized to think? Many scientists now believe they may.

BRUCE SHORE is on the RCA Public Affairs staff.



"Machines endowed with far more than a mere ability to process data in accord with instructions painstakingly prepared by human programmers are definitely on the horizon."

As to how man will know when he has finally achieved a thinking machine, the gifted British mathematician Alan Turing suggested in the early 1930s a simple routine which he dubbed the *Identification Game*.

To play it, a person is placed in one room, a computer in another, and another person in a third. All are then put in communication via teletype consoles. The object of the game is for the individual in the third room—the interrogator—to determine by means of questions and answers sent over the teletype which of the other two is the machine. To help the interrogator, the person in the first room may even lie. If, despite these handicaps, the machine is still able to frame its responses so as to keep the interrogator in doubt, it may be said to think. The ability to play this game is still considered to be the acid test for machine intelligence even today. No presently available computer could even come close.

Interestingly, the notion that machines might be built to simulate the mentality and even the behavior of human beings may be traced, in the first recorded instance, to René Descartes, the 17th-century French philosopher and mathematician. He foresaw the possibility in a short essay entitled *De Homine* in which he called attention to the automatic nature of many of the functions of the lower animals and of man himself.

This observation did not lead anywhere until 1833 when Charles Babbage, Lucasian Professor of Mathematics at Cambridge University in England, conceived the world's first mechanical digital computer.

Called the "analytical engine," this incredible contraption was to be powered by steam and to employ gears, wheels, ratchets, pulleys, and the like to perform any arithmetical operation whatsoever. Babbage envisaged that it would consist of a "store" (memory) capable of holding 1,000 fifty-digit numbers, a "mill" (logic section) where the computations would be carried out, a device for transferring numbers between the mill and the store, and an input-output mechanism (he even considered using punched cards) for handling data moving to and from the outside world. He estimated the machine would be able to do 60 additions a minute. Unfortunately, the unit was beyond the mechanical skills of his day and could not be completely built, but the idea for it was the first clear indication that a mechanical contrivance capable of simulating the mathematical powers of the human brain could be designed.

Again, there was a long time interval, and then, in 1927, two years after Dr. Vannevar Bush and his associates had built the first large-scale analogue computer at MIT, Alan Turing conceived his "universal automaton"—an abstract characterization of what would now be called a digital computer. Turing described his automaton as consisting of an infinite tape divided into equal squares and passing under a reading head like the tape in a video recorder. In each square was a symbol (a zero or a one) which the head could read, erase, change, or rewrite in accord with instructions included on the tape. After performing one of these operations, the head could then move the tape forward or backward to the next square.

Turing proceeded to prove mathematically that such a machine, so organized, could imitate, if instructed to do so, any other automaton. This is what made it universal. It could even reproduce itself, he concluded. In postulating such a machine, Turing was the first to enunciate clearly the need both for problem description (data) and instructions (programs) in order to operate a computer.

Nineteen years later, in 1946, John von Neumann, a mathematical genius and member of the Institute For Advanced Study in Princeton, N.J., conceived the idea of using a *stored* program in the computer memory in order to realize the computer's potential as an intellectual automaton. He was acting at the time as an adviser to the Moore School of Engineering at the University of Pennsylvania where Drs. J. Presper Eckert and John Mauchly were in the throes of building ENIAC, the world's first electronic digital computer, completed in 1946. His idea came too late for ENIAC, which processed data according to the way its circuits were wired together. The first stored-program computer was, instead, the Electronic Delay Storage Automatic Calculator (EDSAC, for short), built at the mathematical laboratory of Cambridge University, England, in 1949.

Von Neumann was also one of the earliest to propose use of the binary number system as the language of digital computers on the ground that, with its exclusive reliance on "ones" and "zeros," it paralleled symbolically the on-off nature of the electronic switches that make up such machines.

Independent of these efforts to build intellectual automata and make them work, Dr. Warren McCulloch, then of the University of Illinois, and Dr. Walter Pitts of MIT collaborated on the development of a theory, published in 1943, in which they proved that any concept or idea capable of being put completely and unambiguously into words could be realized as well in a finite network of digital units with the following properties: each could be excited to give an output or inhibited from doing so; the output of one would act as a stimulus for another; each would give an output only when a certain threshold was reached; and each would exhibit the same time delay after being fired and before it could be fired again. What they were describing was the human nervous system and what they had proved was that this system is really an automaton, not unlike a computer, composed of tiny "black boxes" (neurons) linked in networks whose operation follows logical principles. The concept of a black box encompasses any unit whose internal structure is not known but which accepts inputs and gives outputs. In this sense, even a car engine is a black box to anyone but a mechanic, and so is a television receiver to anyone but a television engineer.

What they meant by logical principles was that such networks operate as if they have an "and" function (this *and* this, expressing conjunction), an "or" function (this *or* this, expressing disjunction), and a "no" function (this *not* this, expressing negation). With these three functions, it turns out, a complete set of logical operations can be performed from which a set of procedures can be developed for detecting a criminal in the best Sherlock Holmes tradition or solving for $x$ in a high-school algebra problem. All other logical operations, no matter how complex, can be derived from these.

Thus, by 1950, the theory and the fact of automata had reached the point where sophisticated electronic digital computers could be built to ape some of the functions of the human brain, and the brain itself, through studies of the nervous system, had been reduced to the status of little more than an incredibly complex automaton. The conclusion was inescapable. If the mind is such an automaton, then it should be able to reproduce itself by other than biological methods.

It is this conclusion, more than any other, which accounts for the undercurrent of suppressed excitement that permeates the ranks of the mathematicians, the logicians, the physicists and engineers, the neurologists and psychologists who are in the van of research in this field. They know there is no theoretical reason why artificial intelligence should not be able to exist. Indeed, the evidence is all the other way. All that is needed is time, an improved grasp of logical processes, a deeper understanding of the mental procedures used to solve problems, a better exegesis of the theory and operation of neurons and neural networks, and further progress in developing electronic components from which memory and logic circuits of sufficient reliability, complexity, and low-power consumption can be assembled to produce an *ersatz* mind.

The value of such machines, when achieved, can only be surmised, but it ought to be tremendous. They would make possible automatic planes that avoid mid-air collisions on their own; cars that never have accidents; production machinery that understands the nature of the product it is making and even makes suggestions on how to improve it; robots that can explore the ocean floor and develop theories about its evolution; automatic spacecraft that can scout star systems and unknown planets in deep space too far away for a useful communications link to be maintained with earth; vast cities whose complex transportation, communications, supply, and control functions are part of a machine intelligence which monitors and supports them. Such are some of the giddy prospects in store for our civilization if we succeed in building machine intelligence into the increasingly artificial environment to which our mechanical, electronic, and nuclear sciences are giving birth.

Even if such dazzling possibilities were never to be realized, however, the effort to achieve machine intelligence would still be worth while. Already, as a result of it, a great deal has been learned about how the body and mind function, a must if further progress in medicine and surgery is to be made. Also, it has produced the modern digital computer which is rapidly finding application in every sort of activity from record-keeping in business and industry to the monitoring of industrial processes, the launching and guidance of space vehicles, the control of vehicular and communications traffic, and the quest for greater scientific knowledge of ourselves and our environment.

This is only the beginning, however. Machines endowed with far more than a mere ability to process data in accord with instructions painstakingly prepared by human programmers are definitely on the horizon. When they arrive, they will show an ability to collect their own data, to write and modify programs which they themselves have generated, and to recommend or take direct action depending on what peripheral gear is associated with them. They will be faster, more efficient, more clever, and more versatile than anything we have yet built.

Finally, such machines will be fun. At last, man will have something in his environment other than his fellow men with which he can strike up an intellectual camaraderie, from which he can learn, and to which he can resort for help in solving problems beyond his ken. ■

# THE GREAT MUSIC REVIVAL

After years of neglect, the popular music of the Twenties and Thirties is being rediscovered by a new generation of Americans.

by John S. Wilson

The waves of the past that sweep over us every now and then can be deceptive. Is it only nostalgia we are feeling, a momentary escape from the stress of reality to a soft cushion of faded memories? Or have we suddenly gained an appreciation of something of value, something we had taken lightly and for granted?

Right now, the popular music of the Twenties and the Thirties is riding toward the crest of one of these waves. The sounds and songs of those decades are turning up on all sides in one form or another.

They are in the movies in "Thoroughly Modern Millie," a recollection of the Twenties that has struck such a responsive chord that its producer, Ross Hunter, is planning a sequel dealing with the Thirties.

They are on the teen-age hit charts where the New Vaudeville Band's "Winchester Cathedral" revealed a market for a pseudo-Thirties style that has brought in its wake the Nitty Gritty Dirt Band and other young revivalists.

They are on the dance floors of New York where bandleaders of the recent past—Vaughn Monroe, Xavier Cugat, Carmen Cavallaro, Harry James, Cab Calloway, Benny Goodman—are returning to the bandstands at the Riverboat, a cavern under the Empire State Building, and in the Rainbow Grill on the 65th floor of the RCA Building.

They have reached the world of publishing in *The Big Bands*, a book by George T. Simon recalling the dance bands that once ruled popular music, which has been picked by the Literary Guild for its members.

And they are, in their original forms, on a growing list of recordings as the three major record companies whose catalogues extend back over those decades—RCA Victor, Columbia, and Decca—dip into their vaults for long-neglected disks.

There have been surges of interest before this in the popular music of the past. Usually, however, it was played for laughs by hip tear-jerkers with hourglass figures à la Beatrice Kay or Mae West or by glib honky-tonk pianists with a derby cocked over one eye and garter-sleeves emblazoning their arms.

But there is something different about this current reexamination of our recent musical past. It does not involve *just* ridicule or *just* nostalgia. It is not limited by memory, or lack of memory, to any one age group. There is physical substance behind it, a sociological foundation under it, and—something no other popular music has ever had before—a vehicle that keeps it alive in its original form.

A perceptive trend-watcher might have spotted signs of grass-roots interest in songs of the Twenties and Thirties as far back as the television success of Mitch Miller's singalongs or, even earlier, of Lawrence Welk. These were deceptive signs, however, for they could have been just the customary twinges of nostalgia that hit any generation as it settles into middle age.

The portents began to change when Barbra Streisand sang "Happy Days Are Here Again" as though it were a sinuous torch song, stripping it of all relationship to its Depression origins. Those who remembered it from those days heard it in a completely new light. Younger listeners thought it was a new song that Miss Streisand had introduced. For once, the either-or extremes of nostalgia or ridicule did not exist. It

JOHN S. WILSON covers jazz and popular music for *The New York Times*.


Top, the sheet music cover for "Good News," a musical comedy of the 1920s. Bottom, a photograph from the same period, showing couples dancing to music from a "Victrola."


Tommy Dorsey


Willie "The Lion" Smith


Benny Goodman

was just a song and people liked it—all kinds of people, of all ages.

Then came the short-lived fad for "camp," which was based on ridiculing the pop culture artifacts of the recent past. Oddly, it left in its wake a backlash of positive interest in the period at which it seemed to be laughing. Older people were reminded that the Twenties and Thirties had produced an unparalleled flow of memorable songs from "Drifting and Dreaming" to "Yes, Sir, That's My Baby," from "The Sheik of Araby" to "Star Dust." Youngsters heard "Blue Moon" and "Hard Hearted Hannah" sung by current rock 'n' roll or folk groups and accepted them as new, contemporary songs. Such songs as "Crazy Words, Crazy Tune (Vo-Do-De-O-Do)," which was written in 1927 by Jack Yellen and Milton Ager, were accepted as folk songs of such indeterminate origin that recording companies sometimes rashly assumed that they were in public domain.

Underneath all this was the gradually dawning realization that the songs of these days were a uniquely American creation. Jazz has often been cited as America's only original cultural development. Yet here was a modest little segment of original cultural creation that had passed through our lives without being recognized for what it was.

In this atmosphere, the time was ripe for a reappearance of the songs of the Twenties and Thirties in the performances of those years—the genuine, historically accurate versions as opposed to "camp" re-creations or even well-intentioned contemporary reproductions which, despite painstaking care, inevitably revealed the fact that they were the work of other people and the product of another time.

The source for these original performances was, of course, recordings—recordings that, in most cases, had been filed away, forgotten, unlistened to since they were first released 30 or 40 years ago. This was the first time in the history of any popular music that such original performances had survived from one generation to another.

An indication that there was an audience waiting patiently for these recordings came when *The Reader's Digest*, which sells records by mail, issued an album called "The Great Band Era" in April, 1965. The album consisted of the top tunes recorded during the decade from the mid-Thirties to the mid-Forties by such favorite bands and singers of the period as Benny Goodman, Tommy Dorsey, Fats Waller, Guy Lombardo, Hal Kemp, Ozzie Nelson, Shep Fields, Eddy Duchin, Larry Clinton, and others. Most *Digest* albums are newly recorded, made specifically for the *Digest*. In competition with this newly recorded material, "The Great Band Era," made up entirely of old, forgotten records, took off with such astounding speed that it even took the *Digest*'s hopeful executives by surprise.

Meanwhile, others were beginning to dig into the original recordings of the Twenties. Columbia produced a three-disk album called "The Original Sound of 'The Twenties'" that brought together samplings of the bands of the decade (Paul Whiteman, Rudy Vallee, Buddy Rogers, Ted Lewis), the jazz musicians (Duke Ellington, Louis Armstrong, Earl Hines), and the singers (Sophie Tucker, Ruth Etting, Ethel Waters, Helen Morgan). This was followed by a two-disk album on the Epic label focused on the Thirties, "Those Wonderful Girls of Stage, Screen and Radio," among whom were the Boswell Sisters, Marlene Dietrich, Grace Moore, Ethel

Paul Whiteman

Merman, Alice Faye, and Dorothy Lamour. Decca put out a series of 15 disks that traced Bing Crosby's recording career for a 20-year period, starting in the early Thirties.

But the most wide-ranging and consistent explorations of the music of the Twenties and Thirties have come from RCA Victor's Vintage series, a project started in 1964 and totally devoted to reissues.

Until that time, most reissue recordings were focused on jazz because the audience for jazz was organized. That is, it had a magazine to represent its views, *Down Beat*, and there were clubs made up of jazz collectors. Fans of non-jazz singers and bands could not make their interests felt as readily since no magazine spoke for them. There were a few fan clubs, but their influence was dissipated because each club's interest, as a rule, was limited to one performer.

The Vintage series, the brain child of Brad McCuen, a veteran RCA Victor record producer, uses as source material, in McCuen's words, "anything outside the classical field that the company has done that has artistic value or for which there is demand." In broad terms, the Vintage releases can be classified as jazz, folk, or personality (this last term is a euphemism that takes care of anything not covered by folk or jazz—John Charles Thomas, the singer, and Isham Jones, the bandleader, are both "personalities").

In the last three years, 39 disks have been released in the Vintage series. They are built around familiar names—Benny Goodman, Duke Ellington, Jeanette MacDonald, and Nelson Eddy—and such echoes of the past as Ray Noble, Coon-Sanders, and Isham Jones, as well as obscure singers of blues and folk songs.

"Fats" Waller

An unusual aspect of the Vintage series is that today's listeners actually hear more on the reissue disks than they could when they were originally released.

"Sound has become as important on Vintage releases as it is in the making of new recordings," says Mike Lipskin who took over the Vintage series from McCuen in 1965. "People buy Vintage reissues even if they have the original 78-rpm shellacs because they have found that the Vintage will be better than the original."

How can this be?

The difference is present-day equipment, both the home playback equipment and the studio mastering equipment. When these records were originally released, they were played on windup machines using soft steel needles that took their form from the shape of the opening grooves (that is why the first few grooves of an old 78 often sound scratchy—these were the grooves that shaped the steel needles). Today's playback cartridges are vastly superior, and their quality is augmented by the equipment available to today's recording engineers.

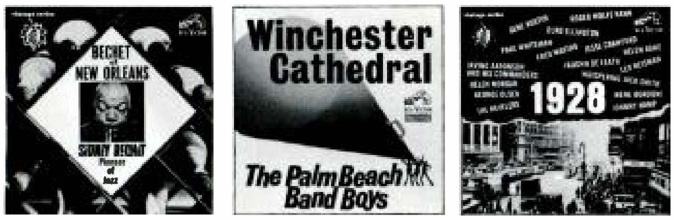

A sheet music cover of the 1920s

Glenn Miller

The high and low ends of the sound spectrum, which were compressed or reduced in the original reproductions, can now be brought out to whatever extent they exist on the master recording.

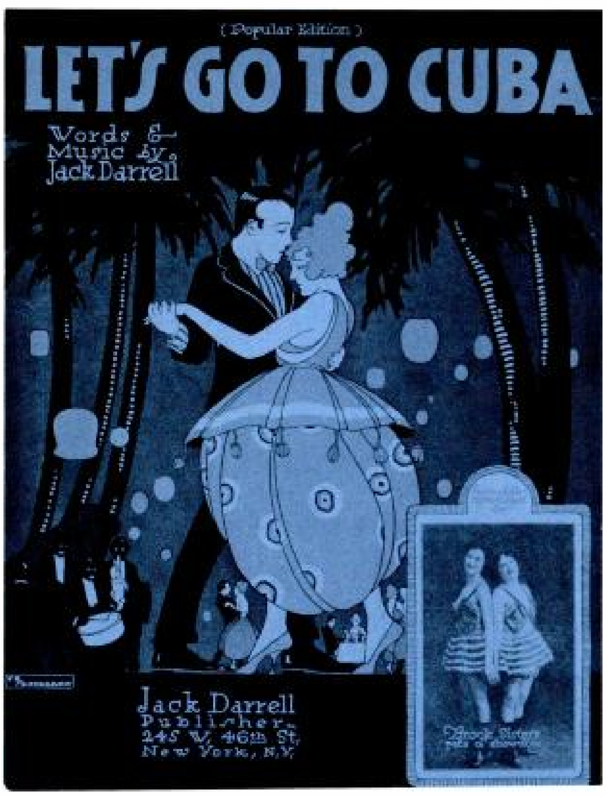
Don Miller, the engineer who does all the remastering on the Vintage releases, has a pocket-sized studio, just big enough to hold a turntable, a speaker, and a huge filter board with which he can raise, lower, or rebalance any part of an old recording.

Here he works with new pressings made from the original molds. These pressings are made with a plastic com-




Recent releases of RCA Victor's Vintage series

"It is this sense of discovery that distinguishes the current interest in popular music of the Twenties and Thirties from previous glances at our musical past."




pound that is far better than the shellac that was used on the original 78s. These new pressings are then transferred to tape in order to remove any defects that were in the original or that have been acquired by the passing of time.

The original record, cut in wax, could not be edited. But once it is transferred to tape, corrections can be made. Using the taped version, what Mike Lipskin calls "the healing techniques" are applied. Snaps, pops, and ticks caused by scratches, thumbprints, or surface wear are removed by snipping small pieces from the tape. This is a process that requires time and patience. Miller has removed 47 consecutive pops from a Fats Waller record, caused by a scratch on the original. When this many cuts have to be made in a tape, they are liable to create a bump in the music by upsetting the flow of tempo. Miller, however, is a musician (he played trumpet in Gene Krupa's band), and his keen musician's ear is alert for musical flaws that might be overlooked by less musically minded engineers.

These correcting processes are aimed at an honest reproduction of the original performance. Although the use of added echo has become commonplace in contemporary recording, no echo is added to Vintage reissues because this would distort the sound value of the original records. (On reissues of old records that are aimed at a broad, general audience rather than discriminating collectors, echo is usually added because it brings the record into the kind of sound area that present-day listeners are accustomed to.)

The reasoning behind this is that the Vintage disks are intended to be permanent representations of the music of their time.

"If you add echo to these old records or if you splice solos," says Mike Lipskin, "you're fooling around with the past. These Vintage records are intended to be a permanent part of RCA Victor's catalogue. Right now they may be bought for nostalgia or curiosity. But in another 50 years these records will be very interesting to sociologists."

Lipskin, who is only 25, is keenly aware of the cycle that carries a musical style from fad to oblivion to ridicule to renewal. As a child, he was fascinated by recordings of the stride piano style of the Harlem musicians of the early Twenties. Subsequently, he studied with Willie "The Lion" Smith, one of the great pianists of that school. Recently, Lipskin sat down at the piano in a Greenwich Village coffee house where rock 'n' roll or folk groups are usually heard and began playing the stride style.

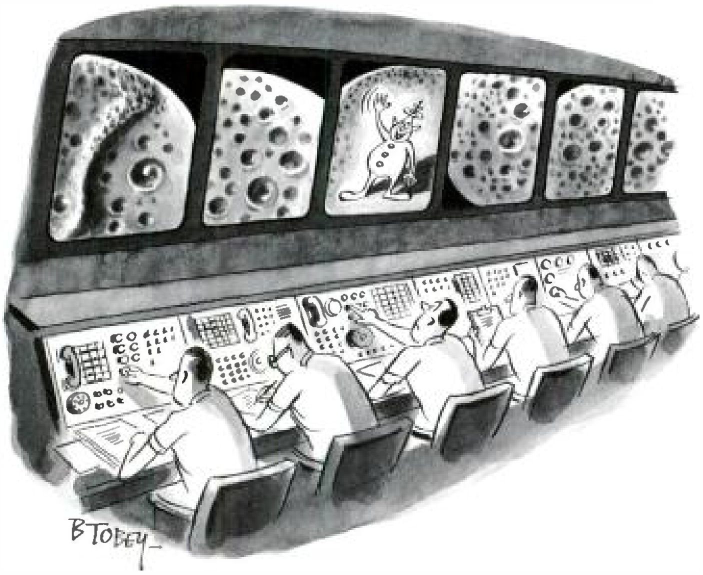
"A big crowd gathered around me," he recalled. "All young people. They were interested and they were curious. They wanted to know what this 'new' stuff was that I was playing. This is the cycle that we're going through now with the music of the Twenties and the Thirties. It's not a question of *re*discovering it. There's a generation coming along now to whom it is completely new. They are *discovering* it."

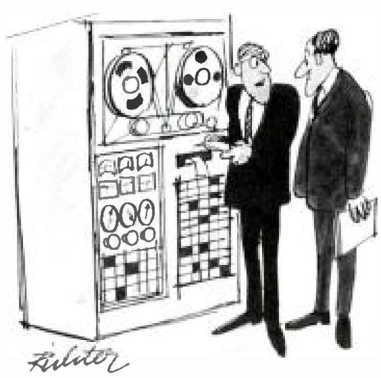
It is this sense of discovery that distinguishes the current interest in popular music of the Twenties and Thirties from previous glances at our musical past. This is more than mere nostalgia. A unique product of American culture is coming into perspective, helped by the fact that, for the first time, the original form and flavor of popular music have been preserved on records for the enlightenment and pleasure of later generations. ■

# This Electronic Age...


"Educational television is ready for him,
but he's not ready for educational television."

"No, I am *not* a recording."





"It says, 'motivate me.'"

# EDUCATIONAL TELEVISION IN DEVELOPING COUNTRIES

Have-not nations throughout the world are moving more rapidly into the 20th century with the help of instructional television.

by Wilbur Schramm

When the President of the United States stopped briefly in American Samoa on his way to the Manila Conference last October, he made only one trip away from the airport. That was to visit a school in which the teaching was built around television.

President Johnson may be forgiven if he was surprised by what he saw. Hundreds of other government officials, educators, and broadcasters from many countries of the world who have come to visit Samoan schools during the last two years also have been surprised. For on that tiny Pacific island is one of the finest and most complete installations of educational television to be found anywhere in the world.

Station KVZK, which operates as a part of the educational department of American Samoa, has six open-circuit VHF channels, with six 10-kilowatt transmitters and two antenna masts on a mountain reached by a mile-long aerial tramway. Four studios and excellent equipment including 10 RCA videotape recorders are in a glass and concrete building beside the bay. When school opens in the morning, in each room the teacher turns up the volume on the receiving sets (the current is left on all the time so that the tropical damp will not corrode the circuits), and soon a studio teacher comes on the screen with a cheery "Good morning" to do her part of the teaching.

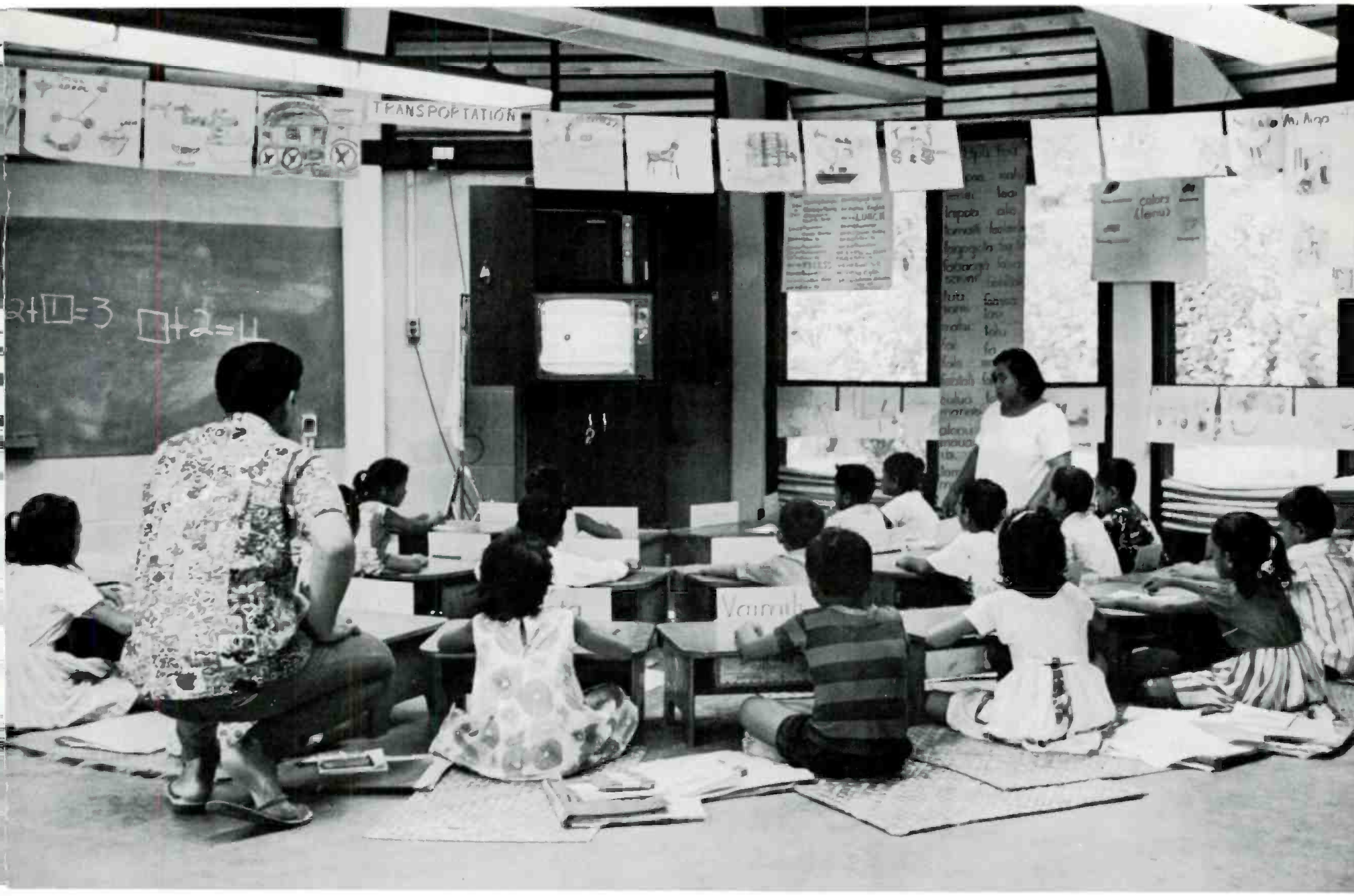
Throughout the day, the studio teacher fills from 10 to 30 minutes of each class period, teaching the core of the subject matter. The classroom teacher then works the televised lesson into the activities of the pupils—answers questions, conducts practice and drill, assigns reading, encourages individual study, takes care of the problems that come because not all students are equally quick or equally interested. The studio teachers are highly trained and expert in the subject matter; some of them are from the American mainland and some are Samoan. The classroom teachers are all Samoan and have had less training. After the school day, there is an hour on television for some of the classroom teachers—a kind of staff meeting, aimed at providing in-service training. In the evening, the station broadcasts four hours of television for home and community viewing: news, entertainment (usually an American western, comedy, or musical), adult education, and children's programs.

Most people are aware that television has been widely used for teaching by industrialized countries. Seven to 10 million pupils in the United States (according to whether one takes a low or a high estimate) are now taught in part by television. Canada, England, France, Germany, Italy, the Soviet Union, and many of the countries of Eastern Europe all make considerable use of instructional television. In Japan, it is used not only to assist in the schools but also combined with correspondence study to teach many thousands of young people who have missed high school. England at this moment is very seriously considering establishing a national university, to be taught by television and correspondence study, for the many able and deserving young men and women who cannot find places on existing campuses.

Uses like these might be expected of television in countries where resources and technology are plentiful. But in developing countries?

As a matter of fact, television often fits more easily and more effectively into the educational plans of developing countries than those of highly developed ones. This is be-

WILBUR SCHRAMM is director of the Institute for Communications Research at Stanford University. He has written extensively on the communications media, and among his more recent publications are *Mass Media and National Development*, *Communication and Change*, and *The New Media: Memo to Educational Planners*. This article is based on a worldwide survey of educational television made by Dr. Schramm for the International Institute for Educational Planning in Paris.




In Samoa, television is being used to teach English as well as other subjects.

cause the developing educational system is less rigid and the educational problems are more demanding. Of the approximately 50 countries in the world now using instructional television, more than half would be called "developing" nations.

When educational problems are extraordinary, it is easier to consider extraordinary solutions. In Samoa, for example, the problem faced by Governor H. Rex Lee and his Samoan council was how the islands could leap educationally from the 18th into the 20th century in a few years. The Samoan schools, although committed by their American trustees to provide education of stateside quality, were depending on less than well-qualified teachers, most of whom dared not venture far from primitive rote learning. Although instruction was to be in the English language, most of the teachers had little English and the pupils less. Graduates of the schools tested, on the average, many grades below mainland standards. The problem was how to bring modern in-

"Most of the really successful users of instructional television have found it helpful to make the studio and classroom teachers a teaching team, planning together and dividing the duties of instruction."

quiring education and challenging teaching into a fairly primitive school system—not in a century or two, but in a few years. After bringing in teams of educational consultants and considering all the alternatives, the Samoan government decided that television would be the most feasible way to meet this problem.

In the Republic of the Niger, at the base of the Sahara in northcentral Africa, there were only 66 teachers who had been through secondary school, and there was no prospect of getting any more for some years because of the great demands for the few graduates who became available each year. This was a serious matter because less than 10 per cent of the children of school age were in school, and the future welfare of the country required that many more be educated. Niger decided, with the aid of its French advisers, that schools could be expanded by sharing the well-prepared teachers by television and using monitors (with grade-school education) in the classroom.

In the Ivory Coast, it became important to prepare natives to fill supervisory positions in the country's growing industry. For these jobs, workers had to be taught to read and write French and to do simple arithmetic. Employers were willing to give some time for the purpose, but needed qualified teachers. So fundamental education courses were put on television, using the best teachers available. The employers furnished meeting rooms and a literate supervisor to conduct practice and answer questions after the television program. And now a new native supervisory group is moving into Ivory Coast industry.

Educational TV programs are beamed to Samoan schools from this control room.

In Peru, thousands of children, particularly in the highlands, had been unable to find places in the overcrowded schools or had dropped out. In the city of Arequipa, a group of volunteer teachers persuaded a television station to give them several hours of free time a day and put their own courses on the air for children who were not in school. Gradually the project grew: Study groups were formed with monitors in charge, classes were offered for both elementary and secondary subjects and then for adult illiterates, and now the program has been given government support and has expanded beyond Arequipa. But all this was begun by public spirit and voluntary service.

The first worldwide study of instructional television has just been completed by experts of the International Institute for Educational Planning in Paris. The report of their conclusions has appeared under the title of *The New Media: Memo to Educational Planners*, and their 23 case studies in 18 countries have been published in three volumes with the title, *The New Media in Action.* They conclude that there is no magic in instructional television. It is no miracle drug for ailing educational systems. It can be used well or poorly. One of the chief requirements for using it well is that it be employed to solve a problem that is sufficiently demanding to challenge a school system to make the necessary changes and provide the support television requires. Let instructional television "begin with a problem..." says the study report, "not with a piece of technology someone thinks could or should be in use...a problem that cannot readily be solved by conventional means."

Given a problem of this kind, then most of the really successful users of instructional television have found it helpful to make the studio and classroom teachers a teaching team, planning together and dividing the duties of instruction. They have found that television does not work well unless a broad base of support is provided for it—financially, technically, and among teachers and administrators. The report cautions against small uses of television for teaching. There is a critical mass that a system must reach before it is economically viable and before it makes enough impact on a system to be taken seriously. Television is a mass medium, and even its educational uses reflect that. And inadequate technical facilities and maintenance have proved a poor bargain wherever they have been tried.

A few years of use of television in the developing countries have disproved some of the stereotypes about it: For example, that it is *passive* learning, in which a class necessarily sits quietly while the studio teacher lectures to it. Samoan classes, especially in the elementary grades, tend to be very active ones. A warm, personal relationship is built up between the pupils in the classroom and the teacher on the screen. She says, "Good morning, children." They answer, "Good morning, Jackie," or Cathy, or Larry, or whoever it is. The teacher poses a question. "Is this right?" she asks. "Oh, no, Jackie!" they cry. "Say it right, then," she says. They give the answer as it should be. And so the period goes —explanations, questions, answers, almost as though the teacher were in the classroom. Then the classroom teacher takes over, and the televised lesson blends into classroom activities. One of the conclusions that comes out most clearly from studies of television in the developing countries is that its effectiveness depends in large measure on the kind of learning activities that can be built around the receiving end of the chain.

An example came from Colombia which used television to help prepare its teachers to handle the new math. A research team from Stanford was on hand at the right time, fortunately, to measure the results. If teachers viewed the televised classes by themselves, they learned a considerable amount. But if they viewed the programs in groups and discussed them afterward, they learned a great deal more. And if they viewed in groups with a supervisor, so that the discussion afterward was planned and directed, they learned still more.

How well does instructional television work in the developing countries when used skillfully? Research is scant, but the results so far are encouraging. In the Ivory Coast and elsewhere, people are learning to read, write, and figure. In Niger, the first-grade classes taught by television and monitor were significantly superior to the classes taught by traditional classroom methods. In Samoa, the classes are much more lively than before, questions are being asked, students are performing experiments, making barometers, learning in ways they would never have used under the old system. English, which is the key to better work in all advanced subjects, is spoken much more and better. And all available tests show that the schools with television are climbing above the schools that do not have it, and that, in the classes entering high school, the pupils who have had some teaching by television—even as little as a year of it—do much better than those who have had no television teaching.

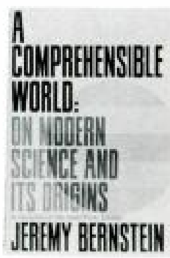
One more question—what does it cost? It is not cheap, because television requires a considerable capital investment unless the equipment is already at hand. Unit costs, however, depend on economies of scale, which in turn depend upon how many pupils can be served. Colombia, which teaches more than a quarter of a million children by television, can do it for about 5 cents an hour per student. This is a figure that need not frighten any educational planner or budget-maker. On the other hand, when smaller numbers are reached, the unit cost may be 20 cents (as it is in some systems in the United States), 40 cents, even 50 cents, per student hour. In some projects where television is used in small amounts and only for "enrichment," the unit costs may run over a dollar per student hour. In the case of these larger unit costs, of course, any system must consider seriously whether the problem to which television is being applied is worth such expense. But the kind of cost that Colombia has reached is more nearly what can be expected as countries learn how to use the medium efficiently. Such a cost would seem to be well worth it for countries whose stability and progress may well depend upon the speed with which they educate their illiterate millions. ■

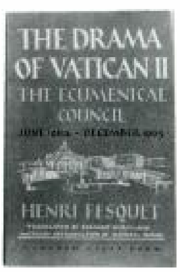
A Korean elder tunes in an educational program on a television set presented to his village by the United States government.

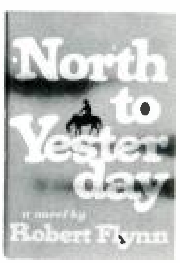
# Books at Random...

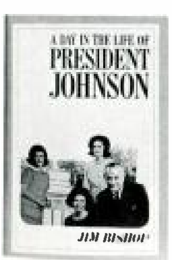
OTHER RECENT RANDOM HOUSE BOOKS

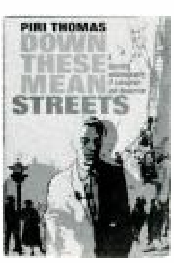


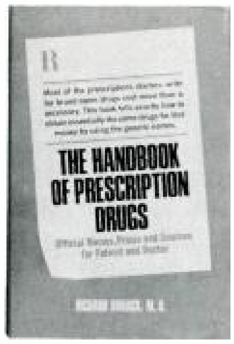


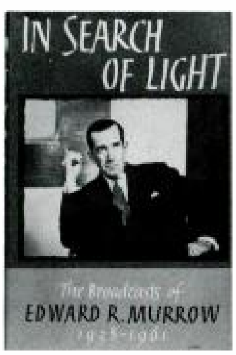




## THE HANDBOOK OF PRESCRIPTION DRUGS

by Richard Burack, M.D. *(Pantheon)*

This book tells the reader exactly how to obtain drugs for less money by using their generic names. An authoritative list of the basic drugs that can be used by general practitioners or internists for treating over 90 per cent of all adult outpatients is included. There is a comprehensive index which enables the reader to look up a drug in three ways: by the generic name, by the brand name, and under the general category of illnesses for which it may be useful. Dr. Burack is Clinical Associate in Medicine and Affiliate in Pharmacology at Harvard Medical School. He maintains a private practice as well as being a member of the Harvard Business School Health Service.




## IN SEARCH OF LIGHT

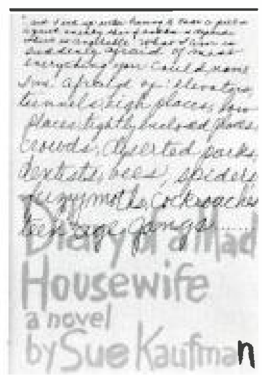
The Broadcasts of Edward R. Murrow 1938–1961 *(Knopf)*

This selection of broadcasts is a permanent testament of a great reporter, and since he had a front-row seat at some of the most important events in recent history, *In Search of Light* is also a public diary of a tumultuous quarter century. Here is Murrow reporting from wartime London, living with young American soldiers on a troopship, describing a bomb run to Berlin, and responding to the horrors of Buchenwald. After the war, Murrow continued to cover world events such as the wedding of Queen Elizabeth, the Korean war, the Negro revolution, and the first rocket probes of outer space. Also included are his portraits of Churchill, Eisenhower, and Stevenson.

## DIARY OF A MAD HOUSEWIFE

by Sue Kaufman *(Random House)*

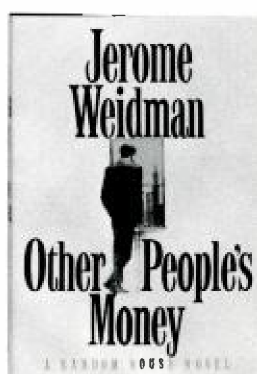
Bettina Balser is insecure about almost everything and thinks she is going mad. She is the mother of two daughters, ages nine and seven, and her husband is an ambitious, insensitive bully and nag who fancies himself the Renaissance Man. A bright college graduate in her mid-30s, Tina experiences anxiety, insecurity, and unfulfillment and sets out to relieve her fears and perhaps save her sanity by recording her thoughts and emotions in a "journal." The zany installments of her diary make up this book. Frankly accounting the way she lives and feels, Tina casts a cool eye on New York City mores, coping with trivia, the urban male, and, above all, on the woman who chooses to be called a housewife. Sue Kaufman is a native New Yorker at work on her fourth novel.




## OTHER PEOPLE'S MONEY

by Jerome Weidman *(Random House)*

This is a major Weidman novel, the best since *The Enemy Camp*. The new book, by the author of *I Can Get It for You Wholesale*, spans 30 years, from the sinking of the *Lusitania* to the end of World War II, and tells the story of two men—one with an instinct for making headlines and one who knows the places where profits pile up. Both are orphaned and raised by the wealthy New York family of the girl around whom the drama of their totally different ambitions is played out.

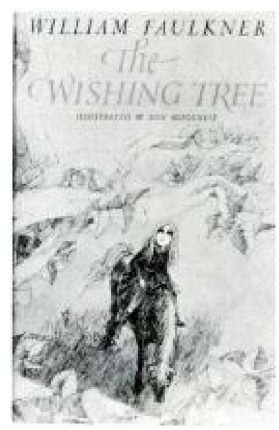




## THE BILLY MITCHELL AFFAIR

by Burke Davis *(Random House)*

Based on a wealth of hitherto classified information—including personal and official reports as well as the complete record of the longest court-martial trial in our history—this biography not only reveals at last the true story behind General Mitchell's dramatic fight for air power but also brings the man himself to life. Burke Davis is the author of many successful biographies and histories and has written four novels. This is his fifteenth book.




## THE WISHING TREE

by William Faulkner *(Random House)*

This book, the only one for children ever written by William Faulkner, has never been published before in any form. Although two different versions of the story exist in manuscript, Random House is using the one that he typed out specially for Victoria Franklin (who two years later became his step-daughter). It was bound by hand on February 5, 1927, Victoria's eighth birthday. It is the story of a little girl's adventures in a dream she has on the eve of her birthday, told with all the vividness, warmth, and humor that could be expected from one of the greatest story-tellers of all time.

# THE CHANGING "HOME ENTERTAINMENT" MARKET

Advancing technology and new patterns of living have altered the traditional marketing concepts of the consumer electronics industry.

by David Lachenbruch

A large marketing research organization recently embarked on a pilot study of consumer purchases of home entertainment equipment, based on several thousand telephone calls in a major American city. It received some surprising answers to its carefully phrased inquiries.

Question: "Has any member of your family purchased a radio or a phonograph in the last six months?" A certain answer kept cropping up with surprising frequency: "I don't know."

Question: "How many television sets do you have in your home?" In several cases, the voice at the other end of the line replied: "Just a minute—I'll count them."

The researcher's experience points up some new facts of life in the proliferating "home entertainment" markets. The industry's products—like those of the appliance industry—are traditionally considered "home" products. But clearly, the tradition is changing. Although there still is a substantial "home" market, this is now only one of many markets for the industry's output of television sets, phonographs, tape players, recorders, and radios.

Even the phrase "home entertainment" does not fully describe this changing market. The industry's products today are designed neither exclusively for the home nor exclusively for entertainment. Today, they wander far from home —in the car, in the boat, on the beach, and on the go everywhere. Although entertainment certainly is one of their major uses, these products increasingly are fulfilling information and educational functions as well. Just a couple of examples: (1) Public opinion polls consistently show that television has become America's primary source of news, while newspapers have fallen to second place. (2) The tape recorder has become a valuable learning accessory for high school and college students.

Therefore, the "home entertainment" industry has earned a new and more descriptive name—"consumer electronics." The phrase is inclusive enough to encompass many of the industry's future products, such as home computers, TV shopping services, and programmed appliances, whose functions hardly fit the description of "entertainment."

The changes in the industry's output and markets have already been far-reaching. Each of its major products started out as a living-room showpiece. Each, in varying degrees, has given birth to a group of specialized instruments tailored to specific markets and purposes—in a happy harmony of new technology and new patterns of American life.

Much has been written about the "new consumer" and his affluence. While he continually has more money to spend on goods and services, more and more industries are competing for that money. While his leisure time is increasing, so are the activities and products designed to fill this leisure time. It has often been pointed out that the pleasure boat, the swimming pool, the ski-lift, and the automobile are competitors of the television set, the stereo phonograph, and the tape recorder.

But at the same time, they are also complements to the new generations of specialized consumer electronic products. The American family cherishes its leisure and makes the most of it. If it can do two or three things at a time during the "recreation break," so much the better. And the industry's designers are ready to accommodate with products that go where the action is—and even participate in the action.

DAVID LACHENBRUCH is editorial director of *Television Digest*.

For example, Americans now own nearly 8 million pleasure boats. And on these boats are increasingly found the products that formerly were manufactured exclusively for the home. There are battery-operated radios (including those designed to receive marine information and weather forecasts), phonographs, and a growing number of television sets and stereo tape players. Amateur mariners are beginning to use some of the more esoteric "consumer" electronic devices, such as low-cost radio direction-finders and fish locators.

Travel and tourism also are rapidly growing leisure pursuits, competing with home activities for the consumer's disposable income. Yet, a short-wave transistor radio has become almost standard equipment in the luggage of the world traveler. More than 90 per cent of motorists listen to radio as they drive, and now many are traveling with recorded stereophonic music of their own selection.

The stereo tape-cartridge player, which can provide up to two hours of uninterrupted music automatically, is now offered as an accessory with all major domestic makes of cars as well as with many imported cars. Since these automobiles have stereo speakers installed (usually in the door panels), the addition of FM-stereo radio can provide another mobile stereo "program source" and can be expected to grow rapidly.

The stereo tape-cartridge player, incidentally, is reversing the traditional pattern of migration of new instruments out of the home. It was originally devised as an easily operated, hands-off traveling entertainer. But now—by popular request—it is coming home. Having purchased compact stereo tape cartridges for highway-fidelity, consumers wanted to play them at home, too. Answering the need came a family of tape-cartridge attachments for home stereo systems, compact bookshelf-sized tape players, even consoles with built-in cartridge players. Next step: out of both car and home in a battery-operated carry-anywhere version.

Undoubtedly the most significant "new" category of customers is the "youth market," which crosses all product lines in its demand for goods and which is becoming so vast that it could well be the greatest single influence of this decade on both product design and advertising. About 50 per cent of the U.S. population is under 25, and this percentage is growing. These young people are prime customers for most of the industry's products. One survey shows that the under-25s spend more than $24 billion annually; another indicates that they already influence 50 per cent of the country's radio sales. A May 1966 poll found that 91 per cent of all teenagers owned radios, 48 per cent had phonographs, and 25 per cent were TV set-owners.

Perhaps more than any other, this group demands products styled with a special flair and dash, and with an on-the-go look. The young set is behind the new lighthearted and imaginative design of many of the industry's portable products. Remember when portable phonographs and TVs were all beige or black? Today, they cover the whole spectrum, from avocado to shocking pink. Remember when radios looked like radios? Today, the emphasis is on "fun" styling, and you will see them disguised as everything from cameras to beanbags.

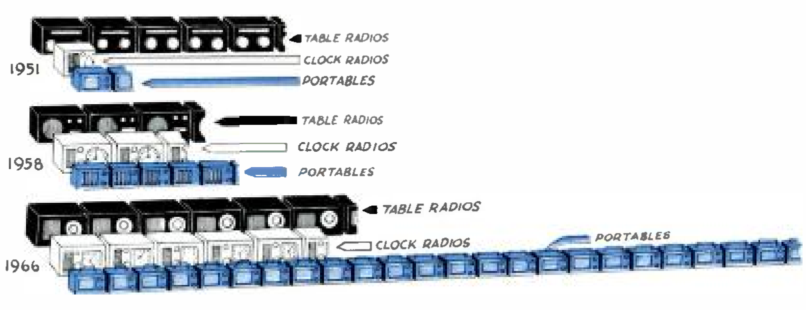
Higher styling, wider variety, and greater sales are accompanied by another "plus"—more for the money. The Labor Department's Consumer Price Index shows that the average television set in 1966 cost only 82.1 per cent of the 1957–59 price average, while portable and table-model radios were selling at 78.7 per cent of the 1957–59 price, and portable tape recorders averaged 95.7 per cent of the December 1963 level.

New technology, new markets, and new design make possible the escalation of sales and de-escalation of prices. Who can conceive of radio today without the transistor which makes possible its variety and flexibility? The economics of production and mass merchandising have brought prices so low that the radio has been described as the first disposable consumer electronics product.

Radio sales figures have soared. If you include all instruments which pick up radio programs—from the TV-radio-phonograph combination to the pocket portable—Americans purchased the astounding total of 47,600,000 new radios last year. This is the equivalent of almost one new radio for every U.S. household. If a radio census were taken today, it probably would show that there are more workable radios in the United States than there are people.

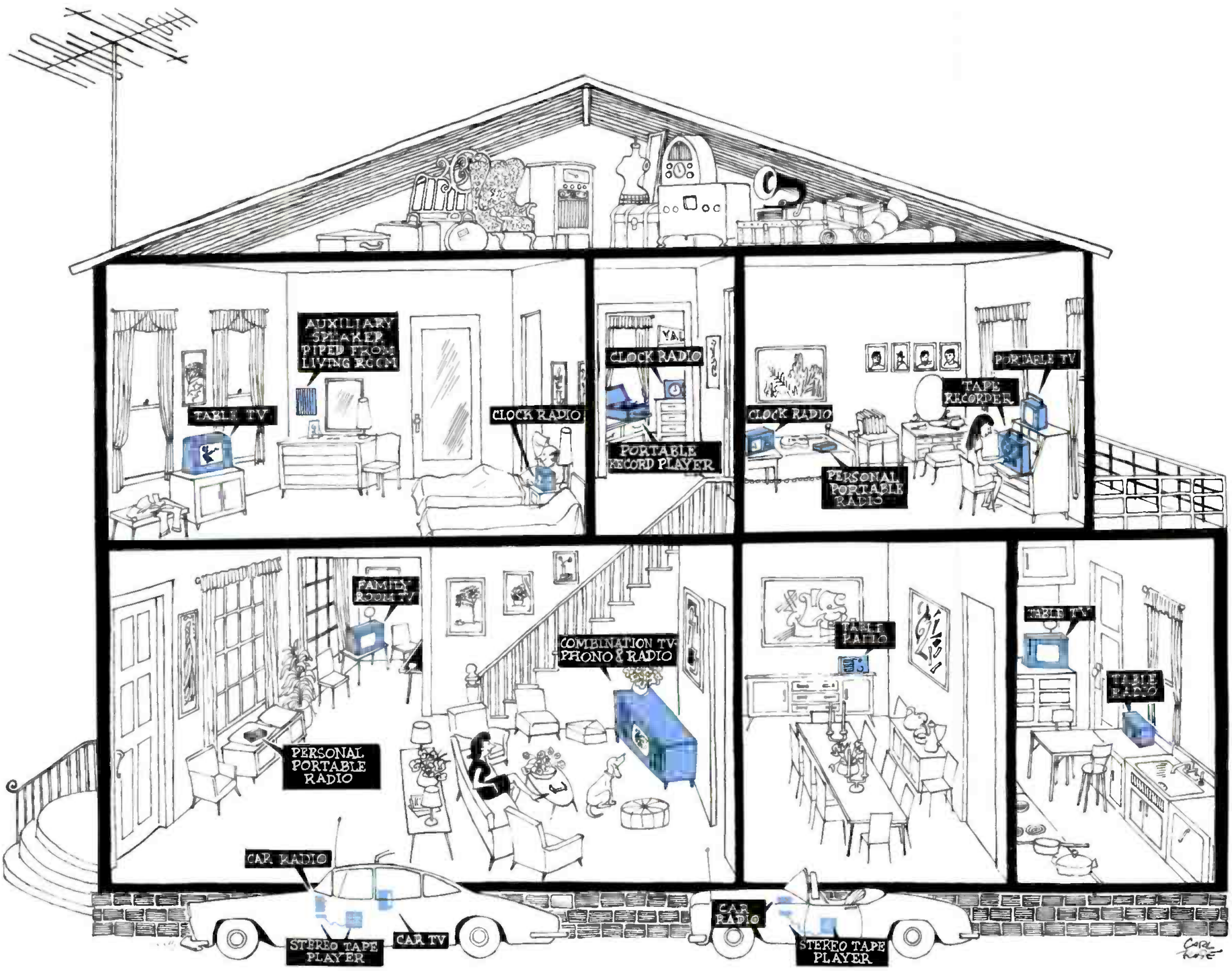
Yet there is no longer any serious thought that radio has reached "saturation"; the consumer electronics industry long ago discarded that word from its lexicon. New versions of existing products both create and fill new market demands.

The current direction of the radio market is evident. Last year, the public bought 6 million table radios, 5 million clock radios, 9 million car radios—and 23 million portables! And almost as phenomenal as the growth of take-it-with-you radio is the sudden public acceptance of frequency




The Changing Radio Market
Factory sales of table models, clock radios, and portables, 1951, 1958, and 1966.
(Total U.S. market, including imports)
Source: Electronic Industries Association
Each unit represents 1,000,000 sets.

"Undoubtedly the most significant new category of customers is the youth market which crosses all product lines in its demand for goods and which is becoming so vast that it could well be the greatest single influence of this decade on both product design and advertising."



modulation (FM)—a medium virtually written off as dead in the 1950s. Last year saw the sale of nearly 13.6 million radios with FM, a jump of 5.8 million in a single year. In the table, clock, and portable categories, sales of radios with FM zoomed 73 per cent from 1965 to 1966.

Contributing to FM's healthy growth is a new diversity in programming as well as technical developments that have brought costs down and performance up. Further increases in FM sales can be anticipated, in view of the recently implemented Federal Communications Commission rule that enforces separation of programming on jointly owned FM and AM outlets in major markets. The popularity of stereo records has spilled over to make FM-stereo radio standard equipment in all but the lowest-priced console phonographs.

Phonographs also enjoyed a record year in 1966, with an increasing number of portables now in the same battery-operated go-anywhere format that sent radio zooming. But at the same time, stereo also remains a living room preoccupation as evidenced by all-time record console sales last year and the general upgrading of sophisticated and authentic furniture cabinets.

Television provides an ideal example of a consumer electronics product in metamorphosis. Like the radio and the phonograph, black-and-white TV started life as the wonder of the living room. With the beginning of the color TV boom in the early 1960s, there were widespread predictions that black-and-white was dead. But it turned out to be the liveliest corpse since radio.

During the years when color TV sales were doubling and redoubling, black-and-white sales also pushed to all-time highs. In 1964, they totaled nearly 8.4 million units (including imports). Then they rose to 8,750,000 in 1965 (well over a million more than the pre-color-boom record set in 1955), despite sales of 2.7 million color sets the same year. In 1966, when 5 million color sets were sold, black-and-white sales still totaled 7.7 million.

But black-and-white TV had developed a new type of market. Last year, more than 85 per cent of the sets sold were table models or portables. While the early trend of black-and-white had been to larger and larger screens, the direction now is to compactness and light weight. Thus, monochrome TV has become a "personal" viewing medium, and television has fanned out from the family center in the living room to a series of individual viewing stations throughout the home.

Television is also following the radio and the phonograph in becoming mobile. Transistor and integrated-circuit technology is making it possible to produce high-quality monochrome receivers designed for battery operation—in boats, in automobile back seats, or for use any place at all. The battery TV is putting an end to the old family conflict of picnic versus ballgame. Now you can have both at the same time.

It is not only changing consumer tastes but the changing nature of broadcasting that is forming the new trend toward personal TV viewing. The increasing number of stations catering to different tastes, the steady growth of educational TV, and the emergence of community antenna cable TV (CATV), which often provides such closed-circuit services as special weather-forecast channels, continuous news, and stock-market quotations—these all contribute to the need for the "individual" TV set.

There is still a big-screen set in the living room, and often it is a color set. As contrasted with the 85 per cent of black-and-white sets that were portables, 82 per cent of all color sets sold last year were consoles or radio-phonograph combinations.

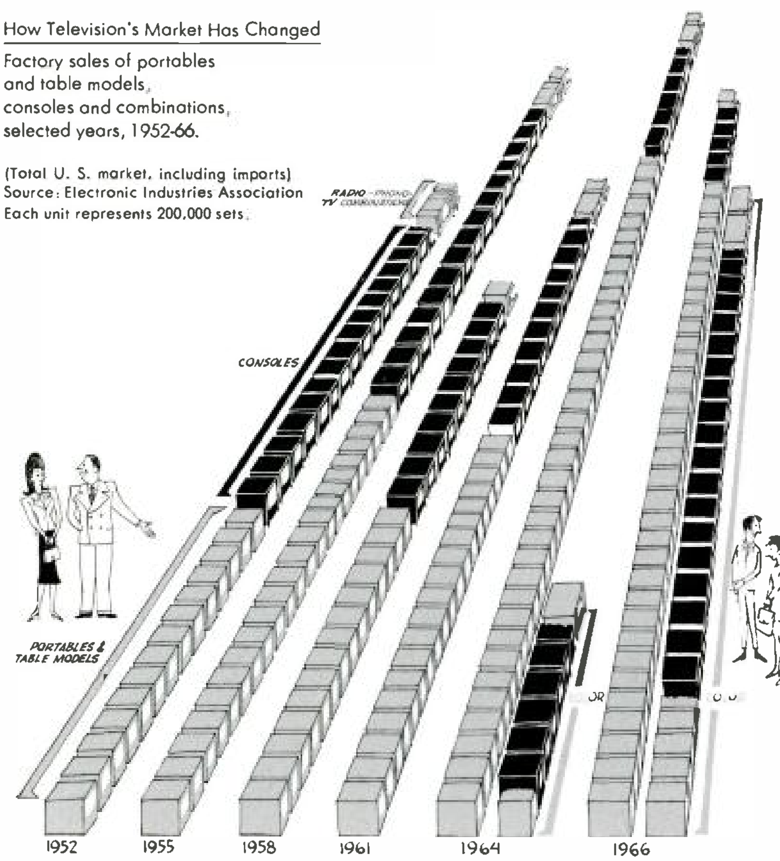
The history of black-and-white may well be telescoped in the case of color TV. Color now is in somewhat less than 20 per cent of American homes—about the same penetration reached by black-and-white television in 1950. But already there is a demand for color portables, and it is believed that a substantial percentage of the limited supply of portable color sets is going into homes that already have color consoles. On the basis of warranty-card returns, one manufacturer estimates that one out of three color portables is being purchased for use as a second color set. It is a rare viewer who is satisfied to watch a black-and-white Johnny Carson in the bedroom with the knowledge that he can be seen in glorious color in the living room. The second-color-set market apparently is not going to wait until the first-set market is substantially satisfied.

One short generation ago, in 1939, the total factory output of the consumer electronics industry—"the radio industry," it was called then—came to $186 million. By 1966, this figure had multiplied more than twenty-fold to $4 billion. New technical developments and processes continually give birth to new "wonder products," which start life as luxury items, then develop into specialty markets, and eventually become an indispensable part of everyday life. In our technologically oriented society, invention has become the mother of necessity. ■

How Television's Market Has Changed

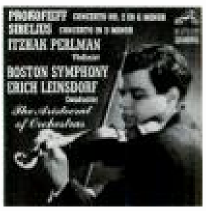
Factory sales of portables and table models, consoles and combinations, selected years, 1952-66.

(Total U. S. market, including imports)
Source: Electronic Industries Association
Each unit represents 200,000 sets.



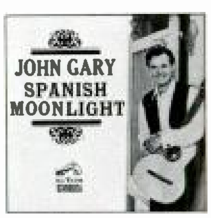
# For the Records...

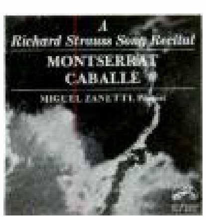
NEWS OF RECENT OUTSTANDING RCA VICTOR RECORDINGS







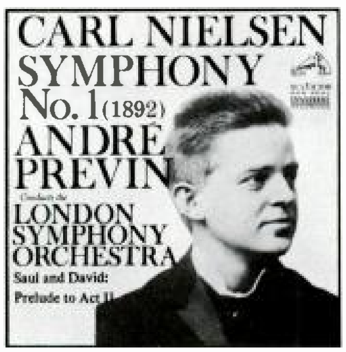




## "MY CUP RUNNETH OVER"

ED AMES

*(RCA Victor LPM/LSP 3774)*

Ed Ames has finally come into his own with the title song from this album, which comes from the Broadway smash musical hit "I Do! I Do!" Ames came very close to having a hit single about a year ago in "Try to Remember" from "The Fantasticks." "Try to Remember" and "My Cup Runneth Over" were both written by the talented team of Harvey Schmidt and Tom Jones. On this album, Ed applies his rich, warm baritone to other ballads such as "Melinda," "True Love," and "Our Love Is a Living Thing."


## NIELSEN: SYMPHONY NO. 1 in G MINOR, OP. 7, and SAUL AND DAVID: PRELUDE TO ACT II

André Previn conducting the London Symphony Orchestra

*(RCA Victor LM/LSC 2961)*

It is only in very recent years that the music of Carl Nielsen has become known outside the composer's native Denmark, but the world has been quick to make amends, for there quite possibly is no music in greater vogue today. The First Symphony had its world première in Copenhagen in 1894, two years before the première of Richard Strauss' "Also Sprach Zarathustra." As a contemporary of Strauss, Nielsen also was a musical explorer, and if his music has been late in gaining recognition, many consider it as significant a contribution as that made by Strauss.

## "A MAN FOR ALL SEASONS"

Original soundtrack recording from the Columbia motion picture starring Wendy Hiller, Leo McKern, Robert Shaw, Orson Welles, Susannah York, and Paul Scofield as Sir Thomas More

*(RCA Victor VDM 116)*

The dialogue from the season's most celebrated motion picture—winner as best film of the year in almost every contest—is brought forcefully to record in this album. In the two-record set, the tempestuous drama of a man who is forced to decide between his king and his God is told with telling impact.


## PROKOFIEFF: SYMPHONY NO. 3 and SCYTHIAN SUITE

Boston Symphony Orchestra, Erich Leinsdorf, Musical Director

*(RCA Victor LM/LSC 2934)*

The Prokofieff Series begun by RCA Victor and the Boston Symphony Orchestra approximately three years ago has been one of the most universally acclaimed classical music projects of recent years. Beginning with a recording of the Fifth Symphony, which many critics called the finest recording of that work ever, each album has added splendid stature to the series. The Third Symphony and the Scythian Suite now are added to the series in an album unsurpassed for sheer sound sonics.



## "AND THEN THERE WAS LANA"

LANA CANTRELL

*(RCA Victor LPM/LSP 3755)*

This is the debut album of Lana Cantrell, Australia's gift to North America, who, within the last year, has received nothing but praise from critics for her nightclub appearances at Los Angeles' Cocoanut Grove and New York's Copacabana. She has also made several appearances on the "Tonight Show" and "The Ed Sullivan Show." In August of 1966, she won first prize at the Polish Song Festival with "I'm All Smiles" (included in this album), from the Broadway musical "The Yearling." She has been compared to Barbra Streisand, Judy Garland, Ethel Merman, and a host of other singers.

## "CASINO ROYALE"

Original Soundtrack Recording

*(Colgems COMO/COSO 5005)*

This latest in the never-ending series of James Bond films has one of the most exciting soundtracks to be heard in a great while. Academy Award-winner, composer Burt Bacharach has the assistance of such "Top 10" artists as Herb Alpert and the Tijuana Brass and Dusty Springfield on this album on the Colgems label (manufactured and distributed by RCA Victor). The list of stars appearing in the film is a Who's Who of show business: Peter Sellers, Ursula Andress, David Niven, Joanna Pettet, Orson Welles, Daliah Lavi, and Woody Allen, with guest stars Deborah Kerr, William Holden, Charles Boyer, John Huston, George Raft, and Jean Paul Belmondo.

# Electronically Speaking...

NEWS IN BRIEF
OF CURRENT DEVELOPMENTS
IN ELECTRONICS

## SECOND-GENERATION WEATHER SATELLITE

A new series of weather-watching satellites—designated TIROS-M—will be placed in orbit beginning in 1969 to provide more extensive coverage of earth weather conditions at less cost than present operational space systems.

A second-generation offspring of the TIROS Operational System (TOS) satellites, TIROS-M will be capable of taking nighttime as well as daytime pictures of cloud cover and of carrying instrumentation not on its TOS predecessor. The spacecraft will be built for the National Aeronautics and Space Administration by RCA's Astro-Electronics Division in Princeton, N. J.

Sensors on the new satellite will include two Advanced Vidicon Camera Systems (AVCS), two Automatic Picture Transmission (APT) camera systems, two High Resolution Infrared Radiometers, a flat-plate radiometer, and a solar proton monitor. Pictures taken by the AVCS cameras will be stored on recorders aboard the spacecraft for subsequent transmission to earth stations in Alaska and Virginia. The APT system will allow simple, inexpensive stations to receive pictures of local area weather conditions from the satellite as it passes overhead.

The infrared radiometers will provide nighttime views of cloud cover by detecting slight differences in heat emitted by the earth and clouds. The flat-plate radiometer will measure the earth's heat balance, while the proton monitor will measure solar proton activity.

The near-polar, sun-synchronous course of TIROS-M will enable the satellite to view every portion of the earth in daylight at least once every 24 hours. A total of four spacecraft are to be built under the $29.7 million contract—one research and development TIROS-M, whose launch is expected in 1969, and three operational satellites, the first one of which will be placed in orbit in 1970.

## SUPERCONDUCTIVITY HARNESSED FOR COMPUTER MEMORIES

Superconductivity is a property of certain materials, usually metallic, that lose all resistance to electricity at temperatures close to absolute zero. Recently, a process was developed at RCA Laboratories to harness this property for use in high-capacity computer memory systems. The achievement has been described as a major advance in information storage technology.

Culminating 11 years of intensive research in the electronics industry, RCA scientists have constructed a unit that stores 14,120 bits of computer information in arrays of microscopic "loop cells" made of superconductive materials deposited in thin films on glass slides. Eventually, the method is expected to make possible all-electronic memories that can store up to a billion bits of computer data.

Superconductivity has been of special interest in computer memory technology because application to a superconductive material of a single electric pulse—representing a single bit of data in computer language—will start a flow of current that continues indefinitely unless it is stopped by an outside force. Information can thus be stored in the form of enduring currents trapped in microscopic bits of superconductive materials.

Because of their potentially large capacity combined with electronic speeds of operation, superconductive memories are expected to compete favorably in the mass-information storage field now dominated by relatively slow electromechanical memories using punched cards, magnetic drums, and magnetic tape. The combination of speed and capacity in superconductive units should enable them to handle up to six times more information per unit of time than conventional memories in certain types of message-center applications.

## HELP FOR THE JOBLESS

New Jersey's Labor Department this year will join the other state unemployment services that have installed computer systems to keep track of statewide job openings and match them with unemployed workers.

The system, one of the most extensive in the nation, will employ an RCA Spectra 70/45 computer connected to remote data transmission terminals at each of the state's local unemployment offices. The computer will eventually be used to handle data on rehabilitation programs, workmen's compensation, and other allied administrative functions.

Computers are operating in dozens of states to assist the unemployed to find jobs matching their qualifications. State unemployment officials look forward to the day when a nationwide computer system will enable a jobless worker to enter an employment office and, at the flick of a switch, receive a list of employment opportunities in all 50 states.

In addition to the administration of job replacement, RCA computers at the Departments of Unemployment in Massachusetts, Ohio, and Colorado electronically verify individual unemployment records stored digitally in their memories, tabulate benefits due, and automatically print compensation checks. Similar RCA computer systems will be installed next year in Oregon, Maine, and Tennessee.

Computers also are taking over the time-consuming task of calculating individual contribution rates and keeping records of payment to state unemployment funds by more than 2.5 million U.S. employers.

## LANGUAGE TAPES FOR CARS

Stereo cartridge tapes offering instruction in French, German, Spanish, or Italian are now available to motorists who want to learn a language without leaving their cars or taking their eyes off the road.

The tapes are RCA Victor's Stereo-8 study series that were developed and produced by the internationally known Institute for Language Study. Specifically designed for use with auto and home tape cartridge units, they represent a new concept in audio education.

The tapes are recorded stereophonically for playback on two stereo channels. Foreign sentences and phrases are on the left channel while pronunciation aids, translations, grammar explanations, and other drill and review exercises are on the right or "practice" channel. Each cartridge contains a minimum of 75 minutes of instruction divided into four programs, giving each complete course 12 programs.

## CLOSED-CIRCUIT TV FOR RACING FANS

A closed-circuit television system that enables a horse-racing fan to sit in an air-conditioned lounge and watch a race, follow the odds on the next race, enjoy an interview show with the winning owners and jockeys, and see photofinish pictures seconds after the end of a race recently went into operation at Monmouth Park, Oceanport, N. J.

In addition to these features, the RCA system also replaces the traditional film patrol for the first time at any thoroughbred track in the world. In racing parlance, a patrol is a method of recording a race so it can be quickly rerun by the stewards to determine if any fouls were committed. Video tape permits a review of a race within seconds, eliminating the delay encountered in developing film.

The network consists of 11 black-and-white and one color TV camera, five video tape recorders, equipment for showing films, 100 black-and-white and 15 color TV sets located in the grandstands and clubhouse, a TV studio, and a control room. Monmouth Park hopes to help amortize the cost of the system by running some 40 one-minute commercials over the network.

## HIGHWAY WARNING SYSTEM

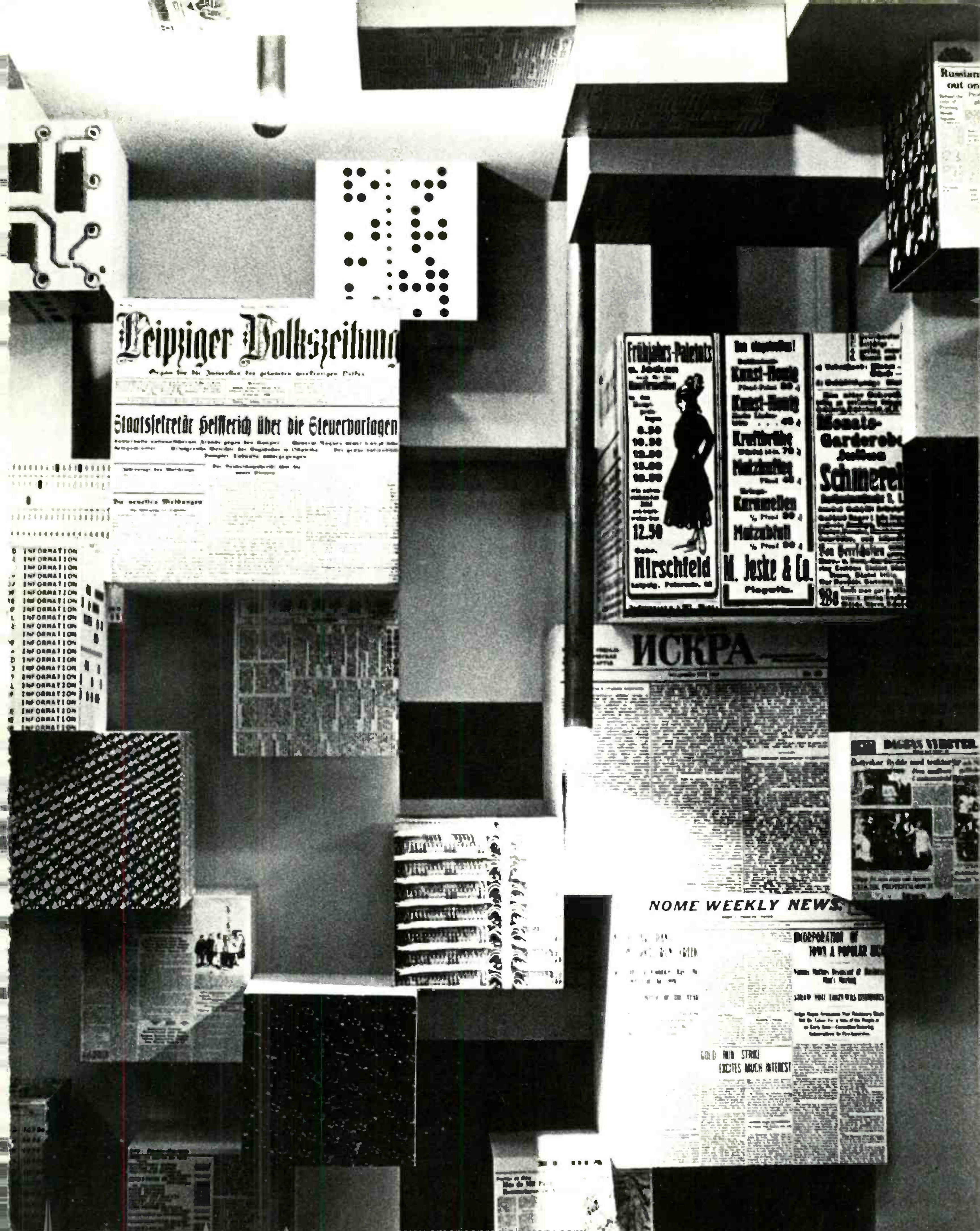
An electronic warning system that will enable a stranded or injured motorist to call for assistance by pressing a button in an emergency call box located along the highway will soon be installed in the village of Park Forest, Ill., a suburb of Chicago.

The system, produced by RCA's Industrial and Automation Products plant in Plymouth, Mich., consists of self-contained radio stations incorporating miniature, solid-state transmitters with a range of approximately 25 miles. They stand on aluminum poles bolted to a concrete base and are powered by batteries that are kept charged by solar-cell arrays.

A pre-coded signal sent from the call box permits a central dispatcher to pinpoint the scene of the problem and to dispatch assistance. At the same time, a printed record is made of the call and the time it came in for future reference.

The RCA system is identical to those now being installed along the 40-mile Atlantic City Expressway in New Jersey and the 42-mile Maryland portion of the Capital Beltway around Washington, D.C. In the case of the Atlantic City Expressway, the system will consist of 100 two-button call boxes spaced at one-mile intervals and may be used to summon either police or a service truck. A similar capability is being built into the Capital Beltway system that will consist of 328 boxes spaced at one-quarter- and one-half-mile intervals.

Picture credits: Front and back covers, front and back inside covers, Henry Wolf; page 7, Sergio Larrain—Magnum; page 9, Eric Hartmann—Magnum; page 10 (left) View of *Toledo* by El Greco, courtesy of the Metropolitan Museum of Art, (right) *The Starry Night* by Vincent van Gogh, collection of the Museum of Modern Art; page 11, T. Mike Fletcher—Black Star; page 12, Expo 67; page 13, Terry LeGoubin—Black Star; pages 14 and 15, Rene Burri—Magnum; pages 27 and 28, U.S. Department of the Interior; page 29, U.S. Agency for International Development. All other photos, the Radio Corporation of America.


Leipziger Volkszeitung
Staatssekretär Helfferich über die Steuervorlagen
INFORMATION
Frühjahrs-Paletots
Hirschfeld
M. Jeske & Co.
ИСКРА
NOME WEEKLY NEWS
GOLD RUN STRIKE
EXCITES MUCH INTEREST

# Electronic Age

SUMMER 1967